Full Length Research Paper

Emergency rice initiative: Socioeconomic analysis of rice farmers in Nigeria

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Random sampling was used to select 90 rice farmers from 9 Local government areas in Kano State. Data were collected with structured questionnaire and analysed using descriptive statistics and multiple linear regression techniques in order to measure household poverty. This study revealed that 98% of the vulnerable farmers' received improved rice seeds under the emergency intervention with average household size of 13 people. The farm size are small, of which 2.2% of the household have farm size that is above 5 acres; 13.3%, 3 to 4 acres; 22.2%, 1.5 to 2 acres and 62.2%, 0.5 to 1 acre. The indicators used to classify resource status were farm size, household and land holding. Wealth distribution showed that 81% population out of which 56% are married and 25% single are poor using per capita income indices. Poverty profile as measured by incidence, depth and severity were 54, 38 and 32%, and poverty line was calculated as the 2/3 of the mean per capita income. A farmer will need 38% of the per capita income to live within the poverty line. Household poverty indicated that 54% were below the poverty line. Majority (94%), have no access to credit facilities and incidence of poverty was 58%. Out of 11 explanatory variables, 6 were determinants of farmers' income. Age, years of education, household size, average yield, improved varieties and access to credit facilities were significant at 10, 5 and 1%. These variables are important determinant of per capita income of the farming household, while the multiple regression on per capita income accounted for 46% of the variation.

Key words: Household, emergency rice initiative, per capita income, rice production, intervention, food crisis.

INTRODUCTION

The world's population is projected to increase from 6.8 billion people today to 9.4 billion people by 2050, meaning that there would be an increasing need to produce more food over the next 50 years than has been in the past 10, 000 years combined (FAO, 2009). Compounding this challenges are the effect of climate change and limited natural resources. Nigeria is a country with a population of over 138.3 million people, about 14.3% of the total African population and 2.1% of the world's population (Komolafe, 2007), with an estimated land area of about 923.768 km^2, of which half is arable. The country is richly endowed with abundant natural, human and material resources, but has not been able to harness these sufficiently and efficiently enough to meet the food needs of the nation (World Bank., 1996). The size of the poor population in Nigeria who are mostly farmers in the rural areas rose from 35 million in 1992 to 44 million in 1995 and by the year 2007, it has risen to 70

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million persons (U.S Census Bureau, 2008; Okunmadewa, 1997). The annual per capita expenditure of the poor rose from ₦593 in 1985 to ₦795 in 1992 and then dropped to ₦720 in 1995. Presently the poor population in Nigeria like most other developing countries spend between 50 to 80% of their income on foods. More alarming is also the fact that about 50% or more of the population still live on US$ 1 (₦140) per day or less and the distribution of wealth remains unequal and exclusive. These facts obviously show the worsening nature of poverty in Nigeria, the consequences of which is increasing level of food insecurity, strive, and civil war. Deficient situation in national food self-sufficiency has continued to be a reocurring phenonmenon in Nigeria (Aromoralan, 2000; Ado, 2005). Currently Nigeria spends more than $3 billion annually on food importation. More recently about N80 billion was released from the Natural Resources Development Fund (NRDF) for the importation of 500,000 metric tons of rice and 11,000 metric tons of grains to compliment local production and ease the scourge of food crisis that is recently hitting the nation very hard (Kolapo, 2008a).

Rice has become the most important staple crop in making billions of people around the world food secured, it feed more than half the world's population. However, increase in rice productivity lags behind other crops. Reason for this include lack of adequate investment to improve varieties and yield, diminishing land and water resources, and environmental stresses. According to Baje (2008) and Ikeokwu (2008), the recent food price increases are a major cause for concern around the world – the price of rice has doubled. In March 2008, rice prices on the world market were at a 19-year high in real terms price in the mid-1990s (FAO. 2008a). In developing countries, where most of the household income is spent on food, increased food prices are undermining attempts to reduce hunger and pushing some of the world's poorest people into abject poverty (World Bank, 2001a, b).

The underlying causes of the most recent increases in food prices are complex and include factors such as increased demand from rapidly growing economies, poor harvests due to an increasingly variable climate, higher energy and fertilizer prices. It is undeniable that over the past century, agricultural science and new technologies have boosted production, with enormous gains in yields and reductions in the price of food (Lupine and Menza, 2004). However, these benefits have been unevenly distributed. Over 850 million people still go to bed hungry every night, especially in parts of sub-Saharan Africa and South East Asia. Primarily this is a problem of distribution and local production. Hence, in coming decades, there would be an increasing need to double food production, meet food safety standards, enhance rural livelihoods and stimulate economic growth in an environmentally and socially sustainable manner.

