Agricultural Journal 6 (5): 274-284, 2011
ISSN: 1816-9155

Household Endowments and Poverty Reduction in Rural Nigeria: Evidence from Rice Farming Households

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Abstract: This study empirically investigated the role of household endowments in determining poverty among the rice farming households in Nigeria. A total of 600 rice farmers selected through multistage random sampling techniques were interviewed with the aid of well structured questionnaires. The data collected were analysed using descriptive statistics, FGT and logit model. Household endowments were classified into human assets, physical assets and financial assets. The results of the logistic regression revealed education of the household heads, access to mobile phone, amount of credit obtained, farm size, irrigation facility, possession of livestock, television set, radio set and number of rooms in a house have a poverty decreasing effect. Although, only number of rooms in the house is statistically significant. This implies that as these variables increase the probability of being poor will decrease. The result of the marginal effects also revealed that an additional increase in the number of rooms will reduce the probability of being poor by 3%. Other variables such as toilet facility and household size were also significant and positively related to the probability of being poor. Strategies, policies and programs that will lead to increase in the household endowments should be put in place. The introduction of good toilet facilities and sanitation should be embarked upon and education on the need for family planning should be increased if poverty is to be reduced or eliminated in the study area.

Key words: Poverty, household endowments, farmers, poor, policies, Nigeria

INTRODUCTION

World Bank (2005) defined poverty as the inability to attain a minimal standard of living, measured in terms of basic consumption needs or some income required for satisfying them. It is regarded as an evil that has plaque many nations of the world, killing, maiming and preventing economic growth and development. Consequently, the reduction of poverty globally has been a major agenda since September, 2000 when the United Nations' member countries signed the Millennium declaration and set their commitments to achieve the Millennium Development Goals (MDGs). The 1st of the eight MDGs is to eradicate extreme poverty and hunger with a target to halve the number of people living on less than one dollar a day. Consequently, the poverty reduction strategic paper was developed by most country to facilitate poverty reduction. However, as revealed by the new poverty estimate published by World Bank poverty in developing countries has declined from the 52% of the global population in 1981-25% in 2005. Yet at this rate, about 1 billion people out of the 6 billion people in the world will still live on <$1.25 a day in 2015 and about three quarters of them live in rural areas. Poverty is mostly deep and pervasive in some of the rural areas of most of the developing countries including Nigeria. The rural areas of most developing countries are characterised with a state of human deprivation with regard to incomes, clothing, housing, health care, education, sanitary facilities and human rights. As reported by Khan (2001), rural poverty accounts for nearly 63% of global poverty and between 65 and 90% in sub-Saharan Africa. The rural poor make up >75% of the poor in many sub-Saharan African and Asian countries (Pinstrup-Anderson and Pandya-Lorch, 2001). In Nigerian, nearly 75% of the country's populations live in rural areas where poverty has been on the increase. Of the total rural population, 65% are directly or indirectly linked with agricultural sector. The incidence of poverty which was 63.3% in rural areas was 42.3% in urban areas and households with heads engaged in agriculture in Nigeria had the highest level of poverty (67%) in 2004. Consequently, poverty in Nigeria is regarded as a rural phenomenon. The Human Development Index (HDI) of UNDP (2005) placed Nigeria

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142nd among 174 countries in 1997 and she dropped to 146th position in 1998 putting her among the forty poorest countries.

The production of food is basically done in the rural areas of Nigeria and the importance of staple food production to the economy of Nigeria cannot be overemphasized. Apart from feeding the teeming population and generating employment for majority of the people in the rural areas, it supplies raw materials for industrial growth and development. Rice is however, one of the most important staple food crops in Nigeria and it is a crop in which the nation relies upon for the food security of the teeming population. Hence, the poverty situation among rice farmers is of high importance to the economy of Nigeria. Since, a reduction in their poverty level could translate into a higher output of rice through the availability of incentives for rice production.

There exists an array of empirical literature on the issue of poverty determinants and different studies focus on different aspects of the issue. The major reason for this is the multidisciplinary nature of poverty as economic, social and political environments all contribute to the creation of conditions which determine the state of poverty. Several important factors have been highlighted in the literature as major determinants of poverty and notable among them are household endowments. According to Ellis (1998), endowments help the household to diversify their source of income and thus reduce the risk of overall income failure by diluting the failure in any single income.

