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Factors influencing Labour Allocation Decision among Smallholder Farmers in Ondo State, Nigeria

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ABSTRACT

Labour allocation and shortage for agricultural production is a serious concern of smallholder farmers in the rural areas of Ondo state, Nigeria. However, there is little empirical evidence to understand labour allocation decisions of smallholder farmers. Hence, the determinants of labour allocation decisions among smallholder farmers in Ondo state, Nigeria were investigated. A multistage sampling technique was used to select respondents for the study using structured questionnaire to elicit information on socio-economic/demographic, farm and locational characteristics of respondents. Data were analysed using descriptive statistics and Multinomial Logit model (MNL). The result showed that the mean age of household head was 44.5±4.3years, 55.7% were male headed households while 56.5% of the respondents were married. The result of the MNL indicated that, age, gender, educational attainment, household size and access to credit, among others were the significant variables influencing labour allocation in the study area. Labour allocation of smallholder farmers plays significant role in agricultural and rural development. It was recommended that access to education, credit and infrastructure would enhance household heads to allocate more time and labour to farm and non-farm activities in the study area.

Keywords : Labour Allocation, Smallholder, Farm Wage Employment, Farming Household.

I. INTRODUCTION

Labour is a major asset of the rural smallholder farmers (Canwat, 2007) and the decision of households to allocate labour is important for their livelihood (Bhatta and Årethun, 2013) Labour allocation decisions of smallholder farmers have attracted researchers' attentions in agricultural economics and in many other disciplines. Labour is one of the natural endowments of rural households which is critical in agricultural production (Canwat, 2007). In rural areas of sub-Saharan African countries, labour allocation to activities is important in determining the welfare of households. Labour allocation among smallholder farmers provides employment opportunities, generates incomes and reduces income variability among farming households (Haggblade*et al*., 2010; Bernardin, 2012). Agriculture in the rural areas is a major employer of labour however; reports have shown that, peasant agriculture is unable to provide adequate means of survival to escape out of poverty, hence the allocation of labour to alternative activities is germane (Awuor, 2007; World Bank, 2008; Emmanuel, 2011). Farming households in rural areas diversify into multiple economic activities to supplement income sources, reduce agricultural production risks and poverty. Despite the fact that smallholder farming households are characterised with surplus labour however, there are reports of labour shortages in agriculture (Anim, 2011) which lower farmers' productivity on the farm. Labour allocation to activities enhances growth both on-farm and off-farm sectors since smallholder farmers have the freedom to choose occupation and allocate labour to activities. Labour diversification to activities provide opportunities in the non-farm sector which help to ease credit or liquidity constraints required for agricultural production thus promoting investment and agricultural competitiveness (World Bank, 2008; Adepoju and Oyewole, 2014). Adepoju and Obayelu (2013) reported that most rural farming households engaged in agricultural activities and also diversify into non-farm activities to supplement household income. Several literatures have documented

labour supply to employment activities, livelihood diversification, non-farm labour supply, among others in rural areas of sub-Saharan African countries and Nigeria in particular (Matshe and Young, 2004; Agu, 2013; Okere and Shittu, 2013, Keija, 2008; Amsalu*et al*., 2013; Canwat, 2007; Zahonogo, 2011). However, there is little empirical evidence on labour allocation decisions to farm and non-farm activities. Also, information regarding labour allocation decisions of farming households in rural areas of Nigeria is not only limited but few available studies considered labour allocation of individual farming households and not necessarily smallholder farmers. From the foregoing, the study investigates factors influencing labour allocation decisions among smallholder farmers in Ondo state, Nigeria.

II. METHODS AND MATERIAL

The study area

The study was conducted in Ondo state with a particular focus on the smallholder farmers. Ondo state consists of 3,441,024 peopleoccupying about 14,798.8square kilometers of land area with population density of about 268 persons per square kilometer (NPC, 2006). Geographically, Ondo state lies between latitude 5^0 45^1 and 8^0 15^1 North and longitude 4^0 45^1 and 6^0 East,(Ondo State, 2010). The study area falls entirely in the tropical rainforest zone with annual rainfall of between 1150mm to 2000mm. The temperature range lies between 24^0C and 33^0C during rain and harmattan seasons respectively. Basically, as agrarian zone it favours farming, fishing, lumbering and petty trading. The study area is reputed for large scale production of cash crops, arable crops and is blessed with mineral resources such as extensive deposit of crude oil, tar-sand (bitumen), kaolin, granite, among others.

