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Research Article

Determinants of Income Diversification among Famers in the Kano River Irrigation Project (KRIP), Nigeria

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Abstract

Income diversification is examined in two ways: as a change in agricultural activity, or as an increase in the number of income sources. The primary source of income for rural Nigerian is agriculture. This study is conducted to access the level of income diversification among beneficiaries and non-beneficiaries of Kano River irrigation Project. The result indicated that crop production account for 65% of the beneficiaries' household income, with other agricultural activities accounting for 18% of the total. While non- agricultural activities account for only 18%. For the non-beneficiaries the result indicated that crop production accounts for 44% of their income other agricultural activities (Fishing, livestock, poultry,) account for 13%, while Non-agricultural activities account for 43 percent of their income. Income diversification is found to be influenced by (age, household size, cultivated area, educational attainment, credit constraints, and annual income. The results show that these elements need to be examined by decision makers in the development of agricultural and non-agricultural projects in this study area.

Keywords: Income diversification, Credit constraints; Rural Nigeria, Beneficiaries.

Introduction

It is possible to define income diversification in a variety of ways. In one definition of income diversification, it refers to an increase in the number of sources of revenue or a more even distribution of income. With two sources of income, a household is more diverse than one with just one source of revenue that accounts for 90% of the total (Daud, Awotide, Omotayo, Omotosho, & Adeniyi, 2018; Olale & Henson, 2013). Off-farm wages and non-farm self-employment are both included in non-farm income. Escobal (2001) stated that although it is not always the case, expanding into non-farm activities is usually associated with a broader range of sources of revenue. In other words, if a family's non-farm income rises from 30% to 75%, this is an increase in non-farm activities, but it is not an increase in the total number and balance of revenue sources (Oluwatayo, 2009).

Livelihood diversification is consequently a term that refers to individuals and households' efforts to find new ways to boost their incomes and minimize environmental risk, which range greatly in their ability to reverse the outcome and the degree of freedom of choice. There are several ways to increase household income besides the primary agricultural activities, such as diversifying into other agricultural and non-agricultural products and

services, selling waged labor, or working for oneself in a small business, and using various risk-spreading measures (C. B. Barrett, Reardon, & Webb, 2001).

Diversification of assets, income, and activities is encouraged for a variety of reasons. Risk reduction, response to diminishing factor returns in any given use, such as family labor supply in the presence of land constraints driven by population pressure and fragmented landholdings, reaction to crisis or liquidity constraints, high transaction costs that induce households to self-provision in several goods and services constitute the first set of motivations. It's important to note that the second set of motivations is referred to as "pull factors," and they include the fulfillment of strategic complementarities between operations, such as crop-livestock integration or milling and hog production (Demissie & Legesse, 2013). C. B. Barrett *et al*. (2001) claim that in the aggregate, these micro-level factors of diversification are mirrored.

Limited risk-bearing capacity in the face of weak financial systems creates substantial incentives for diversifying industries in order to stabilize revenue flows and consumption. Labor and land market restrictions as well as climate uncertainties are also strong motivators for diversification. Nigeria is plagued with severe poverty and food insecurity (Adebayo & Ojo, 2012). The large rain-fed small-scale agricultural sector has not matched with the speedy population increase of the country.

The Kano River Project is a large-scale, high-capital irrigation project located in Kano State, Nigeria. The Hadejia-Juma'are River Basin Development Authority is of charge of overseeing this project, the project was launched in 1971(Wallace, 1981). The KRIP obtained water from three major dams in the state namely, Tiga, Challawa, and Bagauda. These dams provide a means of sustenance to the people in the area and provide water to the city of Kano and reduce flooding of arable land downstream. Although many studies were conducted to access the profitability and livelihood of farmers in the KRIP, no study has been done to access the income diversification of irrigated farmers in the scheme, this study is therefore conducted to access to extent of income diversification among the beneficiaries of the project. The study is therefore intended to answer the following questions;

- What is the socio- economic characteristics of the farmers in the study area?
- What is the extent of income diversification of the farmers in the study area?
- What are the determinants of income diversification among the KRIP farmers?