This is because as stated by Grootaert *et al.* (1997), household endowments helps the household to have access to income from different sources of income hence, it helps to reduce intra year income variability which is common among rural households in sub-Saharan African countries. These assets serve as sources of opportunities (or constraints) to getting out of poverty by different households. The endowments determine what they do how they do it and their capability to adapt to changes beyond their control. The availability of household endowments can thus suppress opportunities for some members of a community while enhancing others. As a result, a key factor in ensuring a good and sustainable quality of life may lie on a more equitable distribution of physical assets combined with the human assets of a household. An important issue here is that these help to expand opportunities to be more productive or to obtain credit facilities or even to serve as safety nets. Incidentally, the contribution of household endowments to poverty status of households has received insufficient attention despite the fact that they are invaluable to poverty outcomes. This definitely represent substantial gap in the qualitative understanding of household poverty status (Grootaert, 1997). In Nigeria, several researches have been carried out on poverty (Okogie *et al*., 1999; Aigbokhan, 1998; World Bank, 1996; Canagarajah *et al*., 1996; Ogwumike and Ekpenyong, 1995). However, very few studies have examined the effects of household endowments on poverty in Nigeria in general and among the rural farmers in particular, despite the arguments of Grootaert (1997) and Ellis (1998) that household asset endowments such as physical and human capital assets play a key role in determining poverty. Stifel and Sahn (1999) have also shown that in the absence of money-metric information in certain surveys, it is possible to construct an asset index that can be used in measuring poverty.

Olaniyan (2002) examined the role of specific household endowments in determining poverty in Nigeria using 1985, 1992 and 1996 National Consumer Survey (NCS) data. However, the conclusion from this study cannot be applied to specific sector of the economy. Since, different sectors have their own peculiarity, it is valuable to carry out a study that will look at this issue using household data set and on a particular subsector like agriculture. Considering the importance of rice in the diet of Nigerians and its potential to eliminate food insecurity, it is essential to examine the role of household endowments on poverty reduction of the farming households with a view to shedding more light on those household endowments that can lead to a reduction in the farmers poverty status. Hence, this study was carried out to examine essentially, the role of household endowment on poverty of rice farmers in Nigeria.

Determination of the poverty line: Basically, the analysis of poverty determinants relies on the construction of a poverty line. A poverty line is often defined as a predetermined or well-defined standard of income or value of consumption which is deemed to represent the minimum required for a productive and active life or even survival (Okumadewa, 1999). Two fundamental approaches have been widely adopted in the literature to determine the poverty line and they include the absolute approach and the relative or subjective approach. Under the absolute approach, a household is said to be poor if its income or consumption level is insufficient to acquire a given level of goods and services regarded for essential minimum standard of living. The poverty line from this approach usually has a fixed value. The popular methods in estimating these poverty lines include the food energy intake and the cost of basic needs methods. The relative or subjective approach defines the poor relative to others in the same society or economy. A relative poverty line

varies as the average of total population consumption varies for example when the poverty level is fixed at 2/3 of the mean. The relative poverty line is both subjective and arbitrary. It is as a result of this that studies often standardise it against some cost of basic needs in the economy (e.g., cost of recommended dietary intake or some internationally acceptable measures like US \$1 day^{-1}).

For this study, the relative poverty line was adopted and the poverty line was generated based on household expenditure. The poverty line used is thus set equivalent to the two thirds of the mean per capita expenditure. This produces a poverty line of ₦6343. This poverty line was used to classify the households into poor and non-poor. Those households whose consumption expenditure falls below the poverty line were classified as poor and those whose consumption expenditure is above the poverty line were classified as non-poor. This demarcation allows the use of logit model to examine the role of household's endowments on poverty with the poverty status as the dependent variables.

MATERIALS AND METHODS

Measurement of poverty: This study utilized the per capita expenditure as a measure of poverty. This is preferred to income because literature has shown that income as a measure of welfare especially in Sub-Saharan Africa (SSA) is prone to many flaws. First, income varies from year to year and from season to season depending on farm production and prices (two variables that are also not stable). The approach using per capita expenditure has been used in many studies on poverty in Nigeria (World Bank, 1996; FOS, 1999). The poverty line was set equivalent to the two thirds of the mean per capita expenditure. The standard FGT was used to measure the poverty level of the farmers. FGT takes the form:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{n} q\left[\frac{Z - Y_{pi}}{Z}\right]\alpha \quad (1)$$

Where:

Z = The poverty line
q = Number of individual below the poverty line
n = Number of individuals in the reference population
Y_{pi} = Per adult equivalent expenditure of the ith household
α = FGT index which takes values 0-2
$Z\text{-}Y_i$ = Poverty gap of the ith household
$Z\text{-}Y_i/Z$ = Poverty gap ratio

The FGT 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 $\alpha = 0$ in Eq. 1:

$$P_0 = 1/n\,(q) = q/n = H \quad (2)$$

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 $\alpha = 1$, the poverty measure becomes the Poverty-Gap index (PG):

$$P_{\alpha-1} = PG = \frac{1}{n}\sum_{i=1}^{n} q_i\left[\frac{Z - Y_{pi}}{Z}\right] = HI \quad (3)$$

Where:

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

This is expenditure gap ratio. I is the mean of the poverty gaps expressed as a portion of the poverty line. When $\alpha = 2$, the Squared Poverty Gap index (SPG) is expressed below:

$$P_{\alpha-2} = SPG = \frac{1}{n}\sum_{i=1}^{n} q_i\left[\frac{Z - Y_{pi}}{Z}\right]^2 \quad (5)$$

where, $P_{\alpha-2}$ measure is increasingly used as a standard poverty measure by World Bank (2005), the 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 per capita expenditure of the poor falls below the poverty line. Another advantage of the P_α measure is that it is decomposable by population subgroups. That is:

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

Where:

j = 1, 2, 3, ……, m
K_j = The population share of each group
$P_{\alpha j}$ = The poverty measure of 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, age, farm size and household size. In this study, relative poverty line was constructed. Per capita expenditure was used as proxy for the standard of living. The poverty line was defined as 2/3 of the mean per capita expenditure.

