EFFECT OF INCOME DIVERSIFICATION ON POVERTY REDUCTION AND INCOME INEQUALITY IN RURAL NIGERIA: EVIDENCE FROM RICE FARMING HOUSEHOLDS

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Abstract: The desire to increase household income and insure against agricultural production risk has led rural households to increasingly diversify their income sources. Yet the potential roles of income diversification on poverty reduction particularly among the rural farmers have not been adequately examined in Nigeria. Therefore, in order to fill this gap and complement other studies on income diversification, this study examined the effect of income diversification on poverty reduction among the rice farming households in Nigeria. Using the primary data collected from 600 randomly selected smallholder rice farmers in Nigeria and adopting the Foster-Greer-Thorbecke (FGT) poverty measures the study observed that farmers that participated in Non-Farm Wage Employment (NFWE) were better off than those in the Farm Related Employment (FRE) and the Non-Farm Self Employment (NFSE). The findings of this study revealed that diversification of income should be given more focus and attention by policy makers in the efforts to reduce poverty among smallholder farmers in rural Nigeria. Farmers should be encouraged to participate more in farmers' organization, the issue of access to land in the rural areas should be thoroughly examined and gender equity in access to productive resources should also be looked into.

Keywords: Income, Diversification, Poverty, Farmers, Nigeria.

INTRODUCTION

Poverty has been defined by the World Bank (2000) as pronounced deprivation in well-being and its reduction remained one of the greatest challenges confronting nations of the world. The persistence and high prevalence of poverty particularly in developing countries seems to have defiled all solutions. In Nigeria, despite a plethora of poverty reduction strategies that have been adopted, poverty incidence particularly in the rural areas is still very high (HDR, 2006; 2007/2008). Higher incidence of poverty in rural areas has been traced to some environmental problems associated with agricultural production, high vulnerability to health hazards (Alayande and Alayande, 2004), lack of access to improved farm inputs and poorly developed infrastructural facilities (Okunmadewa, 2002).Thus poverty reduction remains one of the greatest challenges facing the Nigerian government today. Over 70% of her population is classified as poor, with 35% living in absolute poverty (IFAD, 2007).

The increasing poverty incidence, both within and among locations, persisted, in spite of various resources and efforts exerted on poverty-related programme and schemes in the country, thus

suggesting that the programmes and schemes were ineffective and ineffectual(Obadan,2002). For instance, the focus of most of the poverty reduction strategies has been on the development of the agricultural sector. However, rapid population growth and sub-division of land along inheritance lines has resulted in very small farm sizes. Furthermore, in densely populated regions, there is now major concern that land may have become too scarce to make any meaningful contribution to household incomes (Marenya *et al*., 2003). This land scarcity suggests that agricultural activities may not remain the only, or even the main, source of income and therefore rural households may not climb out of poverty through growth in land productivity alone.

According to Karugia et al. (2006), poverty reduction interventions have also inadvertently ignored the great diversity and heterogeneity in asset portfolios across rural households and the range of activities in which they engage to generate incomes. Burgeoning literature on livelihood diversification across the developing world has pointed to the increasing role of non-farm incomes in poverty reduction (Bryceson, 1996). Several studies (Marter, 2002; Matshe and Young 2004; Serra, Godwin and Featherstone, 2005; Kijima, Matsumoto and Yamano, 2006; Haggblade, Hazell and Reardon, 2007; Jan et al, 2009) reported that livelihood concept and diversification of income help in minimizing household income variability, providing an additional source of income and even employment which have implications for rural poverty reduction and contribute substantially towards improving households' welfare. Therefore, the contribution of non-farm income sources to the rural economy cannot be neglected because it has grown substantially during the last two decades and its share to total household income ranges between 30% and 50% in some developing countries (Awoyemi, 2004; Jonasson, 2005; Haggblade et al. 2005; Benjamin and Kimhi, 2006; Kaija, 2007). Several studies have indicated that income diversification is not only positively correlated with wealth but also with an increased ability to cope with shocks, or in other words, diversification reduces livelihood vulnerability (DE Janvry et al., 1991 and Kinsley et al. 1998). In addition, other studies also observed that non-farm income is concentrated among the poor, so that an increase in these incomes is eventually pro-poor (Adams 2002; van den Berg and Kumbi 2006). Similarly, empirical evidences show that non-farm income is indeed the main source of investment for raising farm productivity (Reardon et al., 1994; Reardon, 1997, 1998; Abdulai and Huffman, 2000; Ellis and Ade Freeman, 2004).