Achieving food security in its totality has been one of the challenges confronting both the developing and developed nations of the world. The difference only lies in the magnitude of the problem in terms of its severity and proportion of the population affected. In developed nations the problem is alleviated by providing targeted food security interventions, including food aid in the form of direct food relief, food stamps, or indirectly through subsidized food production. These efforts have significantly reduced food insecurity in developed regions. Similar approaches are employed in developing countries although with less success (FAO, 2006b). The discrepancy in these results may be due to insufficient resource base, shorter duration of intervention, or different systems most of which are inherently heterogeneous among other factors and land tenure system (Hayami, 2002). Food security; a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life; is affected by a complexity of factors. These include unstable social and political environments that preclude sustainable economic growth, war and civil strife, macroeconomic imbalances in trade, natural resource constraints, poor human resource base, gender inequality, inadequate education, poor health, and natural disasters, such as floods and locust infestation, and the absence of good governance. All these factors contribute to either insufficient national food availability or insufficient access to food by households and individuals. The root cause of food insecurity in developing countries is the inability of people to gain access to food due to poverty. While the rest of the world has made significant progress towards poverty alleviation (Beck and Nesmith, 2000; Barrett, 2008; López, 2007; Senauer and Sur, 2001), Africa in particular Sub-Saharan Africa continues to lag behind. Projections show that there will be an increase in this tendency unless preventive measures are taken (Onwuemenyi, 2007, 2008). Many factors have contributed to this tendency including the high prevalence of HIV/AIDS; civil war, strive and poor governance (Kolapo, 2008b); frequent drought and famine; and agricultural dependency on the climate and environment.

In rapid response to the global food crisis and soaring rise in prices of rice and other food commodities in 2008, Africa rice led a network of partners, research organizations, Non Governmental Organizations (NGOs) and local implementing partners in proposing an emergency rice initiative to boost rice production in four countries in West Africa including Nigeria. The Initiative targeted 10,000 poor rice farmers in each of the 4 countries for 2 years. The main objective of this study was to boost total domestic rice production in each of these countries by a total of 30,000 tons of paddy rice with a current market value of about US$21 million. Specifically the project aimed to improve farmers' access to improved rice seed and mineral fertilizer and to expand knowledge on best-bet rice production technologies through on the job training and video shows on rice production technologies. Rural radio and television

Table 1. Success story of the emergency intervention initiative – performance Inicators.

Reached 15, 046 farmers out of which 1,169 are women
Established 23 partners
Conducted 11 training on rice production
Conduct 5 training of trainers (TOT), 3, 221 male including 431 female
Trained 16 agro-input dealers
Established 12 seed producers association
Work in partnership with 5 seed companies
9 partnership formed
9 technologies
3, 460 farmers reached through videos translated in local langauges
118 tonnes certified seed produced and distributed through the voucher system
585 tonnes of fertilizer mobilized, 1, 538 farmers benefited

broadcasts on these technologies were also used to reach other farmers not directly involved in the project. The success stories of the emergency rice initiative are highlighted in Table 1 as the major performance indicators of the project.

MATERIALS AND METHODS

Data collection and analysis

This study was conducted in the two existing project sites including irrigated lowland of the Sudan savannah ecological zone and the rainfed lowland agro ecological system in the north central geopolitical zone of Nigeria. The primary data used for this study were collected between July and September 2010. The multistage random sampling technique was adopted to select 90 rice farmers from which data were collected for the analysis. Kano state was stratified into two: Kano river project and Wateri river project from which 9 Local Government Areas (LGAs) were randomly selected: Bunkure, Garun Mallam, Dawakin Tofa, Bagwai, Kura, Dogowa, Tudun Wada, Bunkure and Warawa. From each of the LGAs, 2 villages were selected to generate a total of 18 villages out of which 5 rice farming households were finally selected to give a total of 90 farming households. Data were source through well structured questionnaire, personal interview and Focus Group Discussion (FGD). Data collected includes socioeconomic/demographic characteristics: age, gender, marital status, level of education, household size, major occupation, farm size method of land acquisition, access to credit, training received, social capital, source of planting materials. The analysis was carried out using STATA 10.0.