Sources of Data and Sampling Techniques

The primary data for this study was collected in a cross sectional survey of smallholder farmers using structured questionnaire. Information was gathered on the socio-economic/demographic, farm and locational as well as labour allocation characteristics of respondents. A multistage sampling technique was used for the study. The first stage entails the random selection of six local government areas from each of the senatorial districts. The second stage consists of random selection of five wards from each of the selected LGA. Stage three consists of random selection of ten communities in each LGA. A total of three hundred household heads were selected based on probability proportional to size of the selected communities for the study.

Analytical Technique

The analytical techniques employed for the study included descriptive statistics and the multinomial logit model. The descriptive statistics included; frequency distributions, and tables to describe the socio-economic/demographic characteristics of the smallholder farmers while summary statistics such as mean, standard error of means, and percentage of relevant variables in the various econometric models were also computed. The MNL model is employed when individuals make choice among alternatives that are mutually exclusive (Rodriguez, 2003). The advantage of MNL is its computational ease and it is relatively robust as measured by goodness of fit or prediction accuracy (Zahonogo, 2011). Let Pr(Dit = M/X) be the probability of observing outcome M give X, the probability model for Dit can be modelled thus:

$$\Pr(D_{it} = M/X) = \frac{\exp\beta_o + \beta_1 X_{2i} + \ldots\ldots\ldots\ldots + \beta_k X_{mi} \ldots}{\sum_{j=1}^{k} \exp(\beta o\, \lambda + \beta ijX2i \ldots\ldots\ldots\ldots + \beta kjXni} \quad \ldots\ldots\ldots 1$$

The individual's choice among j alternatives is one with maximum utility. Let the utility that an individual i gets from choosing alternative activity j; with

j = 0 if the person does not allocate labour to activity; j =1 if labour is allocated to farm employment; j =2 if labour is allocated to farm wage employment; j = 3 if labour is allocated to non-farm self employment; j = 4 if labour is allocated to non-farm wage employment.

The parameters are not all identified since more than a set of parameters generate the same probabilities of observed outcome unless we impose constraints on the model which is achieved by setting parameters for instance, the first choice category j =0 to be all zero; $\beta 0_1 = \beta_{11} = \beta k_1 = 0$. In other words, the parameters of the first choice category no labour allocation (base category) is used as the base against which the other choices are compared. The log likelihood function for the multinomial logit can be written thus:

$$\ell = \sum_{i=1}^{n} \sum_{j=1}^{k} dijLog(Pij) \quad \ldots\ldots\ldots 2$$

This parameter estimates measure the impact of a unit increase in the relevant explanatory variable on the log

odds ratio of the particular activity in relation to the base category (no labour allocation). In this case the decision to allocate labour is then modelled as a function of the socio-economic/demographic, location and farm characteristics; which can be expressed in form of general equation as,

$$D_{it} = f(Xi) \quad \text{.....3}$$

Where D_{it} takes on values 1,2,3,.....,k, if individual i chooses alternative activity j. The MNL model is however operationalised empirically in the following equations:

$$Dot = \alpha o + \beta 10X1 + \beta 20X2 + .. + \beta 0Xn + \varepsilon 1 \quad ...4$$
$$D1t = \alpha 1 + \beta 11X1 + \beta 21X2 + \ldots + \beta 1Xn + \varepsilon n \quad .5$$

The dependent variable D_i is when smallholder farmers allocate labour to activity i and zero when otherwise. Thus, D_0.....D_4 are the probabilities of the households allocating labour to different activities. X1.....Xn represent vector of explanatory variables; $\beta 1 \ldots \beta 4$ represent the parameter coefficients; εi represents the error term, and $\alpha 0 \ldots . \alpha 4$ are the constant term (Keija, 2008; Durojaiye; 2011). The explanatory variables include:

X_1 = Age of household head (Years); X_2= Age of household head squared $(Years)^2$

X_3 = Gender of household head (1 male, 0= otherwise); X_4 = Education level of household head(Number of years spent in formal schooling); X_5 =Marital status of household head (1 married, 0= otherwise); X_6 = Household size (Number of persons); X_7 = Primary occupation (1 if farming, 0 otherwise); X_8 = Native of community. (1if native, 0 if otherwise); X_9 = Dependency ratio (Number of non-working members/ working members); X_{10} = Distance to the nearest market/urban centre (in Km) ; X_{11} = Total farm size cultivated (in hectares); X_{12} = Access to credit (1= Yes, 0= otherwise); X_{13} = Access to electricity 1= Yes, 0= otherwise); X_{14} =Access to water (1 =Yes, 0= otherwise); X_{15} = Access to good road (1= Yes, 0= otherwise).

III. RESULTS AND DISCUSSION

Socio-economic Characteristics of Household Heads

The result showed the mean age of household heads with no labour allocation, farm employment, farm wage employment, non-farm self employment and non-farm wage employment in the study area were 43.5years, 46.9years, 46.1years, 46.1years and 41.9years respectively. This implies that majority of the household heads are economically and physically active in the study area. On gender male household heads that do not allocate labour accounted for 55.5% while it was 53.1% for farm employment, 31.0% for farm wage employment, 67.6% for non-farm self employment and non-farm wage employment accounted for 60.3%. This implies that majority of the respondents in the various employment activities were male headed household except for farm wage employment in female headed households accounted for 69.0%. The marital status revealed that for household heads that do not allocate labour to activities, 47.7% were married, 22.7%, 18.2%, and 11.4% were widowed, divorced and single respectively. For the various employment categories, farm employment accounted for 59.3%, farm wage employment 65.5%, non-farm self employment 58.8% and non-farm wage employment was 51.3%. This implies that majority of the respondents were married. This is in agreement with Mercer and Zhang (2005) that marriage yields economies of scale and provides a risk-sharing protection against unexpected events. Moreover, it makes families better off partly by allowing individuals within families to specialize, hence yields greater productivity and income. On educational attainment, 50.0% of the household head with no labour allocation had non-formal education while it was 56.8% for farm employment, 10.3% for farm wage employment, 60.3% for non-farm self-employment and 16.7% for non-farm wage employment. However, 65.5% of farmers in farm wage employment had primary education while majority (56.4%) in non-farm wage employment had secondary education. This is in line with the submission of Keija (2008) that education plays a significant role in determining participation in farm employment and non-farm activities.

Factors Influencing Smallholder Farmers Labour Allocation in Ondo State

The results of the multinomial logit estimates (Table 2) shows the likelihood ratio chi-square test was 191.23 with a p-value of 0.0000 and Pseudo R^2 was 0.5603 while the log likelihood was -349.3377 implying that the model as a whole is fit significantly with the variables as good predictors of labour allocation decisions.

Labour Allocation to Farm Employment

The variables that determine labour allocation decisions to farm employment in Ondo state included age, age squared, years of completed education, household size, land-size and access to electricity (Table 2). Age has a positive sign of coefficient significant at 5% level of significance with positive marginal effect. Age influences decision making and this implies that a year increase in age of household head increases the probability of labour supply to farm employment by 3.1% relative to household that do not supply labour to any activity. This agrees with Bagamba*et al.* (2009) and Huffman and Lange (1989) who posited that young farmers tend to be more willing to engage in non-farm work to finance additional assets or to gain non-farm job experience.The coefficients of age squared was negative this follows the life cycle hypothesis and *a priori* expectation that at advance age adult tend to work less on the farm. The effect of years of completed education was statistically significant but with negative coefficient at 1% level of significance with negative marginal effect on labour allocation. This means that an additional year of completed education of household head decreases the probability of allocating labour to farm employment by 0.5% rather than doing nothing. This is not unconnected with the fact that the more educated you are the better the opportunities of securing better jobs outside farm. This is consistent with Matshe and Young (2004). The sign of coefficient of household size was positive and significant at 1% level of significance on labour allocation to farm employment. This implies that an increase in household size, increases the probability of allocating more labour to farm employment by 0.2% rather to doing nothing or being idle in the household. This applies more to household with more adult members and the quest to meet the needs and demands of the family members.