The goal of any poverty reduction strategy is to increase income and other welfare indicators of rural households (Gordon and Craig, 2004), hence exploiting these off-farm opportunities could offer a pathway out of poverty for the rural poor (Barrett *et al.* 2001). However, the pertinent question is by how much in terms of percentage the poverty will reduce if agricultural households diversify their income sources. Providing answer to this question will shed lights on the relationship between income diversification and poverty reduction in rural Nigeria and could also serve as a guide to policy makers in designing appropriate strategies for poverty reduction, improvement in rural households' welfare and overall rural development. Therefore, this study was conducted to empirically assess the effect of income diversification on poverty reduction among rice farming households in Nigeria.

The remainder of this article is organized as follows. Section 2 presents the analytical frameworks and estimation techniques. The data and descriptive statistics use are presented in section 3. The results and discussion from the various analyses is presented in section 4. Section 5 contains the summary of major findings, conclusion and some policy recommendations.

ANALYTICAL FRAMEWORK AND ESTIMATION TECHNIQUES

The term "income diversification" has been used by different authors to describe four distinct but related concepts (Minot et al., 2006). The first definition of income diversification refers to an increase in the number of sources of income or the balance among the different sources (Joshi et al., 2003; Minot et al., 2006; Dercon, 1998). A second definition of diversification concerns the switch from subsistence food production to commercial agriculture (Delgado and Siamwalla, 1997). Third, income diversification is used to describe expansion in the importance of non-crop or non-farm income (Reardon, 1997). Finally, income diversification can be defined as the process of switching from low-value crop production to high-value crops, livestock, and non-farm activities (Minot et al., 2006). For this study, we adopted the first definition of income diversification.

MEASUREMENT OF POVERTY

The 2/3 of the mean per capita income was used as the poverty line (Omonona, 2001; Okunmadewa et al., 2010; Awoyemi, 2011). The standard Foster-Greer-Thorbecke (FGT) (1984) was employed generate the poverty profile of the respondents. FGT takes the form;

$$P_{\alpha}(y,z)=\frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z-Y_i}{Z}\right)^{\alpha} \quad (1)$$

Where Z = the poverty line
q= number of individual below the poverty line
n = number of individuals in the reference population
Y_{pi} = per capita income of the i^{th} household
$Z-Y_i$ = poverty gap of the i^{th} household
$\frac{Z-Y_i}{Z}$ = poverty gap ratio
α = poverty aversion parameter and takes value 0, 1, 2.

This class of poverty measure is flexible in two ways. One, α is a policy parameter that can be varied to approximately reflect poverty "aversion" and two, the P_{α} class of poverty indices is sub-group decomposable.

When α = 0 in equation (1) the expression becomes:

$$P_0=\left(\frac{1}{n}\right)q=\left(\frac{q}{n}\right)=H \quad (2)$$

The head count is the number of people in a population who are poor, while the headcount ratio (H) is the fraction of the population who are poor. The poverty gap measures the total amount of income necessary to raise everyone who is below the poverty line up to that line.

When α = 1, the poverty measure becomes the poverty-gap index (PG)

$$P_1=\frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z-Y_i}{Z}\right) \quad (3)$$

$$I=\frac{1}{q}\sum_{i=1}^{n}\left(\frac{Z-Y_i}{Z}\right)=HI \quad (4)$$

Where: I is the mean of the poverty gaps expressed as a portion of the poverty line. Equation (4) is the income gap ratio.

