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Labour Utilization Options and Productivity in Small-Scale Agricultural Enterprises in Akwa Ibom State, Southern Nigeria

Güney Nijerya, Akwa Ibom Eyaletindeki Küçük Ölçekli Tarım İşletmelerinde İşgücü Kullanım Seçenekleri ve Verimlilik

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LABOUR UTILIZATION OPTIONS AND PRODUCTIVITY IN SMALL-SCALE AGRICULTURAL ENTERPRISES IN AKWA IBOM STATE, SOUTHERN NIGERIA

ABSTRACT

Following the continuous scarcity of farm labour in some farming communities in southern region of Nigeria, the study primarily identified factors that influence farm labour use and its productivity. The study was conducted in Akwa Ibom State in the southern region of Nigeria. A total of two hundred (200) cassava-based farmers were randomly sampled. Descriptive, multinomial Logit and Tobit models were employed to analyze the data. The findings revealed hired labour, family and group labour as the primary sources of labour for the small-scale farmers, with family labour being slightly dominant. Also, farmers' age, educational attainment, farm size, farm income, non-farm income, farming experience and access to farm credit were identified as factors that increase the probability of farmers adopting hired labour relative to group labour. Similarly, farmers' household size and marital status were found to increase the probability of using family labour relative to the group labour. The positive determinants of labour productivity were farmers' age, education, social capital, farm income, sex, access to farm credit and agricultural extension services; whereas farm size and farming experience were negative determinants. It is strongly recommended that farmers' formal education, farm income, farm credit, access to extension services and social capital formation should be prioritized during policy formulation aimed at enhancing labour access and productivity among small-scale farmers.

Keywords: Farm, Labour, Cassava, Productivity, Nigeria.

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GÜNEY NİJERYA, AKWA IBOM EYALETİNDEKİ KÜÇÜK ÖLÇEKLİ TARIM İŞLETMELERİNDE İŞGÜCÜ KULLANIM SEÇENEKLERİ VE VERİMLİLİK

ÖZ

Nijerya'nın güney bölgesindeki bazı çiftçi topluluklarında sürekli olarak çiftlik işçiliği kıtlığının ardından, çalışma öncelikle çiftlik işçiliği kullanımını ve üretkenliğini etkileyen faktörleri belirledi. Çalışma, Nijerya'nın güney bölgesindeki Akwa Ibom Eyaletinde gerçekleştirildi. Yapılandırılmış bir anket kullanılarak toplam iki yüz (200) manyok bazlı çiftçi rastgele örneklendi. Verilerin analizinde tanımlayıcı, multinomial Logit ve Tobit modelleri kullanılmıştır. Bulgular, küçük ölçekli

çiftçiler için birincil emek kaynakları olarak ücretli emek, aile ve grup emeğini ortaya çıkardı ve aile emeği biraz baskındı. Ayrıca, çiftçilerin yaşı, eğitim düzeyi, çiftlik büyüklüğü, çiftlik geliri, tarım dışı gelir, çiftçilik deneyimi ve çiftlik kredisine erişim, çiftçilerin grup emeğine göre ücretli emeği benimseme olasılığını artıran faktörler olarak belirlendi. Benzer şekilde, çiftçilerin hanehalkı büyüklüğü ve medeni durumunun, grup işçiliğine göre aile işçiliğini kullanma olasılığını artırdığı bulunmuştur. Emek verimliliğinin olumlu belirleyicileri, çiftçilerin yaşı, eğitimi, sosyal sermayesi, çiftlik geliri, cinsiyeti, çiftlik kredisine erişimi ve tarımsal yayım hizmetleriydi; çiftlik büyüklüğü ve çiftçilik deneyimi ise olumsuz belirleyicilerdi. Küçük ölçekli çiftçiler arasında işgücü erişimini ve üretkenliği artırmayı amaçlayan politika formülasyonu sırasında çiftçilerin örgün eğitimi, çiftlik geliri, çiftlik kredisi, yayım hizmetlerine erişim ve sosyal sermaye oluşumuna öncelik verilmesi şiddetle tavsiye edilir.

Anahtar Kelimeler: Çiftlik, Emek, Manyok, Verimlilik, Nijerya.

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1. INTRODUCTION

Small-holder farmers' access and utilization of various forms of human labour are becoming relatively difficult in some parts of Nigeria (Jean-Claude, 2011; Obasi and Kanu, 2014; Jayne et al., 2017). The relatively scarce rural farm labour is a severe issue in the south-south region of Nigeria because family labour dominancy has been threatened due to the improvement in the human capital of most rural farm households (Udoh and Akpan, 2017). Once more, the enlargement of the urban areas and enunciation of several youth and entrepreneurial skill programmes, including the drudgery and the risk components of the agricultural system, have worked to alter the framework and composition of the farm labour market in the region (Akpan 2010; Akpan et al., 2017c; Akpan et al., 2019b; Umoren et al., 2021; Akpan et al., 2023). Besides, the improvement in the educational infrastructures and increase in the rural-urban youth migration has contributed to the scarcity of youthful labour in rural farming communities in the region. According to Akanni and Dada, (2012) and Yeboah and Jayne, (2016), human labour constitutes the main source of labour for peasants or small-scale farmers in Nigeria. As noted by Bedemo et al. (2013), human labour is seen as a fundamental asset for resource-poor farmers in developing societies.

