Diversification and farm household welfare in Makurdi, Benue State, Nigeria

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This study examines the socioeconomic characteristics that influence the decision to diversify and also the welfare effect of diversification on farm households in Makurdi, Benue State. A total of 120 farm households were sampled using a simple random technique. Structured questionnaires were used in collecting the data. The ordinary least square (OLS) model was used to analyze the welfare effect of diversification while the Logit model was used to analyze the determinants of diversification. The Logit results show that a male-headed household, education and credit increase the probability of diversification while farming experience and market access decrease the probability. The OLS result shows that diversification, age, education and credit have a positive and significant effect on household welfare while household size has a negative effect. These results have important implications for policy, economic growth and development.

Keywords: diversification; household welfare; farmers; regression

Introduction

Nigeria is largely an agrarian country despite its large oil earnings. It employs about 70% of the total labor force, thus making it the most important sector in this respect (Chauvin, Mulangu, and Porto 2012). Agriculture is characterized by small-scale production which is mainly subsistence, use of simple crude tools and generally traditional farming methods. Despite these characteristics, 80% of food in Nigeria is produced by these small-scale farmers (Chauvin, Mulangu, and Porto 2012). Nigeria’s varied climate which ranges from the tropical areas of the coast to the arid zone of the north affords her the opportunity to cultivate nearly all the types of agricultural produce grown in the tropics and semi-tropical parts of the world (Olayemi et al. 2012).

Although Nigeria has a huge agricultural endowment, hunger characterizes the majority of the population. About 64.4% and 83.7% of the population live below the poverty line of US$1.25 and US$2 per person per day, respectively (Aye 2013). Nigeria faces a lot of challenges including that of attaining food security, which is one of the millennium development goals (FAO 2003). Some of these challenges are caused by natural resources (soil, water and climate), faulty micro economies, agricultural policies, bad economy, etc. Due to these challenges, smallholder farmers in Nigeria are poverty stricken. These challenges affect individual farmers and put the household welfare of the farmer at danger or at risk. Consequently, this risk encourages farmers to diversify into other non-farm activities which are expected to supplement their income.

Benue State, the study area, acclaimed as the ‘food basket of the nation’ has about 80% of the state population directly involved in subsistence agriculture. Of the 33,955 km² of land in the state, only 23,000 km² is available for arable and tree crop cultivation. Studies have also shown that over 600,000 ha of land are available for dry season agriculture in seasonally flooded areas of land. Benue State enjoys fertile arable land, abundant human resource and raw materials (Agricultural Resources in Benue State 2007) which makes Benue State have a higher investment opportunity for agriculture than any other state in Nigeria (agriculture includes crop production, animal production, fishery, forestry, bee farming, hunting, etc.). These resource endowments also provide Benue State with the opportunity to produce most of the crops in Nigeria. Considering the agricultural opportunities in Benue State, the economic development of the state is heavily dependent on agriculture, which means that for the state to develop, the agricultural sector must be given proper and focused attention.

Given that the majority of the farmers are smallholders who produce on a subsistence level, and often do not get optimum economic returns on their produce due to reasons ranging from bad road networks, poor storage facilities, lack of good processing techniques, inadequate government policies, to natural disasters like drought, flood, global warming, etc., some farm households...
diversify into non-farm activities. Since the greater percentage of the population is domiciled in the rural area, the need to study the livelihood of rural farmers becomes paramount. The rural livelihood diversification from farming is one of the rural households’ strategies for survival in developing countries (Ellis 1999) like Nigeria. The rural people diversify into non-farm activities to explore opportunities through which they increase and stabilize their incomes or to supplement farming in order to improve the welfare or living standard of their households. In Benue State as well, rural households diversify or engage in other income generating activities as a way to avoid risk from agricultural disasters or failure, some households diversify into other agricultural sectors/farming strategies while others diversify into non-farm activities like tailoring, crafts and skills like knitting, plaiting of hair/barbing, others get civil service jobs, etc.