When α = 2, the squared poverty gap index (SPG) or the poverty severity index is generated given by:

$$P_2=\frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z-Y_i}{Z}\right)^2 \quad (5)$$

The Poverty severity index weighs the poverty of the poorest individual more heavily. It adds to the poverty gap ratio an element of unequal distribution of the poorest household's income below the poverty line. The FGT measure is increasingly used as a standard poverty measure by the World Bank, regional development banks, most UN agencies and it is used in most empirical work on poverty because of its sensitivity to the depth and severity of poverty. The incidence is measured by the number of people in the total population living below the poverty line while the poverty intensity is reflected in the extent to which the incomes of the poor fall below the poverty line. The FGT indices can be obtained for any subpopulation to get insights on how poverty varies across subpopulations, and thus provide a poverty profile. That is :

$$P_{\alpha}=\sum_{j=1}^{m}K_j P_{\alpha j} \quad (6)$$

Where: $j=1,2,3.....m, k_j$ is the population share of each group $p_{\alpha j}$ is the poverty measure of sub group j.

The contribution of each group C_j to overall poverty can be calculated as follows:

$$C_j = \frac{K_j P_{\alpha j}}{P_\alpha} \quad (7)$$

This property of the index implies that when any group becomes poor, aggregate poverty will increase. Hence poverty can be disaggregated by subgroup such as gender and region. In this study relative poverty line was constructed. The consumption expenditure was used as proxy for the standard of living. Hence, the poverty line was defined as two-third of the mean per capita expenditure.

Measurement of Income Inequality

Income inequality can be measure by using the Gini-coefficient. Following Morduch and Sicular (2002), where incomes are ordered so that $y_1 \leq y_2 \leq y_3 \leq y_4 \leq y_n$.
The Gini-coefficient is computed as:

$$I_{Gini}(Y) = \frac{2}{n^2 \mu} \sum_{i=1}^{n} \left(i - \frac{n+1}{2}\right) y_i \quad (8)$$

Where:
n=number of observation
μ = mean of distribution
y_i = income of the i[th] household.

The Simpson Index of Diversity

The income diversification index is based on three different broad categories of income: income from agricultural production, income from non-farm wage employment, income from non-farm businesses or self-employment. This set of income categories is fairly representative of categories used in the literature (e.g. Davis et al, 2010). The Simpson index of diversity captures both the number of income sources and the relative importance, or evenness of these sources (Minot et al.2006). It is calculated as given below:

$$DID = 1 - \sum_i^n Q_i^2 \quad \textbf{9}$$

$$\textit{Where, } Q_i = \frac{k_i}{\sum k_i} \quad \textbf{10}$$

Q_i = the proportion of income generated from income source i in the total household income
DID = Income diversification index
k_i = income generated from income source i

2. 4. Effect of income Diversification on Poverty and Income inequality: 2SLS Approach
The adopted 2SLS equation is specified below**:**

$$I_i = N\gamma_1 + \lambda_i \gamma_2 + \omega_i \quad \textbf{11}$$

Where:
I_i = per capita income
N = Income diversification index
λ_i = Vector of explanatory variables
γ = vector of parameters to be estimated
ω_i = Error term

Given that the above system of equations is endogenous**, t**he parameters are estimated by using instrumental variable approach. The 2SLS was applied in order to correct for the endogeneity of N in equation (11). A two stage least square (2SLS) instrumental variables regression can be used to produce consistent estimates if the system is poorly identified (Davidson and Mackinnon, 1993). A reduced form equation specified as a function of all the exogenous variables in equation (11) and a set of instrumental variable was specified as follows:

$$N_i = \lambda_i \theta_1 + Q_i \theta_2 + \varepsilon_i \quad 12$$

Where Qi: the vector of instruments that impact on income diversification but do not affect household income. The predicted values from equation (12) defined as $\hat{N}_i$ is then inserted into the structural equation (11) to replace N_i. Therefore, the reduced form of equation (11) which was estimated using OLS is as given below:

$$I_i = \hat{N}_i \theta_1 + \lambda_i \theta_2 + \pi_i \quad 13$$

The vectors of instrument Q_i are: access to credit and electricity and native.