The model and analytical techniques

The data collected for this study were analyzed using descriptive statistics, and poverty indices and multiple regression techniques was adopted.

Poverty indices

The Froster Greer Thorbecke (FGT) poverty measure was adopted to calculate the poverty profiles of the beneficiary farmers.

FGT (1984) takes the form:

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

where Z = the poverty line; q= number of individual below the poverty line; n = number of individuals in the reference population Y_{pi} = per capita income of the ith household; α = FGT index which takes values 0, 1, 2. Z-Y_i = poverty gap of the ith household $\frac{Z - Y_i}{Z}$ = poverty gap ratio; and α is a policy parameter that can be varied to approximately reflect poverty "aversion".

Multiple regression analysis

Ordinary Least Square (OLS) multiple regression analysis was also adopted to identify those variables that had significant effect on the beneficiaries' per capita income in this study area. The model used is stated explicitly below:

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + \text{-------} + b_{11} X_{11} + u \qquad (2)$$

where: Y= Per capita income; b = Constant term 0; $b_1 - b_8$ = Regression Coefficients; X_1- X_8=Explanatory variables;e= Error term
    The description of the explanatory variables is presented in Table 2.

RESULTS AND DISCUSSION

Socio-economic and demographic characteristics of respondents

The description of variables used in the multiple regression models is presented (Table 2). The socio-economic/demographic characteristics of the respondents are presented (Table 2). Prior to the emergency initiative intervention, the major sources of rice seed were farmers' own seed from past harvest (49%), those that purchase their seed from the open market were (29%) and those that obtain their seeds from other farmers

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Table 2. Description of variables used in the multiple regression model.

Variable	Type	Description of variable
Dependent Y_1	Continuous	Log of per capital income
Explanatory		
Demographic variable age	Continuous	Age of household head in years
Household size	Continuous	Number of people in the household
Gender	Dummy	1 if household head is male, 0 otherwise
Socio-economic variable		
Average yield	Continuous	Output per hectare
Education	Continuous	Number of years of education of household head
ERIdum	Dummy	1 if farmer benefitted from the project , 0 otherwise
Improvedvar	Dummy	1 If farmer planted certified Rice seed, 0 otherwise
Farmergroup	Dummy	1 if farmer belong to any group, 0 otherwise
Credit	Dummy	1 if farmer has access to credit, 0 otherwise
Extension visit	Dummy	1 if farmer has contact with extension agents, 0 otherwise

were (20%). These sources of seed have been reported in several literatures to be detrimental to rice production as most seed sourced through these means were attested to be of low quality and contain impurities, diseases, insect pest and weeds, resulting in low rice yields.

Emergency rice initiative supplied certified improved rice seed to the farmers at subsidized rate at the right time for planting; this was done with the view to increase the farmers output, income and ultimately reduce poverty among the beneficiary farmers. This study shows that 98% of the targeted vulnerable farmers received certified improved rice seeds. The respondents consisted of 97% males and only 3% females. The marital status of the beneficiaries showed that 96% were married, while the remaining 4% were single. Household size ranges from 10 to 30 with an average of 13 persons per household, 88% attended Quranic education; 41% primary education; 21% secondary education and only 8% for tertiary education (Table 3). The average years of

education was 15 years, and the distribution of farmers according to the different methods of land acquisition in this study area revealed that land inheritance is the major sources of land for farming as 76% of the rice farmers inherited their farm land from their parents, 17% rented their land, 10% bought their land and only 2% acquired their lands through the state government. Their farm sizes are relatively small, and those that have 0.5 to 1 acre are 62%, 1.5 to 2 acres, 22%, 3 to 4 acres, 13% and more than 5 acres, 2%. This smallness of farm size could be as a result of the high incidence of poverty among the beneficiaries. Increase in the size of farm will attract extra cost on agro-inputs, labor and other farming operations and therefore will hinder farm expansion; hence the beneficiary's farm size was used as one of the indicator of farmers vulnerability to poverty in this study area. Majority of the respondents (99%), have age category ranges from less than 30 and greater than 60 with average of 44 years. However, before the emergency rice initiative project, farmers buy their seeds from open

Table 3. Distribution of respondents according to some socioeconomic/demographic characteristics.