In the southern part of Nigeria, the main categories of agricultural labour are family labour, hired labour, and group or exchange labour. The imputed or family labour is provided by the household members, whereas the hired labour is paid manpower. The group or exchanged labour is one of the social capitals that involves common-minded farmers (common among women) with a common goal

and identity bound in a formal relationship and are engaged in rotational farming among members (Saliu and Ojandage, 2008; Edoka et al., 2014). The group pool human efforts to work on a member's farm until the activities on the farm are done, then they move to all members' farms in an agreed rotating routine. Farm labour availability and its efficient use have posed a severe challenge to the sustainability of small-scale farm production in Nigeria (Ogbalubi and Wokocha, 2013). Some rural farm households with low human capital development still relied heavily on family labour sources (Aggrey et al., 2010). However, with the persistent change in needs and perceptions of most rural farm households, family labour would not provide sustainable farm power to small-scale farmers now and in future (Sakho-Jimbira and Hathie, 2020). Hence, for the survival of small-scale farm production in the region, farmers must devise means and develop the capacity to utilize available farm labour sources. Therefore, the choice or option of farm labour use among small-scale farmers has become a crucial decision due to scarce farm resources and increase in budget constraints of farmers. The choice of labour used by small-scale farmers has a significant relationship with farm output and factor productivity (Obike et al., 2017; Wang et al., 2022; Stevens, 2018). As observed by Nolte and Ostermeier (2017) and Mtaturu et al. (2022), an increase in the wage rate of hired labour increases the farmers' budget constraints and poses a severe threat to labour productivity and growth in output. Also, Akpan (2020) noted that the average rural wage rate of farm labour is becoming competitive among farmers, following the inelastic demand for labour by farmers.

The small-scale farmers' preference for labour sources and the intention to increase farm labour productivity is conditioned by several factors, including economic, social and cultural factors, among others. Human labour accounts for more than 80% of the total farm power and constitutes between 80% to 90% of variable cost of farm production, hence a significant determinant of farmers gross margins and sustainability of small-scale farming system in the region (Anyiro et al., 2013; Nmadu and Akinola, 2015; Akpan et al., 2017a; Akpan et al., 2017b; Akpan and Effiong, 2022b). Since the use of human labour is inevitable among small-scale farmers in the region (Edohen and Ikelegbe, 2018; Ayaz and Mughal, 2022; Tritsch et al., 2022; Akpan et al., 2022a), and the need to increase its productivity is a rational decision; then it is essential to identify factors that affect these variables. The identification of these factors would promote optimal decision-making in the labour market and enhance labour productivity and efficient use of farm resources in small-scale farming system in the region (Wang et al., 2022). In addition, the overall farm productivity of factors of production will be enhanced while an evidence-based farm labour policy framework can be efficiently enunciated and implemented in the region (Akpan et al., 2022b; Wang et al., 2022).

Only a few pieces of literature have dealt with farm labour choices and their determinants. In Ethiopia, Bedemo et al. (2013) found farmers' education, dependent

ratio, farm size, credit availability, and farm income as positive determinants of hired labour choice among farmers. On the contrary, the family size was a negative determinant. In Nigeria, Bassey et al. (2014) showed farmers' farming experience, farm income, educational attainment and age as significant determinants of hired labour use among cassava farmers in Nigeria. In a similar vein, Omotesho et al. (2014) revealed that farmers' household dependent ratio, years of formal education, age, family size and farm income significantly influenced the use of hired labour in farm households in Kwara State, Nigeria. In South Africa, Anim (2011) reported that farmers' experience, land size, extension services, and farm inputs positively influenced labour supply. On the contrary, educational attainment of the head of household, household size, off-farm activities of household members, real wage rate and location of the farm exerted inverse relationship on farm labour supply. Furthermore, Nmadu and Akinola (2015) in Nigeria, reported that the two main sources of farm labour to majority of farmers are the family and hired labour. The study identified farmers' income, household size, wage rate, farm size, and sex as factors that influenced labour utilization in the area.

Similarly, there has been little empirical literature on the productivity of agricultural labour in the production of arable crops. For instance, in Nigeria, Okoye et al., (2008) showed that farmers' experience was a positive determinant of labour productivity among cocoyam farmers. The study revealed that farm size and household size relate negatively to labour productivity. Similarly, Anyaegbunam et al. (2010) in Nigeria found farmers' sex, family size, and age as significant negative determinants of labour productivity. In eastern Nigeria, Obike et al. (2017) found education, farming experience, and farm size as significant factors influencing labour productivity in cocoa farmers in Abia State, Nigeria. In addition, Akpan (2021) modelled the determinants of labour productivity for water leaf producers in the south of Nigeria. The study found farmers' educational level, family size, experience, marital status, agricultural extension services, and farm credit as direct determinants of labour productivity, while farm size, manure applied, and non-farm income were negative determinants. Aggrey et al. (2010); Asghar et al. (2017); Lebedinski and Vandenberghe (2014) found a significant link between educational attainment and labour productivity.