Methodology

Study Area

The Kano River Irrigation Project (KRIP) is located between latitude 11045` and 12005` North of the equator and longitude 08045` and 09005` East of the Greenwich mean. It is situated in a vast area of over 25km south of Kano city and is one of the functional irrigation schemes in the country. It is designed to provide irrigation facilities to about 22,000 hectares of land utilizing water release from the Tiga dam (through the Ruwan Kanya reservoir). The scheme operates in three local government areas: Kura, Garum Mallam, and Bunkure. The study was conducted in all three Local Government Areas (LGAs).

Sampling Method

The study's respondents included both irrigation project beneficiaries and non-beneficiaries who lived in the same catchment in the study area. The Federal Government of Nigeria owns KRIP under the control of HJRBDA. Private irrigation schemes (where farmers use tube wells) in the non-sector regions were used as a control for the study. Multi-Stage Sampling Procedure (MSP) was employed in the data assembly, comprising of 221 project beneficiaries and 165 non-beneficiaries, thus 386 formed the sample size. However, out these numbers 360 questionnaires were retrieved and used for the analysis.

Analytical tool

This study used descriptive statistics to capture objective one and two of the analysis. However linear regression model was used to achieve objective 3. Multiple regression analysis has been employed in several agricultural, economic and extension studies that call for the analysis and prediction of an independent variables against dependent variable (Gujarati & Porter, 2009). In this study the index of income diversification of each household was used as dependent variable.

$Y= \beta\_0+\beta\_1 X\_1+\beta\_2 X\_2 \ldots\ldots\ldots \beta\_k X\_k+u \ldots$ (1)

$Y = \beta0 + \beta1X1 + \beta2X2 + \ldots + \beta kXk + U \ldots\ldots\ldots$ (2)

Where

Y = income diversification index

β0 = Constant

β1, β2,…βk = the regression coefficients which interpret the effect of X on Y

X1, X2…Xk = independent variables

K = number of independent variables

U = Stochastic error

Result and Discussions

Socio-Economic characteristics of Beneficiaries and Non- beneficiaries

Socio-economic variables include; gender of the head of the household, marital status, extension contact, access to credit, cooperative membership, and training received on water management. Gender role in farming depends on the cultural contexts of the community in question. Table 1 indicated that 98.08 of the beneficiary's household heads were male, while 89.40 of the non-beneficiaries were male. This result showed that males are dominant among the farming community in the study area. This was similar to the finding of (Ongoro & Ogara, 2012) in their survey on vulnerability and food security in some selected states of Northern Nigeria. The dominance of males directly reflects the culture, religion, and other traditional settings that limit female participation in many occupations. This restriction also denies them from acquiring land and, to some extent, leadership. The role of gender in production and food security has mixed results. Hamad and Khashroum (2016) opined that a female-headed household utilizes resources more efficiently by using a significant portion of her income to provide good nutritious food for her family than a male-headed household. On the contrary, (Matemilola, 2017) outlined that poverty, low productivity, and high food insecurity are more pronounced in a female-headed household.

The result in the table also showed that 95.22 percent and 92.72 percent of the beneficiaries and non-beneficiaries were married, respectively. This result implies that a fair number of the respondents were responsible for households and farm decision-making. (Amaza, Abdoulaye, Kwaghe, & Tegbaru, 2009) identified that food security and marital status has both positive and negative association. Marriage can increase the economic wellbeing of the family members only if the couple or either of the couple is engaged actively in dependable livelihood activities. However, (Aidoo, Mensah, & Tuffour, 2013) believed that married household head tends to be poorer than their counterpart. In addition, the mean number of wives was 2.03 and 1.55 for beneficiaries and on-beneficiaries, respectively; this is not perplexing since in Northern Nigeria, more importantly, in the North-Western part, polygyny is widespread. The implication of polygamy or polygyny on food security is evaluated by (Mensah, Aidoo, & Teye, 2013) who reported that child nutrition is better in monogamous family settings than polygamy.

