Global Journal of Science Frontier Research: D
Agriculture and Veterinary
Volume 14 Issue 7 Version 1.0 Year 2014
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

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*GJSFR-D Classification :* *FOR Code: 079999*


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# Effect of Rural- Urban Labour Migration on Rural Household Livelihoods and Rural Environment in Delta State, Nigeria

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## I. Introduction

Migration, according to Ekong (2003), is the movement of people from one geographical location to another either on a temporary or permanent basis. Labour migration therefore, refers to the movement of labour from one geographical location to another temporarily or permanently. It is commonly observed all over the world that rural-urban migration is the dominant pattern of internal migration (Ofuoku and Chukwuji, 2012). There was boom in agriculture in years past, but when Nigeria gained independence, there came the oil boom. This boom resulted to rapid urbanization which was prompted by the influx of oil exploring and servicing companies in the Niger Delta Region in which the study area is located. With the oil boom, most educated and non-formally educated youth abandoned farming and farm related activities to work in the oil exploring and servicing companies and ministries. That was what led to loss of labour, by the agricultural sector, to other occupations through rural-urban movements of people.

Ekong (2003) observes that it is difficult to strictly pin-point the causes of migration, since causation connotes absoluteness whereas it is usually difficult to cite this or that variable as the absolute cause of an individual's decision to relocate. It is therefore more scientific to refer to the correlates of migration factors that are systematically related to the phenomenon of migration without necessarily proving causation (Ekong, 2003). Most investigations of rural-urban migration tend to infer that people primarily move for economic reasons, and the need to escape from adverse social and physical conditions. Von Braun (2004) asserts that people tend to be pulled to areas of prosperity and pushed from areas of decline.

Migrants do not typically represent a random sample of the total population (Tadaro, 1976). Most rural-urban migrants are young, formally educated, less risk-averse and more oriented towards achievement and have good network of relationships in other places than does the general population in the source-migration area. Adewale (2005) suggests that rural-urban migration negatively impacts on the quality of rural life, especially when such migrants move away with their needed productivity into the urban areas. Migration of young adults from the rural to urban areas places a greater burden on the farming household, he further stated. This is attributed to the fact that farmers spend more time to cover the same area of land-than when he or she had the assistance of the migrant, thereby depriving himself of leisure time and involvement in social activities (Ofuoku and Chukwuji, 2012) and may consequently decide to reduce the farm size to the one he or she can manage.

However, there is a general agreement in many literature that migration and remittances from migrants reduce rural poverty and raise rural household living standards. According to Taylor and Mora (2006");Schmook and Radel (2008);Wouterse and Taylor (2008), migrant households that receive remittances from migrants members have higher income and consumption levels than non-migrant households. This is further butteressed by Adams (2006) ; Airola (2007) who show that migrant households with remittances tend to spend more than

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non-migrant households on durable goods and productive activities.

Several studies that investigated the impact of migration on agricultural technology use by rural households show that labour scarcity prompted by rural abandonment of traditional labour-intensive agricultural technologies by migrant households as demonstrated by Zimmerer (1993) and, according to Black (1993) discourages the adoption of new agricultural innovations. However, Oberai and Bilsborrow (1984) assert that migration results to technological improvement in rural areas when remittances from migrants are invested in more modern technologies. They further argue that the stimulating effects of new ideas and knowledge brought back by migrants also contribute to improvement in technology in rural areas. Mendola (2008) found that migrant households tend to use new farming innovations to improve agricultural production than non-migrant households.

The rural areas house most of the natural resources in the world. These natural resources include land and forests. Rural-urban migration involves human population and human population has relationships with the environment. Owing to the afore mentioned facts, rural-urban migration and its relationship to the rural environment have led to increasing interest in recent studies on population-environment linkages (Bilsborrow, 2002; Carr, 2009). Qin (2010) observes that in the long running debate on the relationships between population and the environment, early simplistic opinions about negative linear relationships between population growth and the natural environment have been discarded and replaced by a more complex mediating variable framework (Jolly, 1994; Mackeller, *et al*, 1998). According to Qin (2010), this approach incorporates socio-economic, institutional, technological, and cultural contextual factors which change the relationships between population and environmental changes. He further stated that the mediating variable perspective is especially important in studying the specific systems by which migration affects the environment. Pichon (1997); Perz (2003) opine that migrants distinguish themselves from non-migrants with respect to resource use behaviour, resource extraction technologies, and knowledge of local ecosystems in rural areas of destination. Accorading to Bilsborrow (2002), though it is often claimed that settlement of agricultural migrants in environmentally sensitive areas like the rainforests and swamp forests leads to serious deforestation and environmental degradation, some researches, according to Cassels *et al* (2005), found that environmental degradation is not particularly associated with migrant households.

The relationships between migration and the environment are always complex. Since this is so, a precision oriented study needs comparing the biophysical situation pre and post migration. The challenge here is that such records and information are not usually available in developing countries, especially in the rural areas. However, Qin suggests that a reasonable and efficient investigation strategy of differentiating environmental impacts of migration is to compare migrant households or migrants with non-migrant households or non-migrants in relation to activities that have important environmental consequences, such as resource use behaviour and resource extraction technologies. This approach have been used by Browder (1995), Sierra (1999), Perez (2003) to assess the effects of migration on the environment in the Pull area. In contrast, according to Qin (2010), there have been few studies examining the impacts of migration on the environment in the push area.

A lot of literature on the social and economic impacts of migration on rural areas are available. Qin (2010) states that comparing migrant households and non-migrant households regarding agricultural production, use of agricultural technologies, and income consumption is a common approach to studying the impacts of migration on rural people's life. Considering the environmental outcomes of these variables, this line of investigation may have direct implications for future environmental consequences of migration in rural migrant-source areas. However, such linkages have been considered by few studies in the recent past. Factors such as agricultural practices, incomes and assets, and patterns of consumption are critical to the process of rural dwellers' livelihood. Carney (1998) conceptualizes livelihood to comprise of the capabilities, natural, physical, human, financial and social assets; and activities needed for a means of living. Migration is regarded as one of the most important livelihood strategies among rural dwellers, when the environment and natural resources are included in the context as well as in capital assets, strategies and outcomes of livelihoods. According to Sheerbinin *et al* (2008) the linkage between changes in rural household population and the environment is an important area of population-environment study that is in vogue. The household or family is likewise the basic unit of analysis in rural livelihood system. For this reason, the household forms an appropriate level of analysis for a study on the effect of migration on livelihoods and the environment. Qin (2010) suggests that rural household livelihoods can be conceptualized as an integrative mediating factor into the migration and environment model.