The logistic regression equation: To examine the effects of household endowments on poverty, this study employed the logistic regression technique. Logistic regression analyse extends the techniques of multiple regression analysis to research situations in which the outcome variable is categorical. The model for logistic regression analysis assumes that the outcome variable, Y is categorical (e.g., dichotomous) and models the probabilities associated with the values of Y. The dependent variable (Y) is dichotomous and takes the value 1 for the poor individual and 0 for the non-poor individual. In theory, the population proportion of cases for which Y = 1 is defined as p = P (Y = 1). Then, the theoretical proportion of cases for which Y = 0 is 1-p = P (Y = 0). The task here is to estimate p for the sample proportion of cases for which Y = 1. This was done by carrying out a log transformation to normalize the distribution. This log transformation of the p values to a log distribution enables to create a link with the normal regression equation. The log distribution (or logistic transformation of p) is expressed by the equation (Dayton, 1992; Njong, 2010):

$$\text{Log}_e\left[\frac{P\left(Y = 1/X_1, ..., X_n\right)}{1 - P\left(Y = 1/X_1, ..., X_n\right)}\right] = \text{Log}_e\left[\frac{P}{1-P}\right] \quad (8)$$

$$= \alpha + \beta_1 X_1 + ... + \beta_n X_n \quad (9)$$

$$= \alpha + \sum_{j=1}^{n} \beta_j X_j \quad (10)$$

Where:

P = The conditional probability of the form P (Y = 1/X_1, ..., X_n)
Log = Natural logarithms
e = The base of natural logarithms
α = The constant of the equation
β = The coefficient of the predictor variables
n = The number of predictors or explanatory variables

According to Njong (2010), two basic reasons underlie the development of the model above. First, probabilities and odds obey multiplicative rather than additive rules. However, taking the logarithm of the odds allows for the simpler, additive model since logarithms convert multiplication into addition. Second, there is a simple exponential transformation for converting log-odds back to probability. In particular, the inverse transformation is the logistic function of the form:

$$P\left(Y = 1/X_1, ..., X_n\right) = \frac{e^{\alpha + \sum_{j=1}^{n} \beta_j X_j}}{1 + e^{\alpha + \sum_{j=1}^{n} \beta_j X_j}} \quad (11)$$

Basing on the mathematical relationship:

$$\frac{e^a}{1+e^a} = \frac{1}{1+e^{-a}} \text{ for } P(Y=1)$$

The logistic function for linear regression is sometimes presented in the form:

$$P\left(Y = 1/X_1, ..., X_n\right) = \frac{1}{1 + e^{-\alpha - \sum_{j=1}^{p} \beta_j X_j}} \quad (12)$$

Due to the mathematical relation:

$$\frac{1-e^a}{1+e^a} = \frac{1}{1+e^a}$$

The probability for a 0 response is:

$$P\left(Y = 0/X_1, ..., X_n\right) = 1 - P\left(Y = 1/X_1, ..., X_n\right) = \frac{1}{1 + e^{\alpha \sum_{j=1}^{n} \beta_j X_j}} \quad (13)$$

The parameters to be estimated are the constant α and the logistic regression coefficient β_j. The model is estimated using maximum likelihood principle using iterative solution procedure (Dayton, 1992; Njong, 2010). Predictor variables are a set of socioeconomic and demographic status indicators and human and physical and financial asset endowments of the household. They contain both dichotomous and continuous variables. The description of the variables used in the model is showed in Table 1.