The sign of coefficient on land size was negatively significant with labour allocation to farm employment at 10% level of significance. This implies that a hectare decrease in land size decreases, the probability of labour supply to farm employment by 4.7% compared to the base category. This indicates land constraints may hamper labour supply to farm employment in rural areas.. This is consistent with the assertion that smallholder farmers undertake non-farm activities because of the constraints of gaining access to productive land (Matshe and Young, 2004). Access to electricity shows a negative sign of coefficient at 5% level of significance with positive marginal effect on farm employment. This implies that as access to electricity improves, the probability of allocating labour to farm employment decreases by 2.7% compare with household that fail to supply labour to any activity. This may not be unconnected with the fact that steady electricity supply will boost operations and productivity in non-farm activity (Keija, 2008, Babatunde and Qaims, 2010).

Labour Allocation to Farm Wage Employment

Table 2 showed that, age squared, gender, occupation, ethnicity, access to credit and access road are the important variables influencing labour allocation to farm wage employment. Age squared has a negative significant coefficient at 5% with positive marginal effects on the probability of allocating labour to farm wage employment. This conforms with the *a priori* expectation. This implies a non-linear relationship between farm wage employment participation and age which is driven by life cycle relationship. This suggests that older farmers are less willing to engage farm wage employment compare to young farmers who are more willing to work to finance additional assets. Gender had a positive effect on labour allocation to farm wage employment and statistically significant at 10% level of significance with positive marginal effect on allocating labour to farm wage employment. This implies that being male increases, the probability of supplying labour to farm wage employment by 0.4%. This is in agreement with Keija (2008) that being a male is a significant factor influencing access to farm wage employment. On occupation, the result showed that household head's with major occupation being farming was significant at 1% level with positive coefficient and positive marginal effect on labour allocation to farm wage employment. This implies that being primarily involved in farming increases the probability of allocating labour to farm

wage employment by 2.4% rather than doing nothing in the household.

Ethnicity shows positive sign of coefficient and statistically significant at 5% with positive marginal effect. This indicates that being native increases the probability of labour supply to farm wage employment by 0.3%. This is in line with (Matshe and Young, 2004) Access to credit had a negative coefficient but statistically significant at 1% level of significance with negative marginal effect on labour supply to farm wage employment. This implies that increase in access to credit decreases the probability of labour supply to farm wage employment by 1.5%. This is in line with Gordon and Craig (2001) access to credit improves the nature, operations of rural farm activities and rural business start up. Road access showed positive coefficients with statistically significant degree at 10% and positive marginal effect on labour allocation to farm wage employment. This implies that improvement in road access increases the probability of labour supply to farm wage employment by 0.6%. Road access would reduce transaction cost, time and ease of arriving at the market or urban centres. This is consistent with the findings of Keija (2008) and Babatunde and Qaim (2010) that road access is a critical component of infrastructure which helps to create rural employment opportunities in a number of ways.