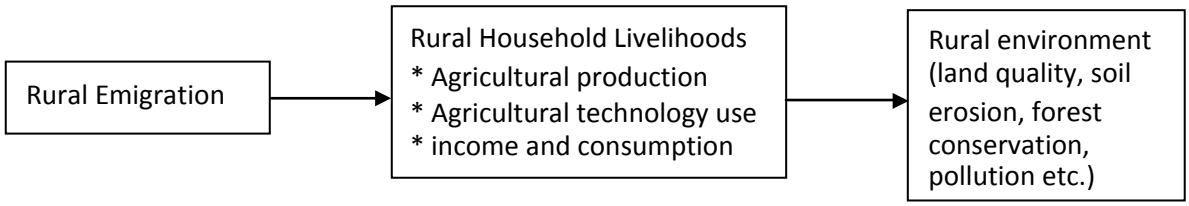


*Figure 1 :* Conceptual Framework for Effects of Rural Emigration on the Rural Environment, Adapted from Qin (2000)

## II. Conceptual Framework

The effects of rural emigration on rural environment are made possible by intervening variables of agricultural technology use, income and consumption, and resource use and management (Qin, 2010). On the advent of rural emigration, at this household level, agricultural production is reduced as a result of shortage of labour. However, rural emigration may lead to adoption of labour saving agricultural technologies to replace lost labour and enhance production. Remittances from emigrants are channeled into the purchase of agricultural innovations and emigrants also bring back home, knowledge and ideas that promote agricultural productivity. Remittances from migrants to households are expected to enhance households' incomes and consumption levels. This may reduce the farm size and magnitude of farming activities and expansion. It may also lead to abandonment of some farmed areas.

Ideas and knowledge acquired and transmitted to rural households promote better resource use and management. With reduced agricultural activities and farm sizes, use of modern technologies, dependence on remittances and better use and management of resources, the rural environment is impacted as consequence of the new status of rural household livelihoods. The land quality is improved and erosion is prevented and reduced and forests reserved while previously abandoned areas regenerate to reafforest. With this re-afforestation, rural pollution is reduced progressively.

## III. Objectives of the Study

This study was carried out in Delta State to ascertain the effect of rural-urban labour migration on household livelihoods and rural environment. Specifically, this study sought to:

- compare socio-demographic variables of labour migrant and non-labour migrant households;
- determine the differences between labour migrant and non-labour migrant households.
- ascertain the differences among labour migrant, local off-farm work households, and farming households.

*Hypothesis (H0):* there is no significant difference between households with respect to agricultural production, agricultural technology use, income and consumption, and resource use and management.

## IV. Method

*a) Study area*

Delta State is located in the Niger Delta Region of Nigeria. It lies betweem longitude $5^0$.00 and $6^0$45' east of the Greenwich meridian and latitude $5^0$00 and $6^0$30 north of the equator (see figure 2). The state consists of 25 local government areas (see figure 3) with a population of 2,570,181 people (NPC, 1993).

The state is naturally demarcated into South, Central and North Agro-ecological zones based on the vegetation cover by the Delta State Agricultural Development Programme, the major agricultural extension agency of the state.

In the past 30-35 years, Nigeria witnessed a mass exodus of labour migrants from rural to urban areas. It is estimated that 80% of rural dwellers in Nigeria are employed in agricultural activities (Abbass, 2009). Wage labour is predominantly in use in the Nigerian urban areas with 50% acquired through rural-urban migration (Abbass, 2009). Delta State is in the forests and derived savannah vegetation belts characterized by ecological problems such as deforestation, diminishing land fertility and soil erosion. Delta State is an important study area for examining the effects of rural-urban migration on the rural environment because of the extent ecological stress and high rates of rural-urban labour migration that take place.

*b) Sampling and sample size*

Two-stage process was used to select the study communities. First, based on the ecological zoning if Delta State, the three agro-ecological zones were considered (Delta South, Central and North Agro-ecological Zones).

In the second stage, two rural communities from each agro-ecological was poor positively selected while considering two criteria: (i) high level/rate of rural-urban labour migration; and (ii) existence of abundant farmland and forests. These two criteria highlight the linkage between rural labour emigration and the rural environment, and therefore can enhance comprehending how rural-urban labour migration relates to conservation of were natural resource. In this process, six (6) villages were selected. These villages included Utagba-Uno and Ossisa (Delta North Agro-econlogical zone), Ugborhe and Boboroku (Delta Central Agro-

ecological zone), and Agadabri and Kiagboda (Delta South Agro-ecological zone). The basic attributes of these 6 study villages are summized in Table 1, which shoes variations in labour migration rates, income levels and natural resources endowments. These communities combine to provide a representative sample of all the rural areas in Delta State.

A total of 60 key informants were selected using stratified random sampling to include village leaders, teachers, resident elders, forestry staff and agricultural extension workers. This was done to represent the broad interests and perspectives in the study communities. In each community, stratified random sampling of labour migrant and non-labour migrant households was done from a list of all households provided by village leaders. Finally, households were randomly selected from each category. A total of 480 households were finally selected. However, a total of 475 questionnaires could be retrieved, (238 labour migrant household heads and 237 non-labour migrant households.