Table 1: Definition of variables used in the Logit model

Variables	Types	Description of variables
Dependent variable		
Y_1	Dummy	1 if farmer falls below the poverty line (poor), 0 otherwise
Explanatory demographic variable		
Age	Continuous	Age of household head in years
Age^2	Continuous	Square of age
Household size	Continuous	No. of people in the household
$Householdsize^2$	Continuous	Square of household size
Gender	Dummy	1 if household head is male, 0 otherwise
Human asset variables		
Education	Continuous	No. of years of education of household head
Vocational training	Dummy	1 if a farmer has undergone a vocational training and 0 otherwise
Socio-economic variables		
Native of farmer	Dummy	1 if farmer is native and 0, otherwise
No. of years of residence in the village	Continuous	No. of years a farmer has been living in the study area
Main occupation	Dummy	1 if the farmer's main occupation is agriculture and 0, otherwise
Institutional variables		
Contact with extension agents	Dummy	1 if a farmer has contact with extension agents, 0 otherwise
Financial asset variables		
Access to credit	Dummy	1 if farmer has access to credit, 0 otherwise
Amount of credit obtained	Dummy	1 if a farmer has access to credit and 0 otherwise
Physical asset variables		
Ownership of house	Dummy	1 if farmer is the owner of the house and 0 otherwise
No. of rooms in the house	Continuous	Total no. of rooms per house
Sources of light	Dummy	1 if farmer's source of light is electricity, 0 otherwise
Sources of water	Dummy	1 if water source is tap water, 0 otherwise
Toilet facility	Dummy	1 if toilet is latrine, 0 if there is no toilet
Mobile phone	Dummy	1 if farmer has a mobile phone, 0 otherwise
Listen to radio program on rice	Dummy	1 if farmer listen to radio program on rice production techniques, 0 otherwise
Watch video on rice production techniques	Dummy	1 if farmer has watched video on rice production techniques, 0 otherwise
Access to land	Dummy	1 if farmer owns land, 0 otherwise
Farm size	Dummy	Size of farm land in hectare
Live stock	Dummy	1 if a farmer has livestock and 0 otherwise

Data and descriptive statistics: Nigeria is the largest country in Africa and comprises of 36 states plus a Federal Capital Territory (FCT), Abuja and 774 Local Government Areas (LGAs) with a total population of 140 million people. This study utilized primary data collected from rice farmers in Nigeria using well structured questionnaire designed to elicit information basically from the household heads. A multistage random sampling technique was adopted to select a total of 600 rice farmers. Nigeria was stratified into the three prominent rice production ecologies: lowland, upland and irrigated. One state was then selected from each of the three ecologies. Hence, Niger, Osun and Kano states were selected from lowland, upland and irrigated rice ecologies, respectively. Five Local Government Areas (LGAs) that practice rice farming were randomly selected from each state and from each LGAs, villages were randomly selected proportionate to size; hence, 30, 10 and 20 villages were selected from Niger, Osun and Kano states, respectively making a total of 60 villages. The last stage involved the random selection of ten rice farming households from each of the villages to generate a total of 600 rice farming households for this study. The survey collected information on socio-economic/demographic characteristics, income expenditure and household endowments as showed in Table 2, about 84% of the

Table 2: Distribution of respondents according to socio-economic characteristics and household endowments

Distribution	No. of respondents	Percentage
Gender		
Male	442	92.0
Female	39	8.0
Household size		
<5	38	8.0
5-9	230	49.0
10-14	140	29.0
>15	69	14.0
Age		
20-29	27	6.0
30-39	91	19.0
40-49	210	44.0
50-59	101	21.0
>60	49	10.0
Farm size		
0.5-2	230	48.0
2.5-4	130	27.0
>4	120	25.0
Educational level		
0	254	53.0
6	115	24.0
12	94	20.0
>12	14	3.0
Main occupation		
Agriculture	403	84.0
Non-agriculture	78	16.0
Access to credit		
Have access	457	95.0
No access	24	5.0

Table 2: Continued

Distribution	No. of respondents	Percentage
No. of radio sets		
0	215	45
1-3	230	48
4-6	36	7
No. of television set		
0	392	81
1	65	14
2	18	4
3	6	1
Access to mobile phone		
Have access	198	41
No access	283	59
Access to media		
Have access	269	56
No access	212	44
Occupancy status		
Owns house	307	64
Tenant	174	36
No. of rooms		
1-10	428	89
11-20	39	8
>20	14	3
Sources of water supply		
River	185	38
Well	250	52
Borehole	46	10
Housing material		
Wood	43	9
Earthen brick	342	71
Baked brick	56	12
Cement	40	8
Roofing material		
Thatch	217	45
Roofing sheet	264	55
Sources of light		
Electricity	55	11
Lamp	320	67
Generator	68	14
Candle	10	2
Firewood	28	6
Sources of fuel		
Agricultural by-product	41	9
Charcoal	150	31
Firewood	290	60
Sanitation		
None	150	31
Latrine	257	53
Others	74	15

Africa rice/NCRI; Field survey (2009)

respondents were full time farmers while the remaining 16% participate in food production as a secondary occupation. The male respondents constitute 92% while the female respondents were only 8% of the total respondents. The mean household size of the respondents was 10 persons per household and 49% have household size of between 5-9.

This large household size could be one of the reasons why the large majority of the respondents (53%) have small farm size of between 0.5-2 ha. This is because as the household size increases the tendency for the land to be continuously fragmented would be high leading to a reduction in yield as a result of excessive cultivation. The mean age was 46 years while a larger percentage (44%) were between the age group 40-49 years.