The literature available on these critical issues needs to be updated, and new variables tested to develop sustainable, workable policies on rural labour market and its productivity in the southern region of the country. Again, the need to have sufficient, timely delivered and efficient human labour for sustainable arable crop production is inevitably given the high headcount poverty rate of 28.82%, poverty gap index of 7.25 and unemployment rate of around 40% in the region (NBS, 2022). The region needs an urgent policy direction based on sound empirical researches to generate a sustainable policy framework to tackle the issue of farm labour market imperfection. In addition, the region needs to address issues related

to persistent low production of arable crops and declining factor productivity in small-scale agricultural production. Based on these facts, the research was mainly designed to:

a. identify factors that influence labour utilization in cassava (*Manihot esculenta*) production in the southern part of Nigeria,

b. estimate farm level labour productivity index in cassava production in the southern part of Nigeria, and

c. identify factors that influence labour productivity in cassava production in the southern part of Nigeria.

2. MATERIAL AND METHOD

2.1. The Study Area

The research was carried out in the Uyo and Etinan areas of the Agricultural Development Programme (ADP) in Akwa Ibom State, the southern part of Nigeria. The Uyo ADP zone comprises of Uyo, Ibesikpo Asutan, Itu, Uruan and Ibiono Ibom Local Government Areas. The Etinan Agricultural Development Programme (ADP) zone consists of Nsit Ibom, Nsit Ubium, Etinan and Nsit Atai local governments. The similarities in the climatic and soil factors as well as the presence of the large population of cassava-based farmers in these zones were the factors considered for the purposive selection of these zones out of the six zones in the State. Agricultural production is the major occupation of the inhabitants of the region. Varieties of crops and animals are being cultivated and reared respectively in the region. Common crops are cassava, waterleaf, fluted pumpkin, yam, maize, plantain, pepper, banana and cucumber among others. Cash crops available include oil palm, rubber and cocoa. The average rainfall in the zones ranges from 2000mm to 3000mm per annum. The region has wet and dry seasons while the average yearly temperature and relative humidity range from 26 degree Celsius to 27 degree Celsius and 75% to 95% respectively (Akpan et al., 2019a).

2.2. Data Source, Questionnaire and Respondents

Cross sectional information were sourced from the respondents using a well-designed structured questionnaire. The study also conducted interviews with selected key informants (consisting of farmers' groups and community leaders) in the selected farming communities to authenticate and compared the consistency and accuracy of information provided by the respondents. The respondents were arable crop farmers that cultivate majorly cassava crop and a combination of other crops. Respondents were selected on the basis that cassava is the most popular food

crop in terms of cultivation and consumption in the region (FGN, 2016; Wossen et al. 2017). In the region, almost 100% of food crop farmers cultivate cassava crops either as a major or supporting crop. It is the most proficient food crop that can be used as an indicator for measuring growth in the crop-sub sector in the region.

2.3. Sample Size

Using a Cochran (1963) sample size selection formula, the study obtained the representative sample size from a large population of smallholder cassava-based farmers (mixed crop farmers with cassava as a major crop) using the equation (1):

$$S_x = \frac{z^2 \rho(1-\rho)}{D^2} \quad (1)$$

Note S_x represents the estimated representative sample; Z connotes the 95% confidence interval (i.e. 1.96); is the percentage of cassava-based farmers in the population frame (about 85%) in the two agricultural zones; D represents the absolute error at 5% probability level of type 1 error. The representative population for the study was obtained as shown in equation (2):

$$S_x = \frac{(1.96)^2 0.85(1-0.85)}{(0.05)^2} = 196 \quad (2)$$

For ease of sampling, the calculated sample population was scaled up to two hundred (200) respondents.

2.4. The Sampling Procedure

The study utilized a multi-stage sampling method to pick the required population. The first process was the purposive selection of two agricultural zones in the State. That is Uyo and Etinan agricultural zones were selected because of the high number of cassava mixed crop farmers. The second process involved randomly selecting two local government areas with a high population of cassava farmers in each of the agricultural zones. The exercise produced four local government areas in all. The third step was a random selection of two (2) villages from each of the previously selected local government areas. In all, eight (8) villages were selected for the study. The villages contain many farm families that cultivate mixed crops with cassava crop as a dominant crop. The fourth stage was the random selection of twenty-five (25) farm families cultivating cassava as a major crop in each of the villages. A total of 200 cassava-based farm families were randomly selected for the study.