*Table 1 :* General Attributes of Study Communities

| Study Villages | Number of households | Population | Number of labour migrants | Per Capita annual | Farmland size(ha Income(N) | Forested landsize (ha) |
|---|---|---|---|---|---|---|
| Utagba-Uno (Ndokwa West LGA) | 234 | 1,712 | 581 | 5,500 | 1,620 | 2,880 |
| Ossisa (Ndokwa East LGA) | 215 | 1,976 | 723 | 3,100 | 1,815 | 5,590 |
| Boboroku (Ethiope East LGA) | 299 | 2,121 | 806 | 4,300 | 2,090 | 7,480 |
| Ugborhe (Sapele LGA) | 183 | 2,316 | 814 | 4,350 | 2,289 | 7,690 |
| Agadabri (Patani LGA) | 143 | 1,022 | 300 | 2,200 | 1,020 | 3,259 |
| Kiagbodo (Burutu LGA) | 168 | 1,130 | 250 | 2,250 | 1,182 | 5,980 |

*Note: 150.00 = Us $1.00 at the time of survey (2012)*
*Source: Community Development Communities of Study Communities*

*c) Data Collection*

A combination of multiple research methods was used. This was necessitated by the complex nature of population-environment relationships. Quantitative and qualitative methods were combined through mixed-methods approach for this study as used by Tashakkori and Teddlie (1998), Qin (2010) in their studies. A structural context of this study was provided by analysis of secondary socio-economic and biophysical data sourced from Federal Bureau of statistics, Ministries of Environment, Environmental protection agencies and Forestry Departments at the state and federal levels of government in Delta State. Key informant interviews were carried out before and during rural household surveys to get information about rural livelihood experiences to guide the development of the questionnaire used for the study. These interviews also provided a contextualized backdrop for the analysis of the collected data. All the interviews were taped, transcribed and qualitatively analyzed to identify common themes (Dunn, 2000; Qin, 2010).

It was observed that the non-labour-migrant households were not a homogenous group as households whose members were mainly engaged in farming and workers in local non-agricultural enterprises were included. As a result of this, the survey households can be further divided into three subgroups (Qin, 2010): 238 labour-migrant households, 95 local off-farm work households, and 142 farming households. The three subgroups were however involved with farming to different magnitudes.

*d) Measurement of variables*

Four components of rural household livelihoods (agricultural production; use of agricultural technologies; household income expenditure and assets; and resource use and management, captured in the conceptual framework were addressed by the survey. They were all measured by multiple variables and

several socio-demographic characteristics of the households were considered.

Agricultural production practices of rural households were measured by four variables. Farmland use was measured by the size of per labour cultivated land (ha) in the year of survey (2012). Respondents were also required to indicate if or not in 2008 their household was engaged in the following areas of agricultural production: (i) grain crops; (ii) yam; (iii) cassava (iv) beans; (v) vegetables; (vi) fruits; (vii) oil palm; (viii) commercial poultry rearing; (ix) fish farming; and (x) livestock rearing. Production diversity (total number of types of agricultural production involved in) was measured by summing up the dichotomous responses (no = 0, yes = 1) (Qin, 2010). Two other variables were included relating to production of major grain crops in 2012: yield of maize (kg) and yield of guinea corn (kg) per ha of farm land.

Use of agricultural technologies was measured by three variables such as the cost (in N) of chemical inputs-fertilizers, pesticides, and herbicides, in the year prior to the study (2011), and two constructed variables pointing out the levels of use of various types of agricultural technologies. The respondents were asked to signify whether or not their households used the following 14 different agricultural technologies in the most recent year. These technologies included indigenous traditional and modern farming technologies. The indigenous traditional farming technology group included (i) tillage (ii) application of organic fertilizer, (iii) mixed cropping, (iv) intercropping, and (v) rotational cropping. The group of the modern farming technologies included (i) usage of large quantity of chemical fertilizer, (ii) application of chemical fertilizer as directed by agricultural extension agents, (iii) application of pesticide (iv) application of herbicide, (v) usage of plastic mulch, (vi) irrigation with water pump, (vi) usage of sowing machine (viii) usage of harvester, and (ix) zero tillage (no-tillage) techniques. The responses of yes = 1, no = 0 were summed up as two variables (total number of indigenous farming technologies utilized and total number of modern farming technologies utilized.

Research has revealed that household income and expenditure are particularly difficult to measure in rural areas of developing countries (Qin, 2010). As he further suggested, to reduce measurement error, the survey focused on the monetary components of rural household incomes and expenditures. Household income was therefore, assessed as cash income per annum, from both farming and non-farming activities in 2011. household livelihood expenses are the annual monetary spending on regular consumer goods and services in rural areas (Qin, 2010), in 2011. this includes large expenditures on heavy projects such as construction of house and the living costs of labour migrants or student members of the household that live in urban areas. Per capita annual cash income and living expenses (in Naira(N)) were computed to account for differences in a rural household's size and composition. An index variable was also included as an indicator of household consumer assets, made according to Filmer and Pritchette (2001) utilizing principle component analysis to drive weights for constructing a linear index of a group of asset variables. The indicators of asset used included household ownership of various durable consumer goods as used by Qin (2010), such as building materials and style of the household dwelling, and the household's sources of drinking water. The index was rescaled to a value range of 0 to 5 to make interpretation easy.

As also done by Qin (2010), 3 variables were included with respect to rural households' resource use and management activities. The proportion of firewood and crop residues present in the total fuels used by a household was used to indicate its level of dependence on biophysical resources for cooking. The use of general forest resources was assessed by directing respondents to signify whether or not their household utilizes timber and non-timber forest resources regularly. The types of timber and non-timber resources listed in the survey instrument included trees, mushrooms and fungi, medical items and herbs, wild edible vegetables, responses (yes = 1, no = 0) were summed up as variable (total number of types of forest products or services used). The respondents were also requested to signify if or not their household undertook natural resource improvement activities for the past twelve months. The natural resource improvement activities were (i) planting of trees or ledges on household farmland and/or forested land (iii) building stone or soil ridges on sloping farmland to prevent soil erosion, (iv) mending of terraces to prevent soil erosion, (v) maintaining and improving irrigation of farmland, (vi) construction of organic fertilizer, (viii) reduction in the utilization of chemical fertilizer and other chemicals, (ix) planting legumes and other green manure crops, (x) Practice of manual weeding of household farmland and/or forested land, (xi) practicing of fallowing, and (xii) acquisition of information on natural resources and the environment from electronic and print media sources such as television, radio, newspapers and magazines. Another composite variable of total number of resource improvement activities carried out in the last twelve months was created by summed up responses of (yes = 1, no = 0).