RESULTS AND DISCUSSION

Summary statistics of household endowments: The household endowments considered in this study were classified into human assets (educational attainment, vocational training), physical assets (ownership of house and land, number of room in the house, access to farm land, farm size, television set, radio set, mobile phone, livestock), financial assets (access to credit and amount of credit), institutional asset (contact with extension agents).

The educational asset of a household has been reported to be poverty decreasing. However in the study, area majority of the respondents (53%) were not educated. Only 24 and 20% has primary and secondary education, respectively while 3% have tertiary education. The preponderance of illiterates among the farmers could be responsible for the prevalent of poverty among the farming household in the study area. Access to credit has been identified as one of the necessary requirements for increase agricultural production.

Farmers require credit for farming activities and adequate and timely access to credit can go a long way to bring a farmer out of poverty. Access to credit was not a problem in the study area as 95% of the respondents reportedly have access to credit. However, the average amount of credit obtained (₦47,391.00) was small and might not really have a positive impact on poverty reduction.

In relation to house ownership, majority of the rice farmers (64%) were landlord of their houses. This could contribute to the reduction of poverty among the rice farmers. This is due to the fact that living in rented apartments could constitute an additional cost and burden on the households and can reduce the consumption expenditure therefore, aggravating the poverty situation because households living on rent are mandated to set aside a considerable proportion of their income every month for the payment of house rent. Hence, ability to own a house will reduce the burden of rent and thereby increases chances of poverty reduction. Additionally, households living in their own house can work with peace of mind and explore earning opportunities to augment their income. Ownership of house is very common in the rural areas of Nigeria. People from the rural areas in most cases live in the extended family system and they often share the same compound. During the last couple of years, cost of living and

particularly of the fixed income people in Nigeria has increased tremendously. One of the major contributors to this is the drastic increase in house-rents and prices of real estate. In these circumstances, an enormous share of expenditures accrues to rents. Therefore, owning a house/accommodation can be considered an advantage. Hence, providing accommodation to the people can be an important way of overcoming poverty in Nigeria. The number of rooms in a house is also an important factor. Too many rooms in a house could put pressure on the available resources, disease could spread fast and this could affect the health of the people with a negative effect on the consumption expenditure.

However, the number of rooms could also be an additional income to the landlord and hence will have a negative effect on the poverty level. The 89% of the respondents live in houses that has between 1-10 rooms, 8 and only 3% live in houses composed of 11-20 and >20, respectively. The role of adequate and timely information in poverty reduction cannot be overemphasised. Through information, farmers got to know about the latest production technologies available such as improved rice varieties, pest management techniques, etc., that can generate increase in output and consequently increase in income. Access to information can be enhanced through the possession of some valuable household assets such as radio, television set and mobile phone. Lack of these valuable information gadgets can further plug a farmer into poverty.

Table 2 shows a large majority of the respondents would probably have no access to information because they lack some of these vital information equipments. For instance, 81% of the respondents do not have a television set. While 45% of the respondents do not have radio and 59% do not have mobile phone, respectively. On the overall, 56% of the respondents have no access to media. Consequently, important information that can improve the general well-being of the rice farmers for instance, information about HIV/AIDS or improved methods of production is not received on a timely basis. This has a negative implication for the general economic growth and development of the nation and poverty reduction in particular. Further distribution of the respondents by sources of water, light, fuel, roofing, housing material and sanitation revealed that 52% of the respondents obtained their water from well while 38% obtained water from river. Majority of the respondents used lamp as source of light and only 11% have access to electricity.

This reduced access to electricity is detrimental to their general well-being. One notable activity in rice production is milling. Milling of rice is better done with electricity as it does not only reduce the cost of milling, it also improves the quality of the milled rice. In the absence of electricity, farmers travel long distance to mill their rice output, this further increase the cost of production and reduce family welfare. Milling of rice with generator is costlier than milling with electricity. The type of light used for milling also affects the quality of the final products hence, rice milled with electricity have better quality and commands higher price in the market than those milled using generator. In the case of sources of fuel, majority of the farmers (60%) used firewood, 31% use charcoal while only 9% use agriculture-by-product. The reliance on forest tree for fuel could further compound the problem of desertification and deforestation which could be hazardous to agricultural production in terms of erosion and lose of soil fertility with a negative implication on farmers output and income. The material composition of a building could also have an effect on poverty. Living in a good house built with cement material and good roofing sheet could culminate into good health, peace of mind and high mental development that can enhance proper planning. Majority of the respondents live in houses built with earthen bricks. There is still high level of the use of local materials such as thatch for roofing in the study area as 45% of the respondents used thatch for house roof while 55% used roofing sheet. Good hygienic environment as revealed by the toilet facility is also an essential condition for poverty reduction. Majority of the farmers lack good sanitation facility. The main type of toilet facility was latrine. The 53% of the respondents use latrine while 31% do not have any toilet facility. This means of sanitation is still very backward and can facilitate the spread of deadly diseases such as cholera and a general reduction in household health and consequently aggravating the poverty situation of the farming households.