2.5. The Conceptual Framework

From the economic theory, a rational farmer will choose a particular technology only if it maximizes utility relative to the other alternatives available. This suggests that given a set of options or technologies, a rational farmer will always prefer an option that yields higher utility among a set of options on the condition that the farmers' budget constraint is minimized. However, since the options are assumed to be latent variables, the utility gain from the options preferences is not observable but is reflected in the choice of the option adopted by the farmer. Hence, the utility can be exemplified by the probability of choosing an option with higher utility among a set of options, as shown in equation 3. According to Zegeye et al. (2022), farmers' behavior towards multiple choices of technology could also be shown in their risk-bearing capacity or behavior. A small-scale farmer is assumed to be rational in his farm decision and is risk averse because he is a resource–poor entrepreneur. Hence, a risk-averse farmer would always seek to maximize farm profit or output by choosing a discrete option of technology that minimizes risk and cost of production. Alternatively, such an option is tended to maximize profit or output subject to the farmers' budget constraints.

$$V_i = \begin{Bmatrix} 1\ if\ U_{max}(V_1) > U_{max}(V_2) > U_{max}(V_3) \\ 2if\ U_{max}(V_2) > U_{max}(V_1) > U_{max}(V_3) \\ 3if\ U_{max}(V_3) > U_{max}(V_1) > U_{max}(V_2) \end{Bmatrix} \quad (3)$$

The adoption of an option among a set of options can be represented in equation 4. The M_i represent the latent variable or a probability which explains the farmer's behaviour in choosing different forms of labour available to him. The Z is the explanatory variable which condition the farmers on the choice of alternative labour. The δ's are the coefficients of the explanatory variables while the ε's is the random error term or the unexplained explanatory variables.

$$\begin{Bmatrix} M_1 = \beta_1 + \delta_1 Z_1 + \varepsilon_1 \\ M_2 = \beta_2 + \delta_2 Z_2 + \varepsilon_2 \\ M_3 = \beta_3 + \delta_3 Z_3 + \varepsilon_3 \end{Bmatrix} \quad (4)$$

It is assumed that the specified predictors (Zi) are not correlated with the error term ε for each of the equations of the labour option. The error is assumed to be independently distributed in each of the alternatives, hence, the independence of irrelevant alternatives (IIA) hypothesis. The above structural form is a resemblance of the structure of the multinomial Logit because of the different options available to the farmer, hence the justification for selecting the multinomial Logit model.

2.6. The Determinants of Farm Labour Options

Rural households are often confronted with different choices of labour, and the use of the multinomial Logit model is appropriate in this case. The Multinomial Logit Model has error terms for each of the choice equations, which are independent and identically distributed. The model has been shown to yield more stable results when the Independent of Irrelevant Alternatives (IIA) hypothesis is fulfilled. According to Kropko (2008), the multinomial Logit model provides results that are almost more accurate and realistic than other models, even when the Independent of Irrelevant Alternatives (IIA) hypothesis is seriously violated. In the specified model, the family labour is considered the base category and all the other Logits are made relative to the base category. A multinomial Logit regression was used to estimate the determinants of farm labour choices of a cassava-based farmer in the study area. According to Gujarati and Dawn (2009), a generalized multinomial Logit model is specified as thus in equation 5:

$$\pi_{ij} = P_r(Y_{ij} = 1) = \frac{e^{\alpha j + \beta_j X_i}}{\sum_{j=1}^{n} e^{\alpha j + \beta_j X_i}} \quad (5)$$

The family labour is used as the base category, and all the other Logits are made relative to the base category. Then the estimated multinomial Logit model is specified as follows in equation 6:

$$\pi_{ij} = P_r(Y_{ij} = j/x) = \frac{exp(x_i \alpha_j)}{1 + \sum_{k=1}^{n} exp(x_i \alpha_k)} \quad for\ j = 1, 2. \ldots, k-1 \quad (6)$$

Y_ij=1, If a farmer chooses alternative j (j =1, 2, and 3). Where j = 1(family labour); j = 2 (hired labour); j = 3 (group labour).The β's are a set of coefficients attached to each alternative, while X's are a set of explanatory variables that determine the respective probability. The dependent variable () represents the probabilities that a farmer chooses alternative 1, 2 or 3, respectively. If there are three alternatives available to a farmer, then the summation of their probability is equal to unity, as exemplified in equation 7.

$$\pi_{i1} + \pi_{i2} + \pi_{i3} = 1 \quad (7)$$

For an i^{th} option, the explicit model is expressed as shown in equation 8,

$$\pi_i = \emptyset_0 + \emptyset_1 AGE + \emptyset_1 HHS + \emptyset_1 EDU + \emptyset_1 SOC + \emptyset_1 FAS + \emptyset_1 FIN + \emptyset_1 NFI + \emptyset_1 GEN + \emptyset_1 EXP + \mu_i \quad (8)$$

The set of explanatory (X's) variables that defined equation 6 are given below;
AGE = Age of a cassava-based farmer measured in years
HHS = Household size of a cassava-based farmer (number)
EDU = Educational qualification of a cassava-based farmer (year)
SOC = Membership of a social organization by a cassava-based farmer (years)
FAS = Farm size of a cassava-based farmer (ha)
FIN = Farm income of a cassava-based farmer (naira)
NFI = Non-farm income of a cassava-based farmer (naira)
MAR = Marital status (married = 1 and 0 = otherwise)
SEX = Sex of a cassava-based farmer (1 for female and 0 = male)
CRE = Amount of credit access by a cassava-based farmer (naira)
EXT = Access to agricultural extension services (number of times in a year)
EXP = Farming experience of a cassava-based farmer (years)