The exogenous variables λ_i are presented below:

λ_1 = Farm size (hectare)

λ_2 = household size (Number of persons)

λ_3 =age of household head (years)

λ_4 =Gender of household head (male=1, female=0)

λ_5 =membership of any organization (member=1, otherwise=0)

λ_6 =vocational training (attend=1, otherwise=0)

λ_7 = contact with extension agents (contact=1, otherwise=0)

λ_8 =House ownership (owns a house=1, otherwise=0)

λ_9 = Years of formal education

λ_{10} = Native of respondents (Native of study area=1, otherwise=0)

DATA AND DESCRIPTIVE STATISTICS

The focus of this study is on rice farming households randomly selected from three major rice growing systems of Nigeria. Nigeria is the most populous country in Africa with an estimated population of 140003,542 million consisting of 51.22% male and 48.78% female (NPC, 2006) and a total land area of about 923770 km^2 . Nigeria is divided into six geo-political zones: South-West, South-East, South-South, North-West, North-East and North-Central. In term of administrative structure, Nigeria is made up of 36 states and a Federal Capital Territory; 774 Local Government Areas, about 250 Ethnic Groups and 90,000 communities (Okojie, 1995). A multistage random sampling technique was adopted to select a total of 600 rice farming households for this analysis. Since the production of rice is carried out under three major rice production systems namely: rain-fed upland, rain-fed lowland and irrigated production system, one state was chosen from each of the three major rice ecologies. Thus, Kano, Osun and Niger state were randomly selected to represent the irrigated, upland rice ecology and lowland rice ecologies respectively. From each of the three states, 5 Local Government Areas were selected and 3 villages were also randomly selected from each of the LGAs. In the final stage farming households were selected. The primary data were collected using a well-structured questionnaire.

The different income sources identified in the study area were classified broadly into three categories. These are: Farm Related Employment (FRE), Non-Farm Self Employment (NFSE), and Non-Farm Wage Employment (NFWE). The distribution of the respondents by income source presented in Table 1 showed that FRE is the dominant income source among the respondents with about 56% of the respondents participating in FRE. Only 29% and 15% were engaged in NFSE and NFWE respectively. This confirmed the widely reported view that agriculture is the main occupation among the rural dwellers in Nigeria.

The socio-economic characteristics distribution of the selected households by income source is presented in Table 2. Majority of the respondents in the total sample were males (81%), while only 19% were females. In terms of gender disaggregation of the respondents by income source, the male headed households were also dominant in all the income sources with about 80%, 84% and 77% of males in the FRE, NFSE and NFWE respectively. Majority of the respondents (67%) from Niger state appeared to diversify their income sources more than the respondents from the other states. Education of the household head is expected to influence diversification into other income sources. However, Islamic education seems be the most prevalent form education in the study area. Access to credit is also a

constraint among the respondents in all the income sources. For instance only 22%, 27%, and 23% of the respondents that engaged in FRE, NFSE and NFWE respectively had access to credit.

About 47%, 42% and 40% of the respondents that engaged in FRE, NFSE and NFWE respectively were food insecure, Although one can say that those that were involved in FRE seems to be a bit better off than those respondents in other income sources. Farm size also differs among all the different income sources, with those engaged in FRE having a larger farm size. Large majority of the respondents that engaged in FRE had contact with extension agents and were members of any organization. Additionally, they also had a large household of 9 persons, an average age of 46 years and had average of 4 years of education. For the NFSE and NFWE group, they had household size of 8 and 7 persons respectively and both had an average age of 45 years. This implies that the respondents in all the income groups were still in there productive age and this could be an asset for income diversification.

RESULTS AND DISCUSSION

Impact of Income diversification on Poverty Reduction

By how much income diversification reduced poverty among the respondents is shown in table 3. Following Mat et al. (2003) and for easy presentation of the results Table 3 was partitioned into 6 different columns. Column (1) presented the poverty situation for the farm related employment income. Column (2 presented the poverty situation for all households when only non-farm self-employment income are included in the farm related employment income. In column (3) the poverty situation for all households when only non-farm wage employment income is included in the farm related employment income. Column (4) is the poverty situation for all households when both non-farm self-employment and non-farm wage employment income are included in the farm related employment income. The study adopted the 2/3 of the mean per capita household income as the poverty line for each of the different income sources. Columns (5) (6) and (7) are poverty calculation in term of percentage change gathered through comparison between column (2) (3) and (4) to column (1) and multiple by 100.