Against this backdrop, this study quantifies the welfare effect of diversification on farm households in Benue State. Two basic objectives are pursued, first to examine the factors that affect the decision of farm households to diversify and second to evaluate the impact of diversification on household welfare. Hence, the null hypothesis of interest is that diversification has no significant impact on the welfare of farm households. In addition, the study tests the hypothesis that socioeconomic characteristics which comprise of physical, human and social capital do not have significant impact on diversification. To the best of our knowledge there is no study that has examined this relationship for Benue State, Nigeria. Moreover, most previous studies simply consider the impact of diversification on welfare without examining the factors that influence a farm household to diversify, while others consider only the latter. These two are considered in this study. The rest of the paper is organized as follows: Section 2 provides details on the data and empirical models used for analysis. In Section 3, the results and discussion are presented. Section 4 concludes.

Literature review

A number of studies have been conducted on diversification and household welfare and/or poverty. This section surveys studies that examined this link as well as studies that examined solely the determinants of diversification or non-farm employment. For instance, Kijima, Matsumoto, and Yamano (2006) analyzed the role of off-farm employment in poverty reduction using panel data from 894 rural Ugandan households in 2003 and 2005. Taking advantage of the unique off-farm labor supply and income data, they analyzed how households respond to negative agricultural shocks, especially through off-farm labor supply and income to mitigate crop income loss. Their analysis indicates that the flexibility of labor time allocation varies across off-farm jobs and that only low skilled and low wage jobs tend to be used to mitigate negative shocks, especially among the asset poor.

Asmah (2011) examined how some selected proxies of the agricultural sector reforms in Ghana changed over time and evaluated their relative importance in influencing rural livelihood diversification and household welfare. In doing this, data were pooled from the 1991/1992 and 2005/2006 Ghana Living Standards Survey and the endogenous switching regression technique was employed. The results showed that diversified households and less diversified households differed significantly in terms of variables related to household assets, markets and institutions. Both household welfare and rural non-farm diversification decisions are mostly driven by household assets including good health, education and household age composition. Households in communities with access to fertilizers, public transports and local produce markets are more likely to engage in non-farm diversification and enjoy improved welfare. The importance of access to TV and radio as effective mass media tools in influencing household behavior is underscored in the analysis.

Oluwatayo (2009) studied the determinants of diversification using a Tobit model. Data were collected from a random sample of 420 households selected from six states (one state from each of the six geopolitical zones) of the country. The result of the Tobit regression model showed that the coefficients of gender, household size, poverty status and access to credit facility were positive. This indicates that any increase in the value of the coefficients of these variables has a higher likelihood of influencing the estimated livelihood diversification index positively. Further, the coefficients of years of formal education, income, marital status, primary occupation and location were negative. Thus, an increase in the value of any of the variables will negatively influence the estimated livelihood diversification index. In general, male-headed, small-sized, non-poor households with formal education and better income and access to credit facility were not engaged in multiple jobs like female-headed, uneducated, large-sized, poor households and those not having access to credit facility.

de Janvry, Sadoulet, and Zhu (2005) used detailed household survey data from Hubei province in China to simulate the counter factual of what rural households’ incomes, poverty and inequality would be in the absence of access to non-farm sources of income. Results show that, without non-farm employment, rural poverty would be much higher and deeper, and that income inequality would be higher as well. They find that education, proximity to town, neighborhood effects and village effects are crucial in helping particular households gain access to these opportunities. They also find that those who stay as pure farmers have non-observable characteristics that make them much more productive in agriculture, implying positive selection on these characteristics. Moreover,
participation in non-farm activities has a positive spillover effect on household farm production.

Sisay (2010) analyzed off-farm activities and income among 1343 households in rural Ethiopia using a panel data set. The key findings were as follows: the non-poor households generate a significant amount of income from farming activities; the non-poor participate more in high-earning off-farm activities while, on average, the ‘poor’ participate in low-earning off-farm activity; poor households participate due to the push factor while the non-poor participate as a choice; households with more resources get better off-farm earnings; the share of off-farm income is higher for poor households, that is, off-farm income constitutes nearly 35% and 18% of household income for poor and non-poor households, respectively, in 2008. In general, the finding indicates that the poorer segment of society relies relatively more on off-farm income and there is an entry barrier for poor households to participate on high-earning activities. Therefore the study concluded that off-farm activities have a potential to reduce poverty and income inequality as it is relatively beneficial to poorer households.