2.7. Measuring Farm-Level Labour Productivity

Labour productivity can be measured in monetary terms or physical quantity. Following the specification Akpan (2021), Labour productivity is measured as the proportion of the total amount of output to the total amount of specific agricultural factors. In this study, labour productivity is given in monetary terms and is measured as follows:

$$LPR = \left\{\frac{Value\ of\ the\ total\ output\ of\ cassava - based\ farmer\ in\ one\ season}{cost\ \ of\ labour\ used(\ total\ cost\ of\ labour)\ in\ the\ same\ season}\right\} \quad (9)$$

$$LPR = \left\{\frac{\sum_{i=1}^{n} Y_i P_i}{\sum_{i=1}^{n} N_l W_i}\right\} \quad (10)$$

Since the range of the estimated labour productivity is defined as (it lies between zero and infinity), the Tobit model was estimated for labour productivity equation. The model is expressed thus:

$$Y_i^* = X_i \emptyset + e_i \quad (11)$$

Where is the latent variable that is observed for values greater than zero (0). is the explanatory variable while represents the coefficient of the explanatory variable. Then the observed Y is defined by the following relationships:

$$Y_i^* = \begin{cases} Y^* \ if \ \ Y^* > 0 \\ 0 \ if \ \ Y^* \leq 0 \end{cases} \quad (12)$$

The marginal effect of the latent variable on the latent dependent variable is given thus:

$$\frac{\delta E(Y_i^*)}{\delta X_i} = \beta_i \quad (13)$$

The marginal effect measures the impact of the unit change in the explanatory variable on the latent independent variable. The explicit form of the Tobit model is given thus:

$$LPR = \varphi_0 + \varphi_1 AGE + \varphi_2 HHS + \varphi_3 EDU + \varphi_4 SOC + \varphi_5 FAS + \varphi_6 FIN + \varphi_7 NFI + \varphi_8 MAR + \varphi_9 SEX + \varphi_{10} CRE + \varphi_{11} EXT + \varphi_{12} EXP + + U_i \quad (14)$$

Where;
LPR = Farm labour productivity as defined in equation 10
AGE = Age of a cassava-based farmer (years)
HHS = Household size of a cassava-based farmer (number)
EDU = Educational qualification of a cassava-based farmer (year)
SOC = Membership of a social organization by a cassava-based farmer (years)
FAS = Farm size of a cassava-based farmer (ha)
FIN = Farm income of a cassava-based farmer (naira)
NFI =Non-farm income of a cassava-based farmer (naira)
MAR = Marital status (married = 1 and 0 = otherwise)
SEX = Sex of a cassava-based farmer (1 for female and 0 = male)
CRE = Amount of credit access by a cassava-based farmer (naira)
EXT = Agricultural extension agent contact (number of times in a year)
EXP = Farming experience of a cassava-based farmer (years)
U = error term

3. RESULT AND DISCUSSION

3.1. Determinants of Labour Preferences

The results in Table 1 show the multinomial logit coefficients for the specified labour choice equation. The chi-square estimates revealed that the likelihood ratio statistics are highly significant ($p < 0.0001$), indicating that the specified models have the power to explain the behaviour of the cassava-based farmers' choice of labour preference. The diagnostic statistics also revealed the pseudo-R^2 of 0.2338, suggesting that 23.38% of the variability in the probability of occurrences of the dependent variables is due to the explanatory variables. The estimation Chi-square model (57.45) is significant at a 1% significance level. This implies that the effects (including the signs) of the explanatory variables in the specified models are statistically significant at a 1% level, hence justifying the reliability of the estimated

model. Note the coefficients of each explanatory variable in the multinomial Logit do not represent the marginal influence or the slope coefficient of the explanatory variable on the dependent variable (the probability of choosing any labour choice). Hence, the post-estimated marginal effects or the slope coefficients, which denote the change in the probability due to a change in the explanatory variable, were used to interpret the multinomial logit model.

3.2. Determinants of Hired And Family Labour (Using Group Labour As A Base Category)

The empirical findings indicate that the age of farmers has a significant positive correlation with the probability that farmers prefer hired labour over the base category (group labour). The finding implies that a unit increase in the farmers' age would likely lead to a 2.48% upsurge in the probability of farmers preferring hired labour relative to the base category. On the contrary, an increase in farmers' age decreases the probability of choosing family labour by 3.65% relative to the reference category.

The findings imply that older farmers would have higher possibilities of using hired labour and lower chances of using family labour relative to group labour. The finding could likely be attributed to the fact that most farm households would prefer to invest in human development to reduce the scourge of poverty, thereby exposing some household members to formal education and entrepreneurial skill acquisition programmes. Hence, at the old age of a farmer, household members might have acquired higher training and leave the farm household for anticipated better job offers and opportunities elsewhere. The gap created at the farm household would lower the chances of utilizing family labour but rather force the aged members to go for alternative labour sources such as hired labour. The result corroborates Omotesho et al. (2014) and Bassey et al. (2014).