Five socio-democratic variables were also included in the analysis to cater for the effects of basic household attributes on livelihood activities. The utilization of these control variables allows for a more accurate evaluation of the differences between labour-migrant households and non-labour-migrant households in rural livelihood (Qin, 2010). The variables included number of years of residence, household size, number

of labourers in a household (inclusive of labour migrant members), mean age of labourers, and mean educational level of labourers. Level of formal educational attainment was measured by eight different levels listed in the survey instrument, such as (i) little or no formal education, (ii) less than primary school leaving certificate, (iv) junior secondary school certificate, (v) senior secondary school certificate (vi) Ordinary National Diploma, (vii) Higher National Diploma (viii) Bachelor of science or Art degree or above.

*e) Methods of Analysis*

Three phases were involved in the statistical analysis of the rural household survey data. In the first phase, descriptive analyses of the data were used to describe study sample characteristics and aggregate patterns of household livelihoods in the study area. The second phase involved the exploration of variations between different household groups with respect to livelihood variables and socio-demographic characteristics, with the use of bivariate comparison statistics. In the final stage, the differences between household groups in livelihood activities were compared, while controlling for the effects of household socio-demographic characteristics, using multivariate discriminant analysis. According to Qin (2010), this technique is particularly suitable in this context because it allowed for the comparison of two or more groups on multiple variables simultaneously. Discriminant analysis is usually utilized while classifying known and unknown cases into groups. In this study, it was used to ascertain the multivariate distinction/differences between household groups, instead of maximizing the odds of correctly predicting the class of a particular case. The bivariate and multivariate analysis were inclusive of the comparison of loabour-migrant and non-labour-migrant households as well as the comparison of labour-migrant, local off-work, and farming households.

## V. Results

*a) Bivariate analysis of socio-demographic and livelihood differences between labour-migrant and non-labour-migrant household groups.*

Table 2 indicates that overall, labour-migrant households were significantly different from non-labour-migrant households in all the five household socio-demographic characteristics captured. Labour-migrant households lived longer on the average, in the rural settlement (Village) and had larger sizes and labourers than non-labour migrant households. Generally, the labour force of labour-migrant households were discovered to be younger and more educated than members of non-labour-migrant households.

The two groups were also significantly different in other livelihood variables such that on the basis of per labourer, non-labour-migrant households had larger farm sizes than labour-migrant households, labour-migrant households had higher per capita cash income than non-labour-migrant households. Labour-migrant households tended to depend less on firewood and crop residues for fuel. These findings are congruent with those of Qin (2010) in his study in South West China.

The results of bivariate comparisons of labour-migrant, local off-farm work, and farming households also captured in Table 2 also show that there were significant differences in socio-demographic variables among the three household groups. Generally, labour-migrant and farming households resided longer in the village than local off-farm work households. With respect to household size and labour pool, labour migrant households were largest on the average, followed by local off-farm work households, while farming household was the smallest. Active labour members of labour migrant and local off-farm work households similarly tended to be younger and more educated than the active labour members of farming households.

In comparison to the two-group comparisons, per capita annual cash consumption expenditure were significantly different among household groups in three-group comparisons. As Table 2 indicates, with respect to five livelihood indicators farming households were significantly different from local off-farm work and labour migrant families. Farming households cultivated more farmland on the basis of per-labourer, but had lower per capita cash income, lower living expenses, fewer consumer assets, and utilized more firewood and crop residues for fuel than off-farm work and labour-migrant and local off-farm work households. However,generally,labour- migrant and local off- farm work households did not significantly differ in these variables. These findings confirm these of Qin (2010) in Chongqing Municipality, NorthWest China.

On the whole or generally, labour-migrant households were significantly different from non-labour-migrant households with respect to socio-demographic characteristics and values for three of the four livelihood constructs captivated in the conceptual models (see Fig 1).

*Table 2 :* Bivariate Comparisons of Household Groups (in means of Variables)

| Variables | two household groups | | Three household groups | | |
|---|---|---|---|---|---|
| | Non-labour-migrant (N = 237) | labour-migrant (N = 238) | Farming (N = 128) | Local off-farmwork (N = 109) | labour-migrant (N =238) |
| **Socio-demographic characteristics** | | | | | |
| Years of residence | 44.2* | 54.0* | 46.5** | 44.9** | 54.0** |

| | | | | | |
|---|---|---|---|---|---|
| Household (HH) size | 4.5*** | 5.5*** | 3.7*** | 4.8*** | 5.5*** |
| Size of household Labourers | 3.5*** | 4.9*** | 3.4*** | 4.5*** | 4.9*** |
| Mean age of household labourers | 56.4*** | 44.0*** | 49.1*** | 45.0*** | 44.0*** |
| mean educational level of household labourers | 2.6*** | 3.6*** | 2.2*** | 3.5*** | 3.6*** |
| Agricultural Production size of per labourer cultivated land | 1.9*** | 1.3*** | 2.1*** | 1.5*** | 1.3*** |
| total Number of types of agricultural production involved | 5.7 | 5.8 | 5.8 | 5.5 | 5.8 |
| Yield of cassava (kg) per ha | 436.9 | 385.0 | 449.1 | 419.3 | 385.0 |
| Yield of maize (kg) per ha | 422.1 | 434.5 | 424.5 | 420.1 | 434.5 |
| **Use of agricultural technologies** | | | | | |
| Expenditure of farming chemicals per ha of land (N) | 256.3 | 251.9 | 286.6 | 246.0 | 251.9 |
| Total number of traditional agricultural technologies used | 4.4 | 4.3 | 4.4 | 4.4 | 4.3 |
| **Household income, expenditure, and assets** | | | | | |
| Per capita annual cash income (N) | 2,556.8** | 3,691.2** | 1,566.7*** | 3,691.0*** | 381.2*** |
| per capita annual living expenditure (N) | 2,445.0 | 2,731.3 | 2,039.1** | 3,018.5** | 2,731.3** |
| household consumer asset index (0-5scale) | 2.2* | 2.6* | 2.0*** | 2.8*** | 2.6*** |
| **resource use and management** | | | | | |
| proportion of firewood and crop residues in total fuels (%) | 30.6** | 27.9** | 30.1*** | 25.2*** | 27.9*** |
| total number of types of forest products used | 0.8 | 0.7 | 0.9 | 0.6 | 0.7 |
| **total number of resource improvement** | | | | | |
| activities embarked on | 5.8 | 5.6 | 5.8 | 5.8 | 5.6 |