Conversely, training and access to extension services are almost the same things. The findings (Table 1) also validated that 77 percent of the project beneficiaries contacted extension agents at least two times in a cropping season. While for the non-project beneficiaries, only 19.87

percent had contact with the extension agent. Agricultural extension exemplifies an instrument through which information related to new skills, improved farming practices, and management could be transferred to farmers. (Love & Zicchino, 2006) examined farmers' contact with extension services on agricultural productivity. The finding showed that access to agricultural extension services could raise crop productivity due to training and better farming practices. However, (Baloch & Thapa, 2019; Haruna & Abdullahi, 2013) outlined that contact with extension agents, although necessary, is not a sufficient condition for increasing crop productivity. For the extension service to be beneficial, it must be effective, the officials must be trained, field demonstration must be in place, and it must be based on the felt need of the target community intended to serve.

Membership of cooperatives is a vital variable in the improvement of the welfare of rural farmers. The results (Table 1) further indicated that 96 percent of the beneficiaries and 67 percent of the non-beneficiaries had a membership to the social organization registered under the scheme (Water Users 'Association and Fadama Users'Association). Farmers groups are essential, especially in loan collection, collective purchase of inputs and output marketing, learning and adoption of agricultural innovation, and social interaction among members.

Access to credit was also vital to rural development. It stimulates income through productive investment. It also decreases the vulnerability of the poor by helping them to smooth their income pattern over time. The absence of rural access to credit hinders rural economic growth and raises poverty, food insecurity, and inequality. In developing countries, access to credit had been reported as a significant impediment hindering agricultural expansion in rural settings. The study's finding showed that 51.67 percent of the beneficiaries had access to credit while only 31.7 percent of the non- beneficiaries had access to credit. This wide variation is probably due to active associations in the project area (Water Users 'Association) since most formal lending agencies give loans through functional cooperatives. Influential water user associations are also essential in the quest for responses to economic and physical water scarcity and mismanagement. It also stimulates innovation and a fair distribution of cost, revenues, and threats.

Table 1. Socio-economic Characteristics of Beneficiaries and Non-beneficiaries.

	Beneficiaries		Non-beneficiaries	
Variables	Frequency	Percentage	Frequency	Percentage
Gender				
Male	205	98.08	135	89.40
Female	04	1.92	16	10.60
Marital Status				
Single	10	4.78	11	7.28
Married	199	95.22	140	92.72
Extension Contact				
Contact	161	77.03	30	19.87
No Contact	48	22.97	121	80.13
Access to credit				
Yes	108	51.67	48	31.79
No	101	48.33	103	68.61
Cooperative				
Member	202	96.65	102	67.55
Non Member	7	3.35	49	32.45
Training on water use				
Yes	42	21.1	27	17.88
No	167	79.9	124	82.12

Source: Author's computation

To maintain water management and conservation, comprehensive efforts at the river basin and local levels should be made to foster water cooperation. Water distribution decisions downstream and upstream, implications of waterborne diseases and water abstraction, infrastructural construction, overexploitation, and water management financing are all concerns that can be improved by functional association.

Main income sources of the beneficiaries and non-beneficiaries

Wan *et al*. (2016) opined that income diversification is not only an excellent way to manage catastrophe risk and improve social welfare, but it could also open up new avenues for research into the vulnerability, resilience, and adaptability of rural social ecosystems. The main income source of the respondents in the study area was revenue from rice farming, with an annual average income of USD 1447.37 and USD 621.05, for the beneficiaries and non-beneficiaries, respectively. The second source of income comes from trading with an annual average income of USD 123.69 for the beneficiaries and USD 450.00 for the non-beneficiaries. Livestock farming was the third income source for the beneficiaries with an average annual income of USD202.63, then a salary job with an annual average of 123.69, this closely followed by poultry farming with an annual average of USD 97.37, second to the last was other occupations (artisan, carpentry and paid labor) with an annual average income of USD 28.95, the most minor source of income was fishing with an average income of USD 13.16 only. In the case of non-beneficiaries, the third income source was salary job with an annual average income of about USD 97.37 followed by fishing, poultry farming, livestock farming, and other occupation (carpentry, paid labor, bricklaying). Table 4.3 shows the occupational distribution of respondents.

Table 2. Beneficiaries and Non-beneficiaries Annual Income from Different Occupations (USD).