Table 1. Estimates of the multinomial logit regression on farm labour choices (group labour as a reference category)

	Hired Labour			Family Labour		
Variable	**Coefficient**	**Z-value**	**dy/dx**	**Coefficient**	**Z-value**	**dy/dx**
Constant	4.2202	1.50	-	6.5653	1.76*	-
Farmers' Age	0.1475	2.04**	0.0248	-0.2270	-2.45 **	0.0365
Household Size	-0.2429	-1.73*	-0.0800	0.4628	2.67***	0.0270
Formal Education	0.1312	2.44**	0.0337	-0.0476	-3.73***	-0.0242
Social Capital	-0.0911	-2.37**	-0.0202	-0.0360	-0.46	-0.0203
Farm Size	1.6407	1.96*	0.5026	-2.3169	-1.52	-0.2379
Farm Income	0.00003	1.81*	5.50e-06	-0.00002	-2.84***	-5.23e-06
Non-farm Income	1.77e-06	3.25***	5.42e-07	-2.48e-06	-0.31	-1.21e-07
Marital Status	-0.4614	-0.67	-0.1949	3.8829	3.17***	0.0230
Sex	-0.4500	-0.97	-0.0715	-0.7082	-1.27	-0.1474
Credit Access	0.0001	1.37	0.0001	-0.0011	-0.02	-0.00004
Agric. Extension	1.2221	1.77*	0.2091	-2.0638	-2.31**	0.3139
Farming Experience	0.0438	1.97*	0.0088	-0.0375	-0.61	-0.0099

Source: data from fiels survey 2022 season. *, **, and *** denote significance at 10%, 5%, and 1%, respectively; Number of observations = 200; LR chi2 (24) = 57.45; Prob > chi2 = 0.0001. Log likelihood = -186.209; Pseudo R^2 = 0.2338.

The social capital coefficient has a significant negative relationship with the likelihood of preferring hired and family labour over group labour. This connotes that as the social capital accumulation increases among cassava-based farmers, the probability of choosing hired and family labour decreases relative to the choice of group labour. A unit increase in social capital will lead to a 2.02% and 2.03% decrease in the probability of choosing hired and family labour, respectively, relative to the base category. Alternatively, an increase in social capital will tend to increase the use of group labour and decrease the use of both hired and family labour. The increase in social capital is known to stimulate farmers' group formation and cooperatives, which enhances the exchange of labour among members.

The coefficient of household size is negative and significantly correlated with the probability of choosing hired labour relative to the base category. An increase in household size would reduce the probability of choosing hiring by 8.00% relative to the base category. On the other hand, an increase in household size increases the likelihood of a cassava farmer preferring family labour over the reference class. An increase in household size would result in an approximately 2.70% increase in the probability that cassava farmers choose family labour over the base category. An

increase in household size provides an incentive to increase the use of family labour and to reduce the likelihood of using hired labour. The finding satisfies a priori expectation as an increase in household size will directly increase the possibility of a household head employing more household members in farming activities, while a decrease in household size will create an opportunity for the household head to search for an alternative labour source. The finding agrees with the reports of Omotesho et al. (2014), Nmadu and Akinola (2015), and Anim (2011).

The marginal effect with respect to the years of formal education is found to be significant and positively associated with the hired at a 5% probability level relative to the base category. An increase of one unit in the number of years of formal education for cassava farmers would increase the chances of choosing a hired labour force of 3.37% compared to the base category. On the contrary, a unit increase in years of formal education of cassava-based farmers would reduce the probability of utilizing family labour by 2.42% relative to the base category. This means that the probability of using hired labour increase with an increase in the educational qualification of cassava-based farmers compared to the group labour. An increase in farmers' educational qualification implies that the farm household members will likely be educated as well; this will generate opportunities for farm household members to diversify to an alternative source of income. The situation may likely create a labour shortage that will prompt household heads to go for alternative labour sources. The opposite situation applies to the probability of using family labour relative to the base category. The finding is substantiated by Anim, (2011); Bassey et al. (2014), and Omotesho et al, (2014); but is contrary to the submission of Bedemo et al, (2013).

The cassava-based farmers' farm size is positively and significantly associated with the probability of using hired labour preference at $p < 0.01$, relative to the base category. A unit increase in farm size would increase the probability of adopting hired labour choice by 50.30% relative to the base category. Besides, the increase in farm size has a significant negative relationship with the probability of farmers using family labour. A unit increase in farm size will cause about a 23.30% reduction in the probability of using family labour relative to the base category. The finding satisfies a priori expectation as a large farm size would attract more labour beyond those provided by the family. Bedemo et al, (2013); Ani, (2011) and Nmadu and Akinola (2015) have reported a similar result.

The result showed that farmers' farm income has a positive and statistically significant marginal correlation with the probability of preferring hired labour relative to the base category at $p < 0.01$. On the contrary, there is a significant negative relationship between farm income and the probability of using family labour relative to the base category. The findings imply a farmer with a large farm income would have a greater capacity to pay for wage rate, and this would encourage hired

labour utilization relative to family labour. Similarly, a farmer with a large income would not rely on family labour for the sustenance of his/her farm income. Bassey et al. (2014), and Nmadu and Akinola (2015) have reported a similar result.

The farmer's marital status (being married) has a positive significant correlation with the probability of desiring family labour choice relative to the reference category. The more the number of married cassava-based farmers, the more the probability of using family labour relative to the base category. The finding satisfies the a priori expectation as an increase in the number of married farmers will increase household size.