Labour Allocation to Non-farm Self-Employment

Table 2 showed that age, gender, occupation, access to electricity and roads were found to be important variables influencing smallholder farmers' labour allocation to non-farm self-employment. The effect of age on labour supply to non-farm self-employment was statistically significant and positive at 5% level of significance. This implies that as age increases, the probability of labour supply to non-farm self-employment increases by a marginal value of 2.7% in comparison to household that do not allocate labour to any activity in the study area. This means that an additional increase in age of household head increases labour supply to non-farm self-employment. This is not unconnected with the fact that at a matured age an individual could be an entrepreneur. This is consistent with Smith (2003) but contrary to the submission of Woldehanna (2000) that an increase in the age of the household head seems to reduce the level and probability of participation in non-farm self-employment. Moreover, Lim-Applegate *et al*. (2002) established that older farmers are likely to be less willing to do non-farm work because they may have sufficient income from other sources such as investment income or may not possess the necessary skills. The gender of household heads' showed a positive sign of coefficient significant at 5% with positive marginal effect on labour allocation to non-farm self-employment. This implies that as being male increases, the probability of labour supply to non-farm self-employment by 23.8% relative to the household that failed to allocate labour to activities. Haggblade*et al.* (2010) reported on gender that women share in non-farm self-employment ranged from 25% to 54% while Keija (2008) submitted that gender plays significant factor in determining access to non-farm self-employment. Access to electricity and road showed negative significant coefficients at 10% level of significance each with negative marginal effect on probability of labour supply to non-farm self-employment. This implies that as access to electricity improves the probability of labour supply to non-farm self employment decreases by 3.8% while increase in road access decreases the probability of labour supply to non-farm self-employment by 3.3% relative to households that do not allocate labour to any activity. This is contrary to the findings of Keija (2008) that availability of electricity supplies and road access promotes production and business opportunities.

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Labour Allocation to Non-Farm Wage Employment

Table 2 showed that year of completed education, dependency ratio and access to credit were the important factors influencing labour allocation to non-farm wage employment in Ondo state. Years of completed education show a positive sign of coefficient at 10% level of significance with positive marginal effect on labour supply to non-farm wage employment. The result implies that a year increase in the years of completed education increases the probability of labour supply to non-farm wage employment by 1.6% compared with the base category where labour is not allocated to any activity. This conforms to the *a priori* expectations that the probability of non-farm labour supply of farm households is expected to increase with education. The above finding supports the fact that education increases

the probability and the level of participation in non-farm wage employment. This is in agreement with Sanchez (2005) that household head with few years of education are less likely to participate in non-farm wage employment and highly skilled jobs, but an increase in number of completed years of education increases labour supply to non-farm wage employment. Dependency ratio shows a negative sign of coefficient but statistically significant at 1% level of significance with negative marginal effect on the probability of labour supply to non-farm wage employment. This implies that as dependency ratio increases the probability of labour supply to non-farm wage employment decreases by 3.0% relative to base category of "no labour allocation". This is conforms to *a priori* expectation that labour allocation to non-farm employment is expected to increase with family size and decrease with number of dependents in a household. On access to credit, the result showed positive sign of coefficient significant at 5% with positive marginal effect. This implies that as access to credit increases, the probability of labour supply to non-farm wage employment increases by 3.6% relative to doing nothing in the household. This is in agreement with Beyene (2008) that availability of credit increases the likelihood of labour supply to non-farm wage employment of farm households.

IV. CONCLUSION

This study examined factors influencing labour allocation to decisions of smallholder farmers in Ondo state. The mean age of respondents was 43.5±4.3years. The result showed that labour were allocated to farm employment, farm wage employment, non-farm self employment and non-farm wage employment. The MNL result revealed that labour allocation to activities is influenced by age, educational attainment, household size, and access to credit, among others. Education was found to significant in allocation of more labour time to non-farm activities hence, training and adult literacy programmes should be provided for smallholder farmers. There is a need to provide smallholder farmers with credit facilities since findings showed that access to credit significantly influence hours allocated to activities. Road access should be provided since it was found to be significantly influencing farming household to allocate labour and invest more time into farm and non-farm activities.

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Table1: Socio-economic Characteristics of Smallholder Farmers by Labour Allocation Decisions