All the three poverty measures revealed that the extent of poverty reduction was greater when non-farm income is included in agricultural household income. For instance, when both non-farm self-employment income and non-farm wage employment income are included in farm related employment income, the effect on the poverty reduction was high. The reduction in the incidence of poverty, depth and severity of poverty were 22.46%, 15.42% and 21.91% respectively. This finding was also similar to the finding of Mat et al. (2011) for Malaysia, De Janvry, Sadoulet and Zhu (2005) also found that rural non-farm income reduces poverty in China, and particularly the severity of poverty, and that those activities have played a key role in falling poverty rates in China, as it provide an alternative to small landholdings

INCOME INEQUALITY

Decomposition of Income Inequality by Income Sources

We examined the effect of income diversification on income inequality among the rice farming households. This is necessary because, inequality is important to both poverty and growth (omilola, 2009). This is based on the premise that increased inequality for a given level of an average welfare indicator (*e.g*., income) will almost always be associated with higher levels of poverty, because a smaller share of income will be obtained by those at the bottom of the income distribution (McKay,2002). This is particularly true for developing countries, where a highly unequal income distribution is almost always accompanied by high levels of poverty incidence (Ellis, 2000). In this section, we examined income inequality within each income sources and also the relative importance of the different income sources to income inequality reduction among the rice farming households in Nigeria. The analysis revealed that income inequality was lowest among those that participated in non-farm self-employment, followed by farm related employment and was highest among the non-farm wage employment (Table 4). Hence, this analysis showed that income from non-farm wage employment is the most important inequality-increasing source of income among the rice farming households in rural Nigeria and also pointing out the role of income from non-farm self-employment as a means to potentially decreasing income inequality among the smallholder rice farmers in rural Nigeria.

Impact of Income Diversification on Income Inequality

The percentage reduction in income inequality brought by income diversification presented in Table 5. Overall, the analysis revealed that diversification into other non-farm income sources significantly reduced income inequality. This is in agreement with the findings of Adams and He,(1995) in a Pakistan case study. They found that non-farm activities and livestock keeping tended to reduce income inequality.

Determinants of Income Diversification

According to Ellis (1993), general socio-economic characteristics influence household decision-making on income diversification choice. Among the rice farming households in Nigeria, the significant socioeconomic characteristics that influence their decision to diversify their income base are presented in Table 6. The result revealed that gender and education of household head, membership of any organization, and house ownership as a measure of wealth, native of the study area and access to electricity were the variables that had positive and significant effect on household income diversification. This implies that females diversify into different income sources more than the males, this could be as a result of the fact that women generally lack access to production resources most importantly land for farming and in most cases women only have access to land for farming only through their husband. The result also showed that a more educated farmer will diversify more than a farmer without formal education. This finding is in line with that of Barrett, Reardon and Webb (2001). However, improving education among the rice farming household in Nigeria is a key challenge as descriptive statistics suggest that majority of the farmers had no formal education. Membership of any organization was used as a social capital variable. Social networks seem to enable household members to extend their participation in new activities. This finding corroborated the finding of Schwarze and Zeller (2005). House ownership as a measure of wealth, implies that wealthy farmers diversify more than the non-wealthy counterparts. Also the fact that a farmer is a native of the study area could also encourage access to productive assets that can influence income diversification, while access to **e**lectrification appears to enable households to diversify into nonfarm activities and also facilitate the starting of an own business.

Furthermore, household size had a negative and significant effect on income diversification among the rice farming households. This could be explained by the fact that large household size depresses household income and also tend to aggravate poverty within the households. As noted by Reardon, et al., (1998), poorer households tend to have less access to nonfarm activities than better-off households. Large household size also implies higher consumption expenditure and this will reduce the available resources needed to diversify into other activities. This is however contrary to the findings of Minot et al. (2006) who discovered that in Pakistan households with many members but small farms are more likely to have multiple income sources, a large share of nonfarm income, and a higher crop value per hectare, but a smaller share of output that is marketed. The coefficient of farm size was negatively significant, implying that farmers diversify more into other income generating ventures as the farm size decreases. Land ownership in developing countries, particularly in Africa is the most important productive asset available to rural households. Hence, those farmers that have adequate access to land in terms of ownership and size are less likely to diversify into non-farm activities. This could also suggest that diversification into non-farm income sources might be related to lack of access to land for farming. The coefficient of contact with extension agents was negative and significant, meaning that those that had contact with extension agents were less likely to diversify. It has been reported that over the past three decades, most developing countries budgetary support for extension services is in dramatic decline, and hence there are limited number of extension agents available for onward transfer of innovation and better productive information to the rural farmers.