The access to agricultural extension by cassava-based farmers is a positive determinants of the probability of using hired labour relative to the based category. This means that a unit increase in extension contact will result in a 20.91% increase in the probability of using hired labour relative to the use of group labour. On the other hand, a unit increase in access to extension services would cause about a 31.39% reduction in the probability of cassava farmers utilizing family labour relative to the base category. The finding revealed the declining roles of family labour in the small-scale production systems in the region.

The farmers' farming experience has a positive significant correlation with the choice of hired labour relative to the base category. A unit increase in farming experience will lead to a 0.88% increase in the probability of preferring hired relative to the choice of group labour. The increase in the farming experience is very significant in determining the optimal resource use and the best combination of farm inputs taking into consideration several endogenous and exogenous factors in the farm. The result aligned with the reports of Bassey et al. (2014); Bedemo et al. (2013) and Anim (2011).

The non-farm income coefficient is positively and significantly correlated with the likelihood of choosing hired labour source at $p < 0.001$ relatives to the base category. An increase in the non-farm income is likely to increase the probability of the farmers' choice of hired labour relative to the choice of group labour. An increase in non-farm income would likely upsurge the financial capacity of a farmer to pay for wages. Anim (2011) has reported similar findings.

3.3. Labour Productivity Among Cassava-Based Farmers

The percentage distribution of indices of labour productivity is shown in Figure 1. The result revealed that about 14.00% of farmers had labour productivity in the range of 0.000 – 1.000. This implies that many farmers were unable to cover their costs of labour from the farm proceeds. Alternatively, about 14.00% of the farmers were unable to efficiently cover the cost of production from farm income. The re-

sult showed that about 86.00% had their labour productivity indices greater than unity. This implies that the majority of smallholder cassava farmers in the region have been able to generate enough farm income to pay wages. Only 12.50% of the farmers achieved a labour index range of above 6.00 units.

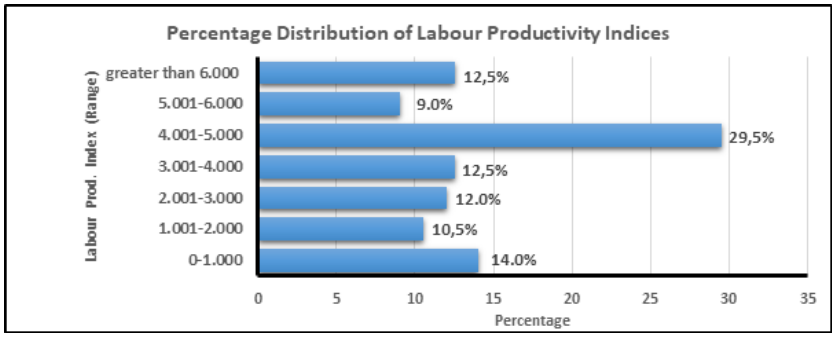

Figure 1: Percentage distribution of labour productivity among cassava-based farmers.

The mean productivity index stood at 3.998±2.628, while values for the minimum and maximum indices were 0.525 and 14.50 units, respectively. The coefficient of variability of the productivity index was estimated at 65.70%, while the skewness is 1.643 units. Since labour cost constitutes about 80.00% of the total farm production cost of the small-scale farmers in the region, it is overwhelmingly necessary for the policymakers to re-access the survival capacity and the sustainability of the small-scale farm production in the region. It was found that about 87.50% of small-scale cassava farmers had a labour productivity index equal to or less than 6.00 units. The finding implies that the profit or gross margins of most small-scale cassava farmers are low, and farm factor productivity will continue to decline unless proactive interventions (such as input subsidy or guarantee minimum price etc.) are implemented.

3.4. Determinant of Labour Productivity

The estimates of the Tobit model is shown in Table 2. The Chi-squared value is statistically significant, implying that the explanatory variables significantly explained the variations in the dependent variable. The Pseudo R-squared implies that about 31.14 % of variations in the latent dependent variable are attributed to the independent variables. The estimate of the variance inflation factor for each explanatory variable showed no evidence of multicollinearity among explanatory variables.

The empirical evidence has shown that the age of farmers, level of education, membership in farm organization, arm income, sex of the farmer, farm credit and access to extension services are significant positive determinants of labour productivity among cassava farmers. For instance, an increase in the farmers' age and education is associated with the improved managerial capacity of farmers. The result revealed that a unit increase in the age and education of farmers would cause about 10.01% and 12.45% increase in the index of labour productivity, respectively. An increase in years of formal education would enhance farmers' ability to source improved information and also be able to analyze efficiently farm issues for better input productivity. The findings corroborate Omotesho et al. (2014); Anyaegbunam et al. (2010); Obike et al. (2017); Akpan (2021); Aggrey et al. (2010); Asghar et al. (2017); Lebedinski and Vandenberghe (2014).