Poverty profile

Distribution of indices of povertyby demographic/ socio-economic characteristics: The study used the Foster *et al.* (1984) to generate the various measures of poverty. The head-count index, P_0 is the proportion of house holds below the poverty line. The higher the head-count index the worse the poverty situation. The poverty gap index (P_1) is the total proportion of income required to enable poor households below the poverty line to acquire the minimum recommended daily calorie allowance thus moving to the poverty line. The higher the value of the poverty gap index, the greater the depth of poverty. The severity of poverty is captured by P_2. The higher the P_2, the more severed the poverty situation. The distribution of poverty indices among the rice farmers

according to demographic/socio-economic characteristics is showed in Table 3. Table 3 revealed that the incidence of poverty was more prevalent among the male headed household in the study area. While the poverty incidence as shown by the headcount index was 52% for the males headed households, it was only 28% among the female headed households although, the female headed households have a higher depth of poverty (19%) compares to 16% for the male headed household. This shows that the female headed households require 19% increase in their per capita expenditure to reach the poverty line.

However, they both have a low severity of poverty of 10%. The distribution of poverty indices by age group shows that the respondents that were >70 years have the highest incidence of poverty (64%) while farmers within the age group of 20 and 29 have the lowest incidence of poverty. The depth and severity of poverty is however higher among the age grouped of 50-59 years. The incidence, depth and severity of poverty also increase as household size increases. This implies that the farmers with large households tend to be poorer.

Table 3: Distribution of indices of poverty among the rice farmers by demographic/socio-economic characteristics

Variables	Headcount (%)	Depth (%)	Severity (%)
Gender			
Male	52	16	10
Female	28	19	10
Age			
20-29	26	11	6
30-39	42	15	8
40-49	46	17	9
50-59	61	25	14
60-69	66	23	11
>70	64	22	9
Household size			
<5	15	7	4
5-9	31	10	6
10-14	72	25	12
15-19	88	37	19
20-25	92	54	33
Main occupation			
Agriculture	52	20	7
Non-agriculture	40	18	10
Adoption of improved rice varieties			
Adopters	46	15	8
Non-adopters	51	19	10
Access to certified rice seed			
Access	42	12	5
No access	52	20	11
Place of origin			
Native	51	18	9
Non-native	44	21	13
Rice ecology			
Upland	53	16	6
Lowland	36	20	13
Irrigated	53	28	18
Contact with extension agents			
Have contact	45	15	8
No contact	51	19	10
Pooled	50	19	10

Africa rice/NCRI; Field survey (2009)

The adoption of improved rice varieties is expected to be highly profitable and encourages the transition from traditional to modern agriculture. Farmers who adopt are also better off in terms of income and household's welfare. Poverty incidence, depth and severity were 46, 15 and 8%, respectively among the adopters and 51, 19 and 10%, respectively among the non-adopters of improved rice varieties in the study area. In terms of depth of poverty, the poor among the adopters will need about 15% increase in their per capita expenditure to reach the poverty line while the poor among the non-adopters will require about 19% of the per capita expenditure to reach the poverty line. Of equal importance in rice productivity increase is access to certified improved seed. Good seeds would enhance the productivity of rice with a positive influence on poverty reduction. As shown from the analysis, the incidence, depth and severity of poverty is higher among those farmers that do not have access to certified improved rice seed this could be due to the negative influence of uncertified rice seed on yield with a depressing effect on income. Finally, farmers that are non-native of the study area and those that do not have contact with extension agents have higher incidence, depth and severity of poverty.

Distribution of indices of poverty by household endowments: Household endowments were classified into human assets (educational attainment and vocational training), physical assets (possession of farm land and farm size, possession of house, television set, radio, number of rooms in the house, livestock, mobile phone, light supply, water supply and sanitation condition), financial assets (access to credit and amount of credit obtained). The distribution of poverty indices by household endowments is showed in Table 4. The study revealed that the incidence, depth and severity of poverty is higher among those farmers that do not have mobile phone, radio set and television set. Also, farmers that rent land for farming have higher incidence of poverty than those that owns their farm lands. In terms of education, poverty incidence is higher among those that have only primary education and also those that do not attend vocational training. Incidence, depth and severity of poverty are however lower among those farmers that watch video show and listen to radio program on rice production technologies. Farmers who are tenants have lower incidence of poverty although, the depth and severity of poverty is higher among them. Payment of house rent could have a significant negative effect on their consumption expenditure and hence, they require a higher percentage increase in their consumption expenditure to reach the poverty line.