Effect of Income Diversification on Poverty

The result of the effect of income diversification on poverty proxied by per capita income is presented in Table 7. The analysis showed that farm size, contact with extension agents, education and gender of household head and membership of an organization had positive and significant effect on per capita household income, while only household size had negative and significant effect on per capita household income. This result suggests that those farmers that had contact with extension agents have increase in household income. This could also be explained by the fact that the farmers that had contact with extension agents are likely to be adopters of new innovation which can lead to increase in yield or productivity and by extension increase in household income. This result supports previous literature of positive contribution of agricultural extension to productivity and income (Dercon et al., 2009; Everson, 2000). However, this result contradicts the negative or non-significant impact of extension service on productivity and income level findings of Gautam and Anderson (1999.

The result also revealed that the male headed households had significantly higher per capita income than the female counterparts and as the other variables increase (farm size, education and membership of any organization), per capita income will also increase, while as household size increases per capita income will decrease. It was also

interesting to observe that income diversification although positively affected per capita household income, it was not significant in determining household income. This means that, the rice farming households could be diversifying into other income sources for other reasons apart from the intent to increase household income.

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

This study revealed the fact that apart from farm related employments, other activities engaged in by rice farmers had the potential to increase household income and hence improve welfare. Therefore, it is important to encourage farmers to participate in other income generating activities in order to achieve the goal of poverty reduction and improvement in household welfare, particularly among the rural farming households. Policy makers should look for means of improving these activities and make policies that will promote them without having negative effects on farming. The result revealed that education of household head, access to electricity, and membership of any organization positively and significantly influences income diversification, while reduction in farm size, lack of contact with extension agents, age of farmers are the factors inhibiting some farmers from participating in non-farm activities. Therefore government should render necessary assistance to these farmers in these areas. Since education of household head, farm size, contact with extension agents and membership of any organization positively and significantly increases household income, all efforts should be geared toward improving rural farmers' access to their variable. The family planning program should be further focus on and more awareness should be created among the rural farmers on the need to reduce their family size for poverty reduction and improvement in households' welfare.

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Appendices

Table 1: Overall Distribution of Respondents by Income Sources

Income sources	**Frequency**	**Percentage**
Farm related employment	316.00	56.00
Non-farm self-employment	161.00	29.00
Non-farm wage employment	86.00	15.00
Total	563.00	100.00

Source: Field survey, 2010

Table 2 : Selected Household Socio-Economic Characteristics by Income Source

Socio-Economic Variables	**FRE N=316**	**NFSE N=161**	**NFWE N=86**	**Total sample**
Gender				
Male	80.00	84.00	77.00	81.00
Female	20.00	16.00	23.00	19.00
State				
Proportion from Osun state	7.00	6.00	62.00	15.00
Proportion from Niger state	76.00	72.00	24.00	67.00
Proportion from Kano state	16.00	22.00	14.00	18.00
Educational Background				
Proportion that had primary school education	11.00	14.00	28.00	14.00
Proportion that had secondary school education	7.00	13.00	10.00	9.00
Proportion that had Islamic education	43.00	43.00	20.00	39.00
Proportion with no formal education	35.00	27.00	29.00	39.00
Proportion that have access to credit	22.00	27.00	23.00	23.00
Proportion that are food insecure	47.00	42.00	40.00	45.00
Proportion that a member of any organization	36.00	19.00	36.00	31.00
Proportion That attended vocational training	17.00	7.00	22.00	15.00
Proportion that had contact with extension agents	39.00	31.00	35.00	36.00
Average age of household head	46.00	45.00	45.00	45.00
Average household size	9.00	8.00	7.00	8.00
Average years of education of household head	4.00	4.00	6.00	5.00
Average farm size	2.66	2.38	1.49	2.39