Lanjouw and Shariff (2004) in India identified that education improves the prospects of finding non-farm employment. Furthermore, they pointed out a negative relation between larger landholdings and participation. Education was also observed to increase the amount of off-farm income. Beyene (2008) analyzed the determinants of off-farm participation using the bivariate probit model and arrived at no significant relationship between the educational status of the household head and off-farm participation. He also found that farmers participate in off-farm activities for the reason of small farm size. Contrary to Beyene (2008), studies made in Chile and Nicaragua indicate that poor society could not allocate labor and resources into off-farm activities because of a lower level of asset (Berdegue et al. 2000; Corral and Reardon 2001). Warren (2002) found that a decrease in availability of arable land, an increase in producer/consumer ratio, credit delinquency and environmental deterioration can be important drivers towards diversification.

Awoniyi and Salman (2011) investigated the level of non-farm income diversification, its effect on welfare status of farming households and factors that determine levels of non-farm income diversification using fuzzy set and Logit regression analysis. The result of the analysis revealed that the factors that determine participation in non-farming activities are age of the household head, being male, having formal education, household poverty status and farm size. The result of the poverty analysis indicates that a larger percentage (53.9%) of farming households whose household heads are not engaged in non-farming activities live below the poverty line compared with farming households (48.3%) whose household head is engaged in non-farming activities. The study concludes that farming households that are not involved in non-farming activities are more vulnerable to poverty when compared with farming households that engaged in non-farm income.

de Janvry and Sadoulet (2001) studied the role of off-farm activities in rural households in Mexico. The result shows that participation in off-farm activities helps reduce poverty and contributes to greater equality in the distribution of income. Results of the multinomial estimation method (where no participation in off-farm work is the choice comparison) show that education, ethnic origin and regional availability of off-farm employment are found to affect participation in off-farm activities. Education helps the farm households in the study area to participate in the more remunerative off-farm activities. A study by Corral and Reardon (2001) also shows that the effect of education is found to be different depending on the type of off-farm activities. Similarly, land scarcity and access to roads have an effect on the participation decision in non-farm employment.

A study undertaken in four districts of Pakistan by Fafchamps and Quisumbing (1997) indicated that education raises off-farm productivity and induces rural Pakistan households to shift labor resources from farm to off-farm activities. One additional year of schooling for all adult males raises household incomes by 8.9%. The other human capital variable, health, has also a positive effect on males but the result is not significant for females in rural Pakistan. Abdulai and Delgado (1999) jointly estimated the determinants of the decision of husbands and wives to participate in cash-income-oriented non-farm work in Northern Ghana by using a bivariate probit model. The result of the analysis suggests that the variable age has a positive effect on the probability of labor supply to the non-farm sector at younger ages and at older ages the probability of participating in non-farm work decreases as age increases. Human capital, as embodied in education and experience, is essential in increasing non-farm earnings and time allocation of rural families and to diversify the rural economy away from agriculture. A husband or wife...
who had more schooling (as measured by years of schooling) had a significantly higher probability of engaging in non-farm activities. The other variables non-labor income and distance to the regional capital are found to have a negative influence on the participation decisions of farm households. Unlike other studies the presence of children had no significant effect on the participation decision of women in non-farm work and on the labor supply of husbands and wives.

Studies by Rosenzweig (1980), Jacoby (1993) and Skoufas (1994) also indicated that the number of children of 5 years old and younger does not lessen women’s hours worked, which includes housework, though not child care per se. But a well-developed infrastructure and population density had positive significant effects on the probability of non-farm work by both males and females. Gender relationships have also emerged as a factor that influences participation patterns and amount of earning. Lanjouw (2001) found that non-farm incomes are significantly higher for men than for women in Tanzania. In Ethiopia, Van den Berg and Kumbi (2006) found no significant relation between sex and participation. Whereas Lemi (2006) found a positive and significant relation between a householded by male and participation in 1994 but no significant relation was found in 1997.

Methodology

The study area is Makurdi local government area, the capital of Benue State, located in central Nigeria or middle belt. Its coordinates are 7°, 43′50″ North and 8°, 32′10″ East. Benue State has enormous potentials in physical and human resources as well as provision of raw materials for manufacturing and processing industries. Makurdi has a land area of 804 km². The population of the study area is about 287,398 people (NPC 2006).