Distribution	Number of respondents	Percentage
Gender		
Male	87	97
Female	3	3
Marital status		
Married	86	96
Single	4	4
Household size		
1-10	35	39
11-20	42	47
21-30	13	14
Age		
<30	9	10
31-40	28	31
41-50	40	44
51-60	11	12
>60	2	2
Farm size		
0.5-1	56	62.0
1.5-2	20	22.0
3-4	12	13.0
>5	2	2.0
Sources of land		
Inherited	68	76
Rented	15	17
Bought	9	10
Government	2	2
Literacy level		
Quranic education	80	88.0
Primary education	37	41.0
Secondary education	19	21.0
Tertiary education	7	8.0
Main occupation		
Farming	81	90.0
Non-farming	9	10.0
Sources of rice seed		`
Open market	26	29.0
Saved seed	44	49.0
Other farmer	18	20.0
Others	9	10.0
Farmer that received improved seed under Emergency Rice Initiative (ERI)		
Yes	88	98
No	2	2
Number of visits to project farmers field	`	
0	12	13.3
1-3	44	48.9
4-6	33	36.7
>6	1	1.1

market at the rate of N290.80 per kilogram weight, and the project provided improved rice seed at the lowest subsidy level of N63.20 per kilogram weight. The averages of some socio-economic and demographic

Table 4. Means of some socio economic variables of respondents.

Variable	Mean
Age	44
Education	15
Household size	13
Cost of 12.5 kg seed from open market (N)	3,635
Cost of 12.5 kg seed from ERI (N)	790
Income from other crop (N)	2,433
Income from non-agricultural activities (N)	53,376
Total annual household income (N)	132,840
Per capita income (N)	12,164
Annual income from agriculture (N)	78,131

Table 5. Average cost of rice production.

Variable	Mean
Cost of land preparation (manual) (N)	7,299
Cost of land preparation (mechanical) (N)	5,039
Cost of seed (N)	3,292
Cost of fertilizer (N)	11,290
Cost of herbicide (N)	2,413
Labour hired (N)	5,934

variables are presented in (Table 4). The mean age shows that the farmers were young and in their productive years. This could have a positive implication for rice production. They also have a high number of years of education; however, quranic education is the most prevalent form of education in this study area. The mean household size is also very high. This is not a surprise as polygamy is a way of life in this study area and therefore it is expected that household size would be higher. Large household size could be used as a source of labour on the farm, but on the other hand it could lead to an increase in household expenditure and consequently put the farmers in to abject poverty. The mean income of the respondents acquire from non-agricultural activities was greatly higher than the mean income from crop production. The average total annual household income from both agricultural and non-agricultural production was ₦132,840.00, while the per capital income was ₦12,164. The average cost of rice production in this study area is presented in (Table 5). The average cost of fertilizer (₦11,290.00) represented the highest cost in rice production, followed by cost of manual land preparation (₦7,299.00) (Table 5). (Table 1 highlights some of the major performance indicators of the project.

Poverty analysis

Poverty profile of the farming household was computed

by using income as a proxy for poverty level (Table 6). The poverty line was calculated as the 2/3 of the mean per capita income (N12,164.00). The analysis showed that the incidence of poverty was 54%, indicating that more than half of the respondents were below the poverty level. The depth and severity of poverty were 38 and 32% for the married and 25% for both depth and severity for the single respectively (Table 4). This implies that the poor would need about 38% of the mean per capita income to reach the poverty line. The result of the poverty analysis also shows incidence of poverty was very high among those that do not have access to credit (58%).Generally, poverty is prevalent among the married people (56%); poverty is also more prevalent among the female headed households when compare to the male headed households.

Determinants of per capita income

Multiple regression analysis was adopted to model the determinants of per capita income. The result is presented in Table 7. The adjusted R^2 shows that the 46% of the variation in per capita income of the farmers was explained by the explanatory variables while the remaining 54% is predicted by the error term. On the overall, the model is well fitted as revealed by the F-statistics. Six out of the eleven explanatory variables were significant in determining the per capita income of the beneficiary farmers (Table 7). Age of the household head was negative and significant at 10% (Table 7). This implies that the young respondents have a higher per capita income and per capita income will decrease as the farmers get older. This could be due to the fact that energy to cultivate land for increase in output which can lead into higher income decreases as the farmers get older. Also young farmers are likely to have relatively lower household size and hence higher per capita income.