**** sig. at 1% level, **sig. at 10% level; *sig. at 5% level*

*Independent t-test was used to compare labour-migrant and non-labour-migrant households. One-way ANOVA was computed to compare farming local off-farm work, and labour-migrant household*

b) *Multivariate discriminant analysis of labour-migrant and non-labour-migrant households*

Though the bivariate comparisons earlier examined is suggestive of the existence of significant differences between labour-migrant and non-labour-migrant households in rural livelihood activities, it did not capture the effects of household socio-demographic characteristics and the inter-relationships among the livelihood indicators. Multivariate discriminant analysis was computed to compare labour-migrant and non-labour-migrant households and for the comparison of labour-migrant, local off-farm work and farming households. In each phase of the analysis as done by Qin (2010), blocks of variables were inputted to create

multiple models meant to examine interactions among variables that measure various livelihood constructs, and to assess the degree to which various sets of livelihood variables differentiate household groups. At the end a final reduced model was estimated by removing non-significant variables from the full model until all the variables remaining in the model had significant effect (Qin, 2010).

Table 3 is indicative that model 1 captured only the four agricultural production variables. The size of the cultivated farm land per labourer and cassava yield per ha of land significantly effected differentiation in the two household groups, statistically but the difference was statistically, marginally significant for cassava yield. However, labour-migrant households cultivated less farm land per labourer and had lower cassava yield than non-labour-migrant households. The variables assessing agricultural technology adoption were captured in the discriminant analysis, in Model 2: The size of labour activated land per labourer maintained the statistical significance in differentiating between the household groups, however, the cassava yield per ha of land could not remain significant. All the three technological use indicators had no significant effects in differentiating the household groups in this model.

In model 3, the three incomes and consumption variables were included. The size of land cultivated per labourer was still strong in distinguishing between labour-migrant and non-labour-migrant households. The cassava yield, became statistical highly significant. The variables that measured the adoption of technologies still had no significant effect. Only per capita annual cash income significantly effected differences between labour-migrant and non-labour-migrant households, out of the three newly captured indicators of income and consumption. Labour-migrant households had higher levels of rural cash income than non-labour-migrant households on per capita basis compared with the effects of other variables. Model 4 captured all the thirteen livelihood variables as the measures of natural resource use and management were included. None of the natural resource use and management variables had significant effects in the model. However, size of land cultivated per labourer, cassava yield per ha and per capita annual cash income – the three major differentiating variables in model 3 remained statistically significant.

Model 5 is the full model as household socio-demographic characteristics were included to the discriminant analysis in the analysis, of all the five socio-demographic variables, only household size did not show significant difference between the two household groups.Labour-migrant households proved to have lived longer in the village and had higher number of labourers than non-labour migrant households. The agile and active members that form the labour force were also seen to be younger and more educated. On the capture of socio-demographic attributes, the size of land cultivated per labourer and cassava yield per ha of land cultivated failed to show statistically significant difference between labour-migrant and non-labour-migrant households. Per capita annual cash income was still statistically significant, and had strong effect on differentiating the household groups like in the previous models. In the full model, household consumer asset index and the proportion of firewood and crop residues in total fuel turned to be statistically significant in the model 5. Labour-migrant households on the average possessed more consumer assets and depended less on natural resources for fuel than non-labour-migrant households.

On conclusion, non-significant variables in model 5 were eliminated to create a reduced model. In final (reduced) model, cassava yield per ha of land, per capita annual cash income consumer asset index, proportion of firewood and crop residue in total fuels, and four of the household demographic attributes (such as number of years of residence, size of labour force, mean age of labour force and mean formal education level of labour force were captured. The size of land cultivated per labour was not significant in the full and reduced models, unlike in the first four models where it was statistically significant. This dynamic suggests that the difference between labour-migrant and non-labour-migrant households in per labourer cultivated farmland is attributable to their differences as touching socio-demographic variables (Qin, 2010). These findings confirm those of Qin (2010) in South West China.

*Table 3 :* Discriminant Analysis of differences between labour-migrant and non-labour migrant households given as F values of variables

| Variables | model 1 | model 2 | model 3 | model 4 | model 5 | final model |
|---|---|---|---|---|---|---|
| Agricultural production Size of land cultivated per labourer (ha) | 6.45** | 7.65** | 6.33** | 5.51** | 0.65 | |
| Total number of types of agricultural production involved | 0.50 | 0.42 | 0.54 | 0.30 | 0.21 | |
| Cassava yield (kg) per ha | 2.75(*) | 2.16 | 5.79** | 6.31** | 1.66 | 6.75** |
| Maize yield (kg) per ha | 0.06 | 0.18 | 0.16 | 0.10 | 0.05 | |
| Use of agricultural technologies Expenditure on farming chemicals (N) | | 1.25 | 0.52 | 0.61 | 0.82 | |
| Total number of traditional agric techs adopted | | 0.05 | 0.08 | 0.22 | 0.35 | |
| Total number of modern agric techs adopted | | 0.00 | 0.04 | 0.09 | 0.12 | |
| **Household income, expenditure, and assets** | | | | | | |
| Per capita annual cash income (N) | | | 6.18* | 5.94* | 6.91** | 4.21** |
| Per capita annual cash living expenses (N) | | | 0.35 | 0.67 | 0.31 | |
| Household consumer index | | | 1.86 | 0.17 | 5.17* | 5.36* |
| **Resource use and management** | | | | | | |
| proportion of firewood and crop residues in fuels | | | | 0.56 | 5.50* | 4.17* |
| Total number of types of forest products used | | | | 0.50 | 0.30 | |
| Total number of resource improvement activities | | | | 0.85 | 0.06 | |
| Socio-demographis characteristics | | | | | | |
| Number of years of residence | | | | | 5.52* | 6.89** |
| Household size | | | | | 0.37 | |
| Average age of household labour force | | | | | 4.25* | 4.14* |
| **Average formal education level household** | | | | | | |
| Numbers | | | | | 9.16** | 10.52** |
| Size of household labour force | | | | | 2.51(*) | 2.98(*) |