Source: Field survey, 2010

Table 3: Impact of Income diversification and Poverty Reduction

	Freinc only	**Farm income &non-farm self-employment income only**	**Farm income & nonfarm wage employment only**	**total income**	**% change (Freinc & nfse)**	**% change (Freinc &nfwe)**	**% change (total income)**
Poverty Indices	**freinc (1)**	**Freinc +nfseinc (2)**	**Freinc+nfwe (3)**	**Fre+nfes +nfwe (4)**	**((2-1)/1)*100 (5)**	**((3-1)/1)*100 (6)**	**((4-1)/1)*100 (7)**
Poverty incidence	0.3481	0.3144	0.3428	0.2699	-9.68	-1.52	-22.46
Poverty depth	0.1258	0.1073	0.1124	0.1064	-14.71	-10.65	-15.42
Poverty severity	0.0703	0.0541	0.0619	0.0549	-23.04	-11.95	-21.91

Source: Field Survey, 2010.
Note: Negative sign signifies reduction.

Table4: Decomposition of Income Inequality by Income Sources

Income sources	**Income inequality**
Farm related employment	0.3056
Non-farm self-employment	0.2947
Non-farm wage employment	0.4283
Total	0.3283

Source: Field Survey, 2010.

Table 5: Impact of Income Diversification on Income Inequality

	Freinc only	**Farm income &non-farm self-employment income only**	**Farm income & nonfarm wage employment only**	**total income**	**% change (Freinc & nfse)**	**% change (Freinc &nfwe)**	**% change (total income)**
Gini coefficient	**freinc (1)**	**Freinc +nfseinc (2)**	**Freinc+nfwe (3)**	**Fre+nfes +nfwe (4)**	**((2-1)/1)*100**	**((3-1)/1)*100**	**((4-1)/1)*100**
	0.3374	0.3159	0.3351	0.3127	-6.37	-0.68	-7.32

Source: Field Survey, 2010.
Note: Negative sign signifies reduction.

Table 6: Determinants of Income Diversification

Variable	Coefficient	Stand. error	t-value	P>|t|
Household size	-0.007***	0.002	-3.61	0.000
Gender	-0.089***	0.018	-4.98	0.000
Age	-0.001	0.001	0.88	0.381
Education	0.004***	0.001	3.54	0.000
Vocational training	0.001	0.021	0.05	0.962
Farm size	-0.002***	0.005	-5.76	0.000
Extension agents	-0.048***	0.017	-2.78	0.006
Membership of organization	0.064***	0.017	3.67	0.000
House ownership	0.047*	0.027	1.74	0.082
Native	0.155***	0.026	5.87	0.000
Access to electricity	0.033**	0.016	2.03	0.042
Access to credit	0.018	0.017	1.04	0.297
Constant	0.258***	0.042	6.08	0.000
Number	559.00			
Wald Chi(2)	17.14			
Prob>chi2	0.000			
R-squared	0.2737			
Adjusted R^2	0.2577			
Root MSE	0.1581			

Note: ***, **, * Significant at 1%, 5%, and 10% respectively
Source: Field Survey, 2010.

Table 7: Econometric Effect of Income Diversification on Poverty

Variable	Coefficient	Stand. error	Z-value	P>|Z|
Diversity index	25424.67	52294.07	0.49	0.627
Household size	-4726.25***	703.335	-6.72	0.000
Gender	13524.92*	7516.915	1.80	0.072
Age	98.122	277.7795	0.35	0.724
Education	991.1995**	463.1921	2.14	0.034
Vocational training	2577.091	6805.018	0.38	0.705
Farm size	5645.787**	2254.315	2.50	0.012
Extension agents	12669.29**	5722.148	2.21	0.027
Membership of organization	19791.42***	7069.995	2.80	0.005
House ownership	576.5693	10204.15	0.06	0.955
Constant	47498.74**	21322.45	0.026	0.026
Number	559.00			
Wald Chi(2)	136.54			
Prob>chi2	0.000			
R-squared	0.2027			
Root MSE	51860.00			

Note: ***, **, * Significant at 1%, 5%, and 10% respectively
Source: Field Survey, 2010.