Table 2. Labour Productivity among Cassava-based farmers

Variable	Coefficient	Robust Std. Error	Z-test	p-value	VIF
Constant	−0.7002	2.3611	−0.2966	0.7668	-
Age	0.1001	0.0585	1.711*	0.0871	1.876
Household Size	−0.1077	0.1071	−1.006	0.3146	1.976
Education	0.1245	0.0472	2.640***	0.0083	1.358
Social Capital	0.1898	0.0701	2.708***	0.0068	1.260
Farm Size	−1.7087	1.0219	−1.672*	0.0945	2.637
Farm Income	8.365e-05	1.438e-05	5.815***	<0.0001	1.622
Non-farm Income	−7.157e-06	6.622e-06	−1.081	0.2798	1.692
Marital Status	−0.8569	0.5825	−1.471	0.1413	1.990
Sex	0.5312	0.2884	1.842*	0.0655	1.495
Farm Credit	6.123e-05	3.928e-05	1.659*	0.0981	1.135
Extension Service	0.8130	0.3145	2.585***	0.0097	1.125
Farming Experience	−0.1562	0.0377	−4.149***	<0.0001	1.940

Chi-square (12) = 92.655*** Pseudo R^2 = 0.3114; Log likelihood = -413.89; Normality test: 1.963 (0.7431).

In a like manner, a unit increment in farm income, social capital, farm credit and extension services would be led to 0.008%, 18.98%, 0.006% and 81.30% increase in the index of labour productivity respectively. An increase in farm income is strongly connected to the ability of a farmer to pay the required wage efficiently and also provide other welfare packages for labour. This would upsurge labour productivity accordingly. This finding is substantiated by Omotesho et al. (2014). In addition, an increase in social capital accumulation enhances social interaction and the ability to choose the right source/type of labour because of access to several sources of information. Besides an increase in farm credit ensure the efficient acquisition and utilization of farm assets/capital which are tools for higher pro-

ductivity of labour. The result agrees with the finding of Akpan (2021). Whereas an increase in the activities of extension services is connected to the introduction and usage of improved technologies that would promote factor productivity. The finding is in consonance with the report of Akpan (2021).

On the contrary, farm size and farming experience have a significant negative correlation with the index of labour productivity of small-scale cassava farmers. A unit increase in farm experience and farm size would result in a reduction of labour productivity by 0.16 units and 1.71 units, respectively, for cassava producers in the region. An increase in farming experience is often linked to farmers' conservativeness which sometimes slows innovation adoption. Similarly, an increase in farm size would increase the production cost. Since the majority of small-scale farmers are resource-poor, the acquisition of sufficient labour or manpower might not be possible, hence labour productivity will decline. The results validate the findings of Obike et al. (2017); Akpan (2021), but are contrary to the submission of Okoye et al. (2008).

CONCLUSION

With the mounting population in the country, and the persistent low outputs relative to demand from the agricultural system, the small-scale farmers which constitute the bulk of the farming population must devise ways to increase factor productivity. Again with the emerging dynamics in the farming environment, small-scale farmers ought to prepare to change in line with the changing system. In this direction and given the need for increased factor productivity, the small-scale farmers should be ready to adjust to the best option of farm labour conditioned by certain characteristics specific to farmers, environment, and culture, among other factors. According to the objectives of the study, three main sources of agricultural labour have been identified among cassava-based farmers in southern Nigeria. These are family labour, the hired and group or exchange labour. The labour source option relative to the base category has a set of exogenous variables that influence its adoption by a smallholder cassava farmer in the southern part of Nigeria. The study identified these exogenous factors that influence the probability of adopting each of the labour options available to small-scale cassava farmer in the region. The empirical results revealed that the farmer's age, formal education, farm size, farm income, non-farm income, access to agricultural extension agents and farming experience are significant positive determinants of the choice of hired labour relative to the group labour by the small-scale arable crop farmers in the southern region of Nigeria. Moreover, household size and social capita have a negative correlation with the probability of preferring hired labour instead of group or exchange labour. Also, the farmers' household size and marital status were identified as significant positive factors that influence the probability of cassava-based farmers adopting family labour sources relative to the group labour source in the region. On the cont-

rary, farmers' age, formal education, farm income and access to extension services were found to have a negative relationship with the probability of cassava-based farmers using family labour relative to the use of group labour.

The study also examines the labour productivity of small-scale cassava farmers in the region. The finding revealed a mean labour productivity index of 3.998 units. The positive determinants of labour productivity among cassava farmers were farmers' age, education, social capital, farm income, sex, access to farm credit and efficient extension services. On the other hand, farm size and farming experience were negative determinants. Based on the empirical results, it is recommended that concerted efforts should be developed to increase the formal education attainment of small-scale farmers, increase farm and non-farm income sources and provision of efficient extension services as prerequisites to upsurge the use of hired labour among small-scale cassava-based farmers in the region. Also to encourage the reduced use of family labour relative to the group labour among small-scale cassava-based farmers, it is recommended that youth should be encouraged to cultivate cassava, formal education of small-scale cassava-based farmers should be paramount and an increase in efficient extension services is required. To increase the labour productivity of small-scale farmers it is recommended that; farmers' education, social capital formation, farm income, access to farm credit and efficient extension services should be increased accordingly.

Conflict of Interest

Authors declared no conflicts of interest.

Ethics

This study does not require ethics committee approval.

Authors Contributions:

Design of Study: ASB (40%), USN (30%), EOU (30%)

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Writing up: ASB (40%), USN (30%), EOU (30%)

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