***sig. at 10% level, *sig. at 5% level, (*) marginally sig. at level*

c) *Multivariate discriminant analysis for labour-migrant, local off-farm work, and farming households*

Block discriminant were also used to analyze the differences among labour-migrant, local off-farm, and farming households to enhance our comprehension of the effects of rural-urban migration on household livelihoods.

In model 1 (Table 4), only the four agricultural production variables were captured. The size of land cultivated per labourer and cassava yield per ha was

statistically significant but cassava yield was marginally significant. More land was cultivated by farming households than the other two groups in terms of per labourer cultivated land. The labourers in the local off-farm households cultivated almost the same size of land as that of labour-migrant households. The other agricultural production variables were not significant.

Model 2 captured agricultural technology use measures in addition to agricultural production variables. The size of land cultivated per labourer and cassava yield per ha remained significant, but cassava yield was also marginally significant. Expenses on farming chemicals per ha of land also proved to be statistically significant. Farming households spent money most on fertilizers and crop pesticides per hectare of land than labour-migrant and local off-farm households; though was followed by labour-migrant households. Model 3 saw the addition of the three rural income and consumption indicators. Per capita rural income and the household consumer asset index significantly differentiated the groups. On the whole, farming households had lower per capita rural income and fewer consumer assets index than labour-migrant households and local off-farm work households. In model 4 measures of household natural resource use and management variables captured in addition to the variables captured in models 1-3. None of the household natural resource use and management was significant. However, all the five significant variables in Model 3 remained statistically significant. Cassava yield per ha of land cultivated was also marginally significant in model 4. The farming households produced the highest quantity of cassava per unit of cultivated land and was followed by local off-farm work households, while labour- migrant households produced the least quantity.

Model 5 captured household socio-demographic characteristics in the analysis in addition to the ones already captured in the previous models. The number of years of residence, size of household labourers, mean age of household labourers and the average formal educational level of household labourers significantly distinguished the three household groups. Size of land cultivated per labourer, expenses on farming chemicals, and household consumer asset index remained significant but proportion of firewood and crop residues in total fuels and cassava yield was marginally significant. Farming households depended more on firewood and crop residues for fuel than local off-farm work households and labour-migrant households that had near equal or equal levels of dependence on firewood and crop residues as part of total fuels used. Household size did not significantly effect differentiations among the three household groups. Generally, labour-migrant households tended to live slightly longer in the village than farming households. Labour-migrant and farming households lived much longer in the village than local off-farm work households. The labour migrant households had the highest number of labourers, followed by local off farm work and farming households in turn. Older and less educated labourers tended to be found in farming households than in the other two households.

*Table 4 :* Discriminant Analysis of Differences among Labour-Migrant, Local Off-farm work and farming households, given as F values of variables

| Variables | model 1 | model 2 | model 3 | model 4 | model 5 | final model |
|---|---|---|---|---|---|---|
| **Agricultural Production** | | | | | | |
| Size of Cultivated land per labourer | 6.78** | 9.41*** | 10.60*** | 8.98*** | 5.72* | 6.50 |
| Total number of types of agricultural production involved | 0.41 | 0.56 | 0.72 | 0.80 | 0.83 | |
| Cassava yield (kg) per ha of land | 2.42(*) | 2.61(*) | 2.82(*) | 2.16(*) | 1.58 | 2.62* |
| Maize yield (kg) per ha of land | 0.06 | 0.10 | 0.12 | 0.12 | 0.04 | |
| **Use of agricultural technologies** | | | | | | |
| Expenditure on Farming chemicals per ha of land (N) | | 5.26** | 4.18* | 4.05* | 5.82* | 6.91** |
| Total number of traditional agricultural technologies used | | .64 | 0.68 | 0.52 | 0.38 | |
| Total number of modern | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| agricultural technologies used | 0.07 | 0.23 | 0.23 | 0.52 | |
| **Household income, expenditure and assets** | | | | | |
| Per capita annual cash income (N) | | 3.61* | 3.82* | 1.96 | 3.86* |
| Per capita annual cash living expenditure (N) | | 0.66 | 0.66 | 0.29 | |
| Household consumer asset index | | 6.83** | 5.25** | 3.28* | 3.91* |
| **Resource use and management** | | | | | |
| Proportion of firewood and crop residues in total fuels | | | 0.46 | 2.52(*) | 3.43* |
| Total number of types of forest products used | | | 0.12 | 0.12 | |
| Total number of resource improvement activities taken | | | 0.46 | 0.19 | |
| **Socio-demographic characteristics** | | | | | |
| Number of years of residence | | | | 3.76* | 5.29* |
| Size of household | | | | 0.31 | |
| Average of household labour force | | | | 21.26*** | 33.10*** |
| Average formal educational level of household labour force | | | | 5.48** | 5.86** |
| Size of household labour force | | | | 3.77* | 3.90* |

**** sig. at the .001 level, ** sig. at the .01 level; * sig. at the .05 level, (*) m. analysis sig. at the .1 level*

In the final model, households livelihood variables such as size of of land cultivated per labourer, cassava yield per ha of land, expenditure on farming chemicals, per capita annual household cash income, and household consumer asset index; and socio-demographic variables-number of years of residence, average age of household labour force, average formal educational level of household labour force, and size of household labour force were captured. Per capita annual cash income and cassava yield which were not significant in model 5 become significant again in the final model. 10 variables became significant here in the final model compared with the final model for the multivariate comparison of labour-migrant and non-labour-migrant households in Table 3.