A multistage random sampling technique is used. There are 11 council wards in the study area. Six council wards (Agan, Mbalagn, Fiidi, North Bank 1, North Bank 2 and Walomayo) were randomly selected. Then, 20 farm households from each council ward are selected using a simple random technique, making a total of 120 respondents for the study. In each household, the household head is selected for study. This study uses mainly a primary source in obtaining information necessary for analysis. Primary data are obtained with the aid of a structured questionnaire.

The first objective is analyzed using the Logit model. The Logit model is estimated with the maximum likelihood estimation technique. The Logit model for this study is specified as

\[ P_i = \frac{1 + \exp (Z_i)}{1 + \exp (-Z_i)}. \]  

(1)

Because Equation (1) is nonlinear, one can linearize the model by taking the natural log. This gives the following linear Logit model:

\[ Li = \ln \left[ \frac{P_i}{1 - P_i} \right] = Z_i \]

\[ = \beta_0 + \beta_1 X_{i1} + \cdots + \beta_{10} X_{i10} + e, \]  

(2)

where \( P_i/(1 - P_i) \) is the ratio of the probability that a farmer will be engaged in other income generating activities apart from farming (non-farm work) to the probability that a farmer will not engage in any non-farm work. Hence, the dependent (endogenous) variable is binary and its value is 1 for a farmer who does at least one non-farm work and 0 for a farmer who did not do any non-farm work.

\[ \beta_0 = \text{constant} \]
\[ \beta_1 - \beta_8 = \text{logistic regression coefficients} \]
\[ X_{i1} - X_{i8} = \text{independent (exogenous) variables where} \]
\[ X_{i1} = \text{sex (if male = 1 otherwise if female = 0)} \]
\[ X_{i2} = \text{household size (number of people living and feeding together)} \]
\[ X_{i3} = \text{experience (farming experience in years)} \]
\[ X_{i4} = \text{education (number of years of formal education in years)} \]
\[ X_{i5} = \text{credit (1 for had access to credit; 0 otherwise)} \]
\[ X_{i6} = \text{farm size (area of land cultivated with maize in hectares)} \]
\[ X_{i7} = \text{market (distance from house to the nearest market in km)} \]
\[ X_{i8} = \text{membership (1 for membership of a farmer group; 0 otherwise)} \]
\[ e = \text{error term} \]

The second objective is analyzed using an ordinary least square (OLS) model. The OLS model for this study is specified as

\[ Y_i = \alpha_0 + \alpha_1 X_{i1} + \cdots + \alpha_6 X_{i6} + e, \]  

(3)

where \( Y_i = \text{household consumption expenditure per capita (in naira)} \), \( X_{i1} = \text{diversification (1 if farmer engages in non-farm income generating activity; 0 otherwise)} \), \( X_{i2} = \text{age (in years)} \), \( X_{i3} = \text{education (number of years of formal education in years)} \), \( X_{i4} = \text{credit (1 if farmer had access to credit; 0 otherwise)} \), \( X_{i5} = \text{household size (number of people living and feeding together)} \), \( X_{i6} = \text{land (total land holding in hectares)} \), \( \alpha_0 = \text{intercept, } \alpha_1 - \alpha_6 = \text{coefficients, } e = \text{error term} \).

The summary statistics of all the variables used for analysis are presented in Table 1. Table 1 indicates that of the 120 households sampled, 67% are male-headed households while the remaining 33% are female-headed households. The farmers are on average about 39 years of age, which is an indication that they are mostly in their productive age bracket. They have mean household size of six
persons and have been farming for about 15 years on average. The mean level of education is 12 years, showing that these farmers on average completed only secondary school. Only 38% had access to credit. The average farm size is 2.8 ha and the mean distance from house to the nearest market is about 6.3 km. About 43% of the farmers are members of any farm group while 79% of the farmers are involved in non-farm employment. The average consumption expenditure per capita per month is about ₦10,612.67 which is equivalent to US$65.14 at the prevailing exchange rate.