Educational level of the respondents was positive and significant at 10% (Table 7). Higher level of education will enables a farmer to acquire more knowledge about rice production techniques and utilized same judiciously to acquire increase in output which can generate increase in per capita income. The size of the household is negative and significant at 10%. This suggests that as household size increases the per capita income of the respondents would decrease. This could mean that the bulk of the household were dependants who were not really contributing to the household's income. The yield obtain from the farm has a great implication on the farmer's income; hence one of the focus of emergency rice initiative project was to generate an increase in rice production per hectare, per land area and per year. As shown from the analysis in Table 7, yield has a positive and significant effect (1%) on the farmers' per capita income. As yield increase per capita income will also

Table 6. Distribution of poverty indices (%) among the household.

Variable	Head count	Depth	Severity
Marital status			
Married	55	38	32
Single	25	25	25
Gender			
Female	67	36	33
Male	54	38	31
Access to market			
Yes	53	37	31
No	64	42	34
Farmers group			
Yes	58	41	34
No	39	26	23
Rice variety			
Improve	63	46	39
Local	42	26	21
Training			
Yes	47	37	31
No	59	43	38
Extension visit			
Yes	53	37	31
No	67	43	38

Table 7. Linear regression coefficient explaining parameter estimate.

Variable	Coefficient	Std. error	t
Age	-0.027	0.016	-1.68*
Years of education	0.027	0.014	1.89*
Household size	-0.034	0.018	-1.89*
Farm size	0.019	0.124	0.15
Average yield	0.016	0.006	2.83***
Sex	-0.501	0.639	-0.78
Training	0.075	0.252	0.30
Improve variety	-0.552	0.234	-2.36**
Farmers group	0.182	0.388	0.47
Credit facility	1.493	0.646	2.31**
Extension visits	0.197	0.457	0.43
R^2	46		
Adjusted	54		

increase. Access to credit is positive and significant at 5% (Table 7). This means that farmers that have access to credit have a higher per capita income. Access to credit facilitate easy procurement of rice production inputs particularly fertilizer. Access to credit would also enable the farmers to hire additional labour for farm expansion. The result also indicated that the females have higher per capita income than the males (Table 6), using the per capita income indices among the household. The bigger the farm size the higher the per capita income and farmers that benefitted from the project have a higher per capita expenditure.

Challenges and limitations of ERI program in Nigeria

Access to mineral fertilizer was a major challenge of farmers in the project area, and non provision of fertilizer by the project and lack of credit facilities. Sourcing for, and getting highly certified and good quality improved seed for onward distribution to the farmers was also one of the major challenges of the project as this was another problems encountered from the seed companies.

Conclusion

The ERI project was an initiative to reduce the menace of the global food crisis and to help ameliorate the suffering of the poor rural household's majority who depend solely on agriculture for survival. The results from this study showed that the program has achieved a lot of desirable impact on the rural farmers, particularly in relation to poverty reduction as majority of them accessed improved seeds that have been so difficult. On the capacity building, many of them received training that increase their technical knowhow on rice production and a management practice. The approach in the short term has brought the activities of research and extension workers closer, and also result in much closer linkages to farmers, agro-input dealers and communities as they partners work in harmony to boost rice production in the project area. The concept of the emegency intervention on rice production (and farmer participation) appear to be gaining acceptances as models that offer great potentials for "co-learning" by farmers, researchers, development and implementing organization. The strategies adopted by the project has greatly helped to advance the adoption of improved rice technologies that will consequently increase their output. Evidently, improving the resource-base of farmers has enhanced knowledge base of the farmers and therefore, to effectively eradicate poverty and reduce the suffering of the rural poor households and to achieve the goal of affordable nutritious food for all, in an environmentally sustainable manner, an emergency approach like these, may therefore offer fruitful direction that will increase welfare in the shorter term, but longer-term sustainability requires investment in developing an elite human resource base. In conclusion, the ERI has provided the rice farmers with the leadership and skills needed in rice farming.

RECOMMENDATIONS

Intervention should center on targeting farmers, who are

vulnerable, but however, this alone would not be enough to eliminate poverty, there is also need for effective safety net programs in times of crisis and for helping afflicted households and communities cope with chronic disease problems like HIV/AIDS. Communities, rural farmers leaders should be involved in the design and implementation of targeted programs, there should be increased support for small scale farmers who should be at the centre of development policies that promote production of locally appropriate crops. Interventions need to focus on supporting the small scale farm sector, for example, post harvest facilities, market feeder roads, improving access and tenure to land and productive resources, provide access to credit, etc. Establishing national safety nets and public food distribution systems to provide the poorest and most vulnerable members of the populations with resources to meet their basic needs as well as to protect them against food price shocks.

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