Table 4: Distribution of indices of poverty by household endowments

Variables	Headcount (%)	Depth (%)	Severity (%)
Source of light			
Electricity	53	19	8
No-electricity	46	19	11
Mobile phone			
Have mobile phone	47	16	8
No mobile phone	52	20	11
Radio set			
Yes	51	17	8
No	49	20	12
Television set			
Have television set	35	12	6
No television set	53	20	10
Sanitation			
Latrine	57	19	9
No toilet	45	18	10
Farm land ownership			
Own land	47	28	19
Rent land	50	18	9
Educational level			
Primary	45	18	8
Secondary	38	13	8
Tertiary	29	18	13
Vocational training			
Yes	36	15	9
No	52	19	10
Watch video on rice production techniques			
Yes	37	11	4
No	51	19	10
Listen to radio program on rice production techniques			
Yes	49	14	6
No	50	20	11
House ownership			
Owns house	54	17	8
Tenant	43	21	13
Farm size			
0.5-2	51	20	11
2.5-4	42	14	7
>4	56	20	10
Roofing material			
Thatch	51	19	10
Roofing sheet	48	18	9
Water supply			
Yes	53	21	11
No	49	18	9
Access to credit			
Yes	54	25	14
No	50	18	9
Pooled	50	19	10

Africa rice/NCRI; Field survey (2009)

Household endowments and poverty: This study presents the results of the logistic regression of the effects of household endowment on poverty. The result is shown in Table 5. The study revealed that most of the household endowments have a decreasing effect on poverty. Specifically, education of the household heads, access to mobile phone, amount of credit obtained, farm size, irrigation facility, possession of livestock, television, radio set and number of rooms in a house were all negatively correlated to poverty. This means that as these variables increases poverty will decrease. Although, only number of rooms in the house is statistically significant. The reason is that with more rooms in a house the landlord could make more money through lease and hence move above the poverty line. The result of the marginal effects also revealed that an addition room will reduce the probability of being poor by 3%. The coefficient of toilet facility has a statistically positive relationship with poverty among the rice farmers in the study area.

Table 5: Results of the logistic regression of household endowments and poverty

Variables	Coefficient	SD	Z-value	Marginal effect
Age	-0.053	0.046	-1.15	-0.013
Toilet facility	0.876	0.332	2.64*	0.215*
Farm size	-0.430	0.049	-0.88	-0.011
Livestock	-0.333	0.352	-0.95	-0.082
Water supply	0.030	0.318	0.94	0.075
Roofing material	-0.368	0.333	-1.11	-0.091
House ownership	0.537	0.432	1.24	0.132
Radio program on rice production	-0.389	0.330	-1.18	-0.096
Years of farming experience	0.021	0.016	1.36	0.005
Electricity	-0.097	0.337	-0.29	-0.024
Video show on rice production	-0.238	0.545	-0.44	-0.059
Gender	0.957	0.498	1.92***	0.221***
Mobile phone	-0.244	0.297	-0.82	-0.061
Television set	-0.166	0.425	-0.39	-0.041
Ownership of farm land	0.505	0.493	1.02	0.125
Age^2	0.000	0.000	1.03	0.000
Household size	0.815	0.112	7.29*	0.203*
Main occupation	0.219	0.415	0.53	0.054
Amount of credit	-0.000	0.000	-1.36	-0.000
Educational level	-0.021	0.028	-0.75	-0.005
$Household\ size^2$	-0.019	0.004	-5.13*	-0.005*
Irrigation	-0.024	0.441	-0.05	-0.006
Access to certified rice seed	-0.569	0.434	-1.31	-0.139
No. of years of residence in the village	-0.029	0.014	-2.07**	-0.007**
Native of farmer	-1.039	0.422	-2.46**	-0.252**
No. of rooms	-0.113	0.047	-2.41**	-0.028**
Constant	-2.228	1.421	-1.57	-
Log likelihood	-242.032	-	-	-
No. of observation	481.000	-	-	-
LR Chi-square (27)	182.640	-	-	-
Prob.>Chi-square	0.000	-	-	-
Pseudo R^2	0.274	-	-	-

Significance level *p<0.05; **p<0.01; ***p<0.001; Africa rice/NCRI; Field survey (2009)

This implies that the type of toilet facility used in the study area increases the probability of falling below the poverty line. The most prevalent toilet facility in the study area was latrine. The use of latrine is not hygienic and could aggravate the spread of deadly diseases such as cholera and diarrhoea which could have negative effect on rice productivity and income and the perpetuation of poverty. The source of water supply is also positively correlated with poverty although not significant. This could be due to the fact that public water supply generally in Nigeria is not always available and most people rely on untreated water from well or river. This could lead to the spread of water borne diseases such as typhoid and diarrhoea which could also have a depressing effect on household income. Lack of good water supply could also hinder rice processing. Parboiling of rice requires good

and adequate quantity of water. Lack of water supply can reduce the quality of milled rice, add to the cost of production and finally cut down on the farmers' income. The coefficient of gender is also positive and significant. This shows that the male headed households have a higher probability of falling below the poverty line than the female headed households in the study area. This could be due to the fact that female headed households are relatively smaller in size than the male headed households. This finding is in line with most studies on poverty in Nigeria.