Results and discussion

The Logit model is used in estimating factors that influence diversification by farmers in Makurdi. The estimated coefficients of the Logit model, along with the standard error, z-values and p-values are presented in Table 2. The likelihood ratio statistics as indicated by the $\chi^2$ statistic is significant at 1%. This implies that all the variables included in the Logit model are jointly significant in influencing farmers’ decision to diversify to other income generating activities. Therefore, the socioeconomic characteristics of farmers have a significant effect on their decision to diversify. Table 2 shows that male-headed household, education, farming experience, credit and market are statistically significant determinants of diversification. However, the parameter estimates of the Logit model provide only the direction of the effect of the independent variables on the dependent (response) variable: estimates do not represent actual magnitude of change or probabilities. Thus, the marginal effects from the model, which measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable, are reported in Table 3 and discussed henceforth.

If male-headed households have more access to opportunities than female-headed households, the probability of working off-farm is expected to be positive for the former (Beyene 2008). Moreover, women are usually more time constrained given their greater involvement in home chores. This may likely reduce their probability of engagement in non-farm income generating activities compared to their male counterparts. In this study, as expected male-headed households are positively related to diversification and significant at the 10% level. Male-headed households are 9.7% more likely to diversify into non-farm activities

| Variable        | Coefficient | Standard error | Z-value | P-value |
|-----------------|-------------|----------------|---------|---------|
| Sex             | 2.578*      | 1.520          | 1.700   | 0.090   |
| Household size  | -0.198      | 0.192          | -1.030  | 0.304   |
| Education       | 0.853***    | 0.283          | 3.010   | 0.003   |
| Farming experience | -0.069**   | 0.033          | -2.090  | 0.036   |
| Credit          | 3.268*      | 1.951          | 1.680   | 0.094   |
| Farm size       | 0.384       | 0.286          | 1.350   | 0.178   |
| Market          | -0.533*     | 0.277          | -1.920  | 0.055   |
| Membership      | -1.635      | 1.189          | -1.370  | 0.169   |
| Constant        | -2.383      | 1.407          | -1.690  | 0.090   |
| LR chi(2)       | 93.310      | 14.282         |         |         |

*Statistical significance at 10% level.
**Statistical significance at 5% level.
***Statistical significance at 1% level.
than female-headed households. If members of farm households have access to credit, then the probability of working off-farm is expected to increase. As expected, credit is positive and significant at 10%, implying that farmers who have access to credit are more likely to diversify than those with no access to credit.

Education is expected to have a positive effect on off-farm work decisions if the effects of human capital on off-farm wages outweigh the increase in the shadow value of labor on the farm (Lass et al. 1991). Education is positive and significant at 1% indicating a rather strong relationship with non-farm income generating activities. This suggests that households with higher education are more likely to seek non-farm employment in rural areas. The marginal effect of 0.032 shows that one extra year of education increases the probability of non-farm employment by 3.2%. This is similar to the findings of Ibekwe (2001) for Imo State and Parasada (2002) for India. It is understandable that where the education of household workers is higher, they are reluctant to work in the farm sector as they have better prospects elsewhere.

Farming experience increases the value of the marginal value of farm work relative to the marginal value of off-farm work. So the probability of participation of farm households are expected to diminish (Beyene 2008). In this study, farming experience is negatively related to diversification and is significant at 1%.

The result shows that distance to the market is significant at the 5% level and negatively related to diversification, indicating that farmers who lived further away from the market are less likely to be involved in off-farm activities. The participation of farm family members in off-farm markets is affected not only by their willingness and ability to supply labor but also by the demand for their labor. Therefore, a long distance to the nearest market reduces the probability of working off the farm.

The OLS model is used to analyze the effect of diversification on household welfare and the results are presented in Table 4. The linear, the double-log and the semi-log functional forms have been tried but the double-log is selected as the best model based on $R^2$ value, $F$-value, sign and statistical significance of the variables. This implies that all variables except dummy variables have been used in log form. Therefore, the coefficients on each of these variables are their respective elasticities. The $F$-statistic is statistically significant at the 1% level, implying that the variables included in the OLS model are jointly significant in influencing household welfare. The $R^2$ value is 0.35. This means that 35% of the variation in household welfare is explained by the variables included in the

Table 3. Marginal effects from the Logit diversification model.