## V. Discussion

The population of the world is growing at a geometric rate. According to Izquierdo *et al* (2011), the global population has increased from 3 billion in 1960 to 6 billion in 2000, and is expected to reach 9 billion by 2050. With this rapid period of growth, the population is expected to become stable and largely settled in urban areas (UNFPA, 2007). It is expected that conditions increase in human population and per-capita consumption, and the changes in diet prompted by rural-urban migration, are increasing the global need for food and propelling agricultural expansion. However, Mather and Needle (1998) Izquietdo et al (2011) suggest that the concentration of modern agriculture on productive soils has favoured the population shift from rural areas to urban centres. Understanding the effects of rural population on land-use change is essential for predicting the future extent and configuration of natural ecosystems and their ecosystems services.

The study examines the effect of rural migration on the rural environment and rural household livelihood is used as a mediating factor. The results revealed that at least one variable measuring each livelihood construct but use of agricultural technologies, was statistically significant, however some of them were marginally significant in distinguishing rural labour-migrant households and non-labour-migrant households. All the livelihood constructs had at least one assessment with significant effect in the discriminant analysis of differences among the labour-migrant, local off-farm work, and farming households. These findings reject the null hypothesis that there is no significant difference between labour-migrant and non-migrant households with respect to agricultural production, agricultural technology use, income and consumption, and resource use and management. The findings are congruent with those of Qin (2010) in his study in China.

The results also indicate that rural non-labour-migrant households are heterogeneous. More significant differences among labour-migrant, local off-farm work and farming households were discovered than in the

comparison between labour-migrant and non-labour-migrant households in the bivariate and multivariate analyses of the household groups. Generally, there were differences between labour-migrant and non-labour-migrant households. Qin (2010) suggests that these differences were mainly due to the differences between labour-migrant and farming households, while labour-migrant households shared many similar livelihood characteristics with local off-farmwork households.

The livelihood differences between rural labour-migrant and non-labour-migrant households have important implications for the environmental consequences of labour emigration in rural areas of origin (Push areas) Qin, 2010). Bilsborrow (1992) state that in developing countries, rural poverty is often closely related to environmental degradation, because the economically disadvantaged primarily live in rural areas and directly depend on local natural resources. However, Izquierdo et al (2011) found that between 1970 and 2001 there was a strong positive relationship between the annual change in rural population and the deforestation rate in Misiones, but rural emigration reduced deforestation by 24% in comparison with "no-migration" scenario. If rural population continues to grow and poverty persists, over exploitation of the forests will occur and the consequence will be deterioration of natural resources. When this happens, food security and rural livelihoods will be adversely affected. There were very great differences between rural labour-migrant households and non-labour-migrant households in terms of income and consumption. Generally, labour-migrant households had higher rural cash income and consumer assets than non-labour-migrant households. This confirms the findings of Qin (2010) in China. This implies that labour migration tends to contribute to improved capital assets and enhanced material well-being for labour-migrant households, while reducing poverty in rural push areas, and consequently reduces the pressure mounted on local natural resources.

With respect to cash living expenditures, significant difference was not found between rural labour-migrant and non-labour-migant households. This is attributed to the fact that the remaining members of the rural labour-migrant households consume less because of rural community development engagements. Qin (2010) opine that this is probably due to the fact that remaining members of rural migrant households are mostly elders and children, who generally have relatively lower levels of consumption. Zhao (1999) gave his own explanation that rural migrant households consider income from labour temporary and therefore do not increase consumption proportionately. Qin (2010), however suggests that rural labour emigration has mixed impacts on rural consumption. He observes that on one hand, even if labour migrants do not remit enhanced income, their absence reduces overall rural household consumption needs. He further explained that labour migration tends to check the increase in numbers of rural households because labour-migrant households are more lively than non-labour households to maintain a multi-generational family structure, and thus may contribute to higher efficiency of rural household resource consumption. Reduced absolute consumption needs and increased efficiency in consumption may consequently reduce pressure of the rural population on the rural local environments. On the other hand, Qin (2010) suggests that rural labour migration enhances the consumption level of rural-migrant households. Remittances from rural labour-migrant help to enhance the standard of living of their rural families. Rural labour-migrant households had significantly higher per capita annual cash expenditure than farming households in the bivariate comparisons that captured the two non-labour migrant household subgroups. The labour-migrant households had significantly more consumer assets than the non-labour-migrant households, especially the farming households in the bivariate and multivariate discriminant analysis. In Nigeria, and in Delta State in particular, there is no efficient waste management facilities in most of the rural areas, this implies that this increase in household consumption will worsen the very serious residential pollution challenges in the rural areas. This is the same situation in China where Qin (2010) observes that, given the lack of efficient waste disposal in most rural areas, increased household consumption may worsen already serious residential pollution problems in rural villages.

The results imply that labour-migrant households cultivated smaller land size per labourer, had lower cassava yield and spent lesser on pesticides, herbicides and fertilizers on per ha of land cultivated than farming households subgroup of the non-labour-migrant households. The key informants gave a similar comment to what was given in Qin's study that labour migration was a substitute for subsistence agricultural production, and farmers were mostly found among the older generations and that these farmers were mainly women who were not as energetic as their male contemporaries. Labour shortages emanating from the absence of major household labourers, combined with the unprofitable nature of agriculture, can result to progressive abandonment of previously cultivated distant farmland (Qin, 2010). Observations in abandoned farmlands showed to the researchers by key informants, confirmed the natural vegetative re-growth on the abandoned farms in Utagba-Uno, Ugborhe and Agbadabri.