Variables	No Labour Allocation (%) n= 44	Farm Employment (%) n =81	Farm Wage Employment (%) n =29	Non-farm Self Employment (%) n=68	Non-farm Wage Employment (%) n=78
Age					
<25	2.3	2.5	0.0	2.9	2.6
25-42	38.6	30.9	24.1	22.1	42.3
43-60	54.6	65.4	75.9	73.5	55.1
>60	4.5	1.2	0.0	1.5	0.0
Total	100.0	100.0	100.0	100.0	100.0
Mean(SD)	43.5(8.7)	44.9(8.2)	46.1(7.5)	46.1(7.7)	41.9(7.7)
Sex					
Male	55.5	53.1	31.0	67.6	60.3
Female	45.5	46.9	69.0	32.4	37.7
Total	100.0	100.0	100.0	100.0	100.0
Marital Status					
Single	11.4	4.9	6.9	2.9	15.4
Married	47.7	59.3	65.5	58.8	51.3
Widowed	22.7	25.5	10.3	22.1	17.9
Divorced	18.2	9.9	17.2	16.2	15.4
Total	100.0	100.0	100.0	100.0	100.0
Educational Attainment	50.0	56.8	10.3	60.3	16.7
Non-formal Education	15.9	14.8	65.5	14.7	14.1
Primary Education	20.5	17.3	20.7	16.2	56.4
Secondary Education	13.6	11.1	3.4	8.8	12.8
Tertiary Education	100.0	100.0	100.0	100.0	100.0
Total					

Source: Field Survey, 2014

Table 2: Multinomial Logit Model for Factors Influencing Smallholder Famers Labour Allocation Decisions in Ondo State

Explanatory Variable	Farm Employment		Farm Wage Employment		Non-farm Self- Employment		Non-farm Wage Employment	
	Coefficient	Marginal Effect	Coefficient	Marginal effect	Coefficient	Marginal Effect	Coefficient	Marginal effect
Age	0.03(0.67)**	0.001	0.16(1.64)	0.101	0.14(2.94)***	0.027	0.05(0.10)	-0.213
Age_2	-0.07(1.71)*	0.002	- 0.012(1.92)**	-0.026	-0.04(-1.40)	-0.000	-0.03(-1.71)	-0.034
Sex	0.38(0.55)	0.000	3.64(2.12)*	0.004	1.27(2.07)**	0.238	0.03(-0.06)	0.136
Years educ	-0.06(0.94)***	-0.005	-0.03(-0.82)	-0.041	-0.04(-0.78)	-0.009	0.07(-0.15)*	0.015
$Marist at_2$	0.70(0.46)	0.062	-0.06(-0.02)	-0.012	-0.22(-0.15)	-0.052	-0.15(0.10)**	-0.021
H/H size	0.04(0.25)***	-0.002	0.11(0.36)	0.000	0.07(0.52)	-0.001	0.15(1.24)	0.025
Occupation	-1.29(-1.34)	-0.149	5.90(3.25)***	0.024	1.24(1.77)*	0.215	0.62(0.96)	0.039
Ethnicity	0.80(1.06)	0.066	2.88(2.04)**	0.003	-0.12(-0.20)	-0.016	-0.27(-0.47)	-0.072
Depend ratio	-0.50(-0.76)	0.001	1.75(1.53)	0.003	-0.58(-1.13)	-0.020	-0.91(-1.76)*	-0.030
Distance	-0.05(-1.14)	-0.002	-0.04(-0.56)	-0.000	-0.02(-0.87)	-0.002	-0.01(-0.40)	0.001
Land size	-0.68(-1.95)*	-0.047	-0.14(-0.28)	-0.000	-0.32(-1.15)	-0.056	0.08(0.29)	0.067
Acscredit	1.17(1.20)	0.119	-4.63(-2.59)***	-0.015	0.02(0.00)	0.107	1.31(-2.05)**	0.036
Acselect	2.78(3.05)**	0.027	2.69(1.77)*	0.004	-1.51(-1.72)*	-0.038	1.73(0.97)	0.127
Acswater	-2.88(-2.49)	-0.172	2.37(1.67)	0.216	0.57(0.76)	0.194	-0.18(-0.25)	-0.041
Acsroad	0.57(0.57)	0.087	0.65(0.49)	0.001	-1.28(-1.71)*	-0.033	-0.07(-0.10)	0.065
Constant	-1.38(-0.50)		-4.49(2.83)***		-4.59(-1.97)**		1.12(0.56)	
Observation	156							
LogLikelihood	-349.33		$LRchi^2$ 191.23		$Prob>chi^2$0.000	R^2 0.560		

Author's Computation, 2014 * ** and *** significant at 10%, 5% and 1% level. Absolute value of z statistics in parenthesis