	Beneficiaries		Non-Beneficiaries	
Income source	Average annual income (USD) Beneficiaries	% Mean share of income	Average annual income (USD) Non-beneficiaries	% Mean share of income
Rice farming	1447.37	65.32	621.05	44.69
Salary	123.69	5.58	97.37	7.00
Livestock	202.63	9.14	44.74	3.21
Poultry	97.37	4.40	52.63	3.78
Fishing	13.16	0.59	81.58	5.87
Trading	294.74	13.3	450.00	32.38
Other	28.95	1.3	36.84	2.65
Total	2215.79		1389.48	

Source: Authors computation

1USD= 380 naira

Determinants of Income Diversification

The result of regression model showed that there is disparity in the effect of explanatory variables on participation decision of households in income diversification. The analysis shows the R2 Adjusted value of 0.92% indicated that the variables included in the model explain 92% of the variation in the dependent variable. The F- statistics of 319.27 indicates

that the overall model in fit at 1% level of significance.

The major determinants of income diversification identified in this study include; age and education of household members; cultivable land, credit limits, as well as annual earnings (see Table 3). At the 5% significance level, the size of the household has a significant and favorable impact on income diversification, which is in line with predictions. There are more people to feed, which necessitates a greater effort to obtain food from other sources. Household head age has a negative correlation with diversification of income at the 5% level of significance, showing that the likelihood of non/off-farm revenue decreases as the household head ages. According to the findings, younger household heads can earn more money through non/off-farm self-employment than their older counterparts. Increasingly, the elderly heads of households are focusing their time and energy on farm operations rather than exploring for non-farm occupations that can help diversify their income.

Diversification is negatively and strongly affected by the household head's educational level, with a 5% significance level. People with a high level of education, particularly in the northern portion of the country where this study is taking place, may be reluctant to engage in some small-scale businesses because of this. At a 1% probability level, the size of the family's farmland had a large and beneficial impact. Perhaps the capacity to generate more and amass initial capital for participation in non-farm self-employment of farmers cultivating huge areas of plots explains this conclusion.

However, a credit constraint has a negative and significant impact on income diversification. This is because farmers who has no access to credit may face constraints to their production and hence their income. This makes them unable to have surplus to invest in other non-farm businesses. Similarly, the result indicated that farmers' annual income has a significant and positive influence on income diversification at 5% significance level in agreement with a priori expectations. This means that those farmers that got more return in their farming businesses has more probability of engaging in other sources of income. This is in line with (J. C. Barrett, Fry, Maller, & Daly, 2005) and (C. B. Barrett *et al*., 2001) who reported that in assessing diversification strategies of households' differences in initial asset endowments, rich and poor households diversify differently.

Table 3. Determinants of Income Diversification.

Variables	B	Std. Error	t- statistics
Age	-117.976	58.064	2.032*
Sex	-11.661	7.774	-1.500
Family size	105.146	53.276	1.97*
Education	-25.142	10.302	2.44**
Cultivated area	298.031	8.391	35.518***
Farming Experience	-1.503	5.292	-.284
Extension contacts	2.889	5.415	.533
Credit constraints	-267.025	87.167	-3.063***
Annual income	205.23	86.32	2.38**
F-statistics	319.275***	-	-
R^2 Adjusted	.925	-	-

Source: Authors computation

Conclusion and Policy Recommendations

In this paper we have examined the income portfolios of farm households in the Kano River Irrigation Project, focusing on five main activities: food-crop production; livestock production, poultry production, trading and fishing. The results show that households hold very different portfolios of incomes and these in turn are related to the different levels of income. Poorer households are found to have fewer opportunities in diversifying their income. The result also indicated that the level of diversification is moderately low although better for beneficiaries as against the non-beneficiaries of the project. The result also show that Income diversification is found to be influenced by; age, household size, cultivated area, educational attainment, credit constraints, and annual income. The results provided here provide evidence for public attention to income diversification among farming households that are the most vulnerable in rural Sub-Saharan Africa. In particular, adopting policies that enable poorer households to obtain access to non-crop options may help address the imbalance of opportunities that exists presently in Nigeria. This can be helped by assisting non-crop firms through project assistance to enable access to the capital needed for growth at the household level.

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