As labour migration prompted labour shortage and land abandonment, land quality and soil erosion is affected. This is mostly so in the swampy areas. It was also found that land abandonment that was induced by migration reduced environmental degradation and more

vegetative re-growth in Bolivia and Central Mexico and Misiones, Argentina Swiss maintain (Preston et al, 1997; Aid and Grau, 2004; Lopez *et al*, 2006; Gellrich *et al*, 2007; Izquierdo *et al*, 2011). However, Qin (2010) observes that the impacts of labour-migrant households withdrawal from farming on rural land quality and soil erosion appears to largely depend on local ecological and socio-economic characteristics.

The results indicate that the there were no significant differences between rural-migrant households and non-labour-migrant households with respect to the uses of traditional and modern agricultural technologies. But the discriminant analysis showed that farming households spent more on agro-chemicals than labour-migrant households. The reduced agro-chemical usage by the labour-migrant households is expected to mitigate pollution induced by agricultural production activities to some levels. Most farmers in Nigeria make excessive use of fertilizers and other agro-chemicals which cause heavy non-point pollution in the rural areas, thus reduced use of these chemicals may reduce such pollution.

The biovariate and multivariate analyses indicate that labour-migrant households depended less on forest resources for fuel than non-migrant-labour households. The implication is that labour migration results to reduced dependence on forest resources for fuel. This is expected to enhance land and forest conservation, since fuel wood collection is a major cause of deforestation which leads to soil erosion in rural areas of developing countries (Qin, 2010), especially Nigeria, where there is uncontrolled exploitation of the forests. These findings congruent are with Mather (1992) in the forest transition theory, which states that there is a long-term sequence from initial deforestation due to human settlement to eventual recovery. There are two major pathways of forest recovery at the end of agricultural expansion identified by Rudel *et al* (2005), - (i) economic development, and (ii) forest scarcity. He explained that in the first case, urbanization and economic development prompt farmers to emigrate from rural settlements to urban areas for better paying non-agricultural jobs. The loss of labour raises wages of farm workers in rural origin areas. This makes agricultural production unprofitable. Smallholder farmlands are therefore abandoned and these eventually re-grow into forests. In the second case, rapid progressive deforestation increases forest product prices. This leads to a situation where people participate in reforestation or people seek alternatives to forest products which eventually leads to reforestation. The federal and state governments are the major actors in this type of forest recovery as they purportedly create forestation programmes in response to deforestation consequences. However, in Nigeria and in Delta State in particular, corruption and lack of political will is inhibiting these programmes. Tree planting days are observed but no meaningful numbers of trees is planted. However, this study unveils a relationship between rural labour emigration and natural forest re-growth in the study area. The findings in this study confirm the findings of Qin Chongqing municipality in South West China.

## VI. Conclusion

This study was conducted to examine the effect of rural-urban labour migration on rural household livelihoods and rural environment in Delta State, Nigeria. The rural household livelihoods concept was used as integrated factor mediating in the conceptual framework of rural-urban migration and the rural environment. Data on the rural household collected from the survey and key informant interviews. The findings is at variance with the null hypothesis of this research which states that there is no significant difference between labour-migrant and non-migrant households with respect to agricultural production, agricultural technology use, income and consumption and resource use and management. The results indicate that labour-migrant households farm less intensively, have more rural cash income, possess more consumer assets, and depend lesser on biophysical resources for fuel than non-labour migrant households. Rural non-labour-migrant households are a heterogeneous group. While labour-migrant households are different from farming households, they share similar characteristics with local off-farm work households.

## VII. Implications

The findings in this study have proved that rural-urban labour migration has effect on the local rural environment. It has enhanced our comprehension of the environmental effects of rural-urban migration. The environmental consequences of labour emigration in rural push areas are dependent on the resulting changes in rural household livelihoods. The rural household livelihood variables that serve as the mediators between rural-urban migration and the rural origin environment unveil the potential areas to be considered in policy making. Rural-urban migration may result to either gains or losses to the conservation of local natural resources. Therefore, future rural environmental management policies of the federal and state governments should have the objectives of providing favourable conditions that will make it easy to achieve positive environmental consequences of rural-urban migration and which will at the same time reduce drastically, the negative consequences.

The broader social and economic contexts at the federal and state levels have influence on the relationship among rural-urban migration processes, household livelihood, and changes in rural environment. In the household system in Delta State farmers have free-hold to land either by purchase or inheritance. Inherited land is held sacred and it is almost regarded

as a taboo to sell such land. Thus, a migrant household cannot sell its farmland under any circumstance. Labour migrant households keep the land for future use by any member of the household who may become interested in farming, especially when the urban economic situation is on longer favourable. Labour-migrant households abandon their farmland abandon their farmland or under-cultivate it because of household labour shortages. The relationship between agricultural land use and the rural environment in Delta State and other coastal states in various countries of developing countries is not complicated as in the hilly mountain areas. Rural-urban labour migration and under-cultivation, and farmland abandonment facilitate forest re-growth and ecological recovery. In order to make ecological recovery faster, agro-siviculture should be implemented to further benefit from the ecological effects of rural-urban labor migration and concomitant household agricultural adjustments. Formulation and proper implementation of policies that encourage ecosystem recovery on abandoned land, such as tree and tree crops planting can promote sustainable land use and reduce soil and water erosion.

This study shows that local off farm work households share similarities with labour-migrant households with respect to livelihood activities. Since off-farm local work and therefore, employment do not majorly impact on the rural environment and result in long term absence of household labour, policies that will enhance a combination of resource-based and non-resource-based activities should be encouraged among rural households. This calls for the creation of more non-agricultural employment opportunities close to rural communities without environmental degradation. This will promote sustainable agricultural production and natural resource use.

The ministries of environment and agriculture seldom study environmental impacts of human activities. However, this study indicates that rural emigration results to reduced dependence on agriculture and natural resources for sustenance of livelihood, and that the emerging trend in the study area is toward vegetation regeneration. There is also the need to study changes in land quality, forest cover over a period and soil erosion in the rural areas where there is high level of labour emigration.

## VIII. Acknowledgements

This study was inspired by Qin (2010) and his article in Human Ecology 38,675-690 formed the guide for this study. The cooperation of the rural community leaders, key informants and the respondents is also highly appreciated.

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