The size of household is also positive and significant. This means that poverty increases as household size increases in the study area. Evidence from other past studies has pointed to the link between household size and poverty. According to Okurut and Adebua (2002), the larger the household, the higher the dependency ratio hence, the tendency to perpetuate poverty in the long run. Also in a subsistence economy, the large household size tends to increase competition for land resource use between food crops and cash crops which may be coupled with declining soil productivity.

This may result in low output, low household income and the perpetration of poverty. An additional person to the household size will increase the probability of being poor by 20.3%. However, the square of household size is also significant but negatively related to poverty level. This means that household size will increase to a certain level and poverty will begin to reduce. This could happen if the increase in household size generates more hands for farm labour.

Other variables such as number of years of residence in the village and farmer being a native of the study area were also significant negative correlates of the probability of falling below the poverty line. This could be due to their effects on long term planning and positive influence on farm decision making.

Other notable household endowments such as farm size, livestock, roofing material, listen to radio program and watch video show on rice production technology, electricity, television set, radio set, education, mobile phone, irrigation facility and access to certified improved rice seed were all negatively related to poverty although not significant. This means that as these variables increases, the probability of falling below the poverty line will decrease.

Finally, the respondents that have agriculture as the main occupation tend to have a higher probability of being poor. This could be attributed to the small size of farm land, prevalence of tenancy, lack of irrigation facility, scarcity and escalating prices of agricultural inputs, low yield and high cost of farm labour. The basic focus of this study was to empirically determine the effects of household endowments on poverty reduction among the rice farming households in Nigeria. All the households in the survey were virtually involved in agriculture as primary occupation. Almost all have access to farm land. Majority of the respondents were males (92%) while only the remaining 8% were females. The households' size was relatively high as 49% have household size of between 5 and 9. There is also a preponderance of middle age farmers in the study area.

The mean age was 46 years and 44% of the farmers were between 40-49 years old. Land fragmentation is also a problem in the study area as majority of the farmers (48%) have small farm size of 0.5-2 ha. The respondents were mostly illiterates, 53% of them were not educated at all. In terms of household assets, 48% of the farmers have 1-3 radio sets, 81% have no television set and 59% have no mobile phone although, 56% have access to media. Majority of them (64%) live in their own houses. Latrine is the most common toilet facility in the study area and 52% obtain their water from well.

Majority of the farmers (71%) used earthen bricks for housing material. More than half (55%) use roofing sheet as roofing material while 45% used thatch for roofing material. Only 11% of the respondents have access to electricity, 67% used lamp as a source of light and the major source of fuel is firewood.

Poverty incidence, depth and severity are highest among the farmers that have agriculture as a main occupation. Incidence of poverty is highest among the male headed households. Farmers within the age group 50-59 have the highest depth and severity of poverty. Incidence, depth and severity of poverty increase as household size increases. Those farmers that do not have contact with extension agents have the highest incidence, depth and severity of poverty in the study area.

In relation to household endowments, incidence, depth and severity of poverty is highest among the farmers that have no mobile phone, no television set, no vocational training, do not listen to radio program or watch video show on rice production techniques, use well water and have farm size of 0.5-2 ha. Incidence of poverty is highest among the farmers that have primary education. Education of the household heads, access to mobile phone, amount of credit obtained, farm size, irrigation facility, possession of livestock, television, radio set and number of rooms in a house were all negatively correlated to poverty. This means that as these variables increases poverty will decrease. Access to public goods such as electricity and tap water has been identified as critical determinants of households' ability to increase their income and reduce the risk of falling into poverty.

CONCLUSION

In this study, providing such goods in an efficient and equitable manner appears to have potential for greatly improving the scope for future poverty reduction in Nigeria. In view of the importance of households endowments for both growth of income and poverty reduction, policies, programs and strategies that will encourage the accumulation of assets and investments particularly housing is highly recommended. The use of latrine has been discovered to positively influence a farmer's probability of being poor.

RECOMMENDATIONS

Modern means of waste disposal should be encouraged among the farmers and the use of sanitary inspectors to monitor households' sanitation condition is also recommended.

ACKNOWLEDGEMENTS

This study has benefited significantly from the financial support of Bill and Melinda Gates, European Union and IFAD. Researchers would also like to thank the Africa Rice centre for the scientific support. Researchers are grateful to National Cereal Research Institute, Badeggi, Niger state Nigeria for the data collection. The appreciations also go to Dr. O Ajayi and all the staff members of Africa Rice Centre, Ibadan, Nigeria for their moral supports during the cause of this study. Finally researchers also appreciate the farmers and the extension agents for their supports and cooperation during the cause of data collection for this study. However, the views and comments in this study are those of the researchers.

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