| Variables       | Marginal effects | Standard error | Z-value | P-value |
|-----------------|------------------|----------------|---------|---------|
| Sex             | 0.097*           | 0.053          | 1.850   | 0.064   |
| Household size  | −0.007           | 0.007          | −1.040  | 0.296   |
| Education       | 0.032***         | 0.006          | 5.030   | 0.000   |
| Farming experience | −0.003***     | 0.001          | −2.470  | 0.013   |
| Credit          | 0.123*           | 0.068          | 1.820   | 0.070   |
| Farm size       | 0.015            | 0.010          | 1.430   | 0.151   |
| Market          | −0.020**         | 0.009          | −2.190  | 0.029   |
| Membership      | −0.062           | 0.042          | −1.470  | 0.142   |

*Statistical significance at 10% level.
**Statistical significance at 5% level.
***Statistical significance at 1% level.

Table 4. OLS regression of welfare effect of diversification.

| Variables         | Coefficient | Standard error | T-statistic | P-value |
|-------------------|-------------|----------------|-------------|---------|
| Constant          | 7.988***    | 1.036          | 7.620       | 0.000   |
| Diversification   | 0.567***    | 0.209          | 2.710       | 0.008   |
| Age               | 1.023***    | 0.321          | 3.190       | 0.002   |
| Education         | 0.075***    | 0.027          | 2.810       | 0.006   |
| Household size    | −0.495***   | 0.184          | −2.680      | 0.008   |
| Credit            | 0.224*      | 0.131          | 1.710       | 0.090   |
| Land              | 0.173       | 0.128          | 1.350       | 0.179   |
| $R^2$             | 0.314       |                |             | 0.000   |
| Adjusted $R^2$    | 0.345       |                |             |         |
| $F$               | 3.11        |                |             |         |

*Statistical significance at 10% level.
***Statistical significance at 1% level.
model, while 65% are explained by other factors not included in the model.

The coefficient of age is significant at the 1% level and positively related to household welfare. Older farmers might have more members with better employment and therefore higher consumption expenditure per capita. Education is also significant at the 1% level and positively related to welfare. This indicates that the more educated farmers are, the better their welfare compared to non-educated farmers. This is not surprising because the higher the level of education, the more likely that the households will diversify and hence improve their welfare. This finding is consistent with that of Babatunde and Qaim (2009).

Household size is significant at the 1% level and negatively related to welfare meaning that, all things being equal, each extra member decreases the welfare of a household, therefore increasing the household burden. This is essentially the case when most of the household members are dependents and as such do not contribute to the income portfolio of the household. This finding is consistent with that of Asmah (2011).

The coefficient of credit is significant at the 1% level and positively related to welfare indicating that the more credit obtained, the more the capital for off-farm investment and the more the income generated by the farm household which is then used to improve consumption patterns. Farmers who are diversified are better off than non-diversified farmers as diversification is significant at the 1% level and positively related to welfare. This implies that diversified farmers get more income at the end of the year when compared to non-diversified farmers and therefore are likely to spend more on consumption. Therefore, the null hypothesis that diversification has no significant effect on household welfare is rejected.

Conclusion

This study has examined the impact of diversification on household welfare in Benue State using the OLS regression model. It also investigated factors that influence diversification decisions by farmers using the Logit model. The Logit results show that the probability of engagement in off-farm income generation activities decreases with farming experience while it increases with male-headed household, education, credit and market. The OLS results show that diversification is positively correlated with household welfare, showing that farmers who have alternative sources of income are more able to cater to the food and non-food requirements of their households. Further, age, education and credit have positive effects on household welfare while household size has a negative effect. Overall, these results suggest that education, credit and markets are crucial for diversification and hence household welfare in Makurdi, Benue State, Nigeria. Therefore, policies to ensure farm households access to these are recommended. The government can, for instance, grant free and or subsidized primary and secondary education especially in the rural areas. The monetary authority in collaboration with the government can promote non-farm employment by ensuring farmers access to credit through reduced interest rates and possibly a waiver of collateral requirement for a small amount of loans. Moreover, the commercial banks can be encouraged to give loans for small and medium scale productive activities by guaranteeing some proportion of the credit given to such businesses. Provision of good roads could enhance farmers’ access to market and hence promote diversification into non-farm activities.

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