J Soc Sci, 19(1): 31-39 (2009)
PRINT: ISSN 0971-8923 ONLINE: ISSN 2456-6756
DOI: 10.31901/24566756.2009/19.01.05

Determinants of Wealth and Socioeconomic Status of Rural Households: An Application of Multinomial Logit Model to Soybean Farmers in Northern Nigeria

Ifeanyi A. Ojiako*, V.M. Manyong, Chuma Ezedinma*** and Godwin N. Asumugha******

International Institute of Tropical Agriculture, PMB 5320, Ibadan, Oyo State, Nigeria
*E-mail: *<iojiako2000@yahoo.co.uk>, **<v.manyong@cgiar.org>,*
****<cezedinma@yahoo.com>,*
*****National Root Crops Research Institute, PMB 7006, Umuahia 440001, Nigeria*
E-mail: <gnasumugha@yahoo.com>

KEYWORDS Wealth Ranking. Rural Farmers. Economic Variables. Regression. Nigeria

ABSTRACT This study combined the qualitative and quantitative techniques of data collection and analyses. It used the card-sorting technique of wealth ranking to stratify 307 randomly selected soybean-farming households into wealth categories, examined the validity of the key informants' wealth ranking as a way of assessing the socioeconomic status of rural farmers, and consequently investigated the factors that influenced households' socioeconomic status using the empirical multinomial logistic regression model. Data on the explanatory and other standard economic variables were collected using structured questionnaire administered by trained enumerators. Wealth ranking by key informants categorized 12.0% of respondents as rich, 46.6% as middle class, and 41.4% as poor farmers. The high positive and statistically significant associations found between the standard economic variables, including farm size and incomes, and households' wealth status support the construct validity and empirical evidence of the wealth ranking as a means of stratifying households by socioeconomic status. Results of regression analysis showed that ownership of means of transport, adult women resident in household and household size had significant influences on the households' wealth categories. Increases in these variables reduced the probability of being either in the poor households' category or in the middle class category compared to the probability of being in the rich category, although the effects were stronger for the poor versus the rich than for the middle class versus the rich households. Policies directed towards the improvement of households' wealth and socio-economic status should emphasize the use of these socioeconomic characteristics.

INTRODUCTION

Wealth and socio-economic status (SES) is an important social category definition of which, in most societies, may vary among cultures and villages. It is one of the most important variables in social sciences research since it plays a significant role in the planning and execution of development programmes (Tiwari et al. 2005). A household's socio-economic status would mean the ranking of the household in the milieu to which it belongs, in respect of defined variables, like physical assets, economic status, education, occupation, social position, social participation, caste, muscle power, political influence, among others (Tiwari et al. 2005). Some elements of these variables have the tendency to go together.

Correspondence to:
Dr. Ifeanyi A. Ojiako
International Institute of Tropical Agriculture
PMB 5320, Ibadan, Oyo State, Nigeria
Telephone: +234-805-330-7313
E-mail: iojiako2000@yahoo.co.uk

In agriculture, SES affects labor availability, money to expend on purchasing inputs, savings and investment decisions, and types, amounts and uses of crops grown. It also affects the numbers and variety of animals a livestock farmer could keep, as well as, their management tactics and use. Given his varied needs and problems, a farmer's SES could also influence his/her ability or otherwise to adapt to proposed agricultural technologies.

In the developing countries the measurement of SES is challenging (Worrall et al. 2003), albeit the specific definition and what constitutes a rich or a poor farmer would depend on the local conceptions of the terms (Bellon 2001). The traditional approach to measurement of household SES has been through the use of standardized household interview surveys (Adams et al. 1997; Worrall et al. 2003). As Worrall et al. (2003) also observed the generally accepted "gold standard" approach to estimating household welfare is to use data on income and expenditure. Income/ expenditure surveys provide objective, quanti-

tative data that can be collected on large, generalizable samples of households, examined using statistical methodology and are comparable across time and place (Hargreaves et al. 2007a). However, household expenditure data are viewed as better measure of permanent income due to their tendency to fluctuate less vis-à-vis household income and are consequently preferred. Deaton (1997) has argued succinctly that households tend to smooth expenditure in anticipation of "lumpy" income. A second reason for relative preference of expenditure data is that they are more practical to collect and avoid the complexity of valuing household consumption of own production (Worrall et al. 2003).

Collectively, the income/expenditure approach to SES measurement has been variously criticized on the grounds that it is likely to be associated with the difficulty of obtaining accurate data from respondents, either because they will be inherently unwilling to provide certain data or that they may be highly biased when they provide them (Adams et al. 1997; Reddy 1997; Filmer and Pritchett 2001; Worrall et al. 2003; Hargreaves et al. 2007a). Specifically, Reddy (1997) has identified among the shortcomings of the income/expenditure approach the fact that: a) household's asset position, like buildings, land et cetera, may not provide continuous flows of income under all circumstances; b) there can be other sources of income that will not be captured under assets; and c) for certain obvious reasons, households may tend to either underestimate or overestimate their income and/or expenditure. It has been further argued that not only would the method have the tendency to rely on variables that only appear to avail themselves to quantification, but also that the ease with which responses are obtained on these variables may be offset by their quantitative unreliability due to biases relating to recall, season, sensitive information, expectations of the interviewee, mis(information) on household members not interviewed, and the dynamics between the interviewer and the respondent (Glewwe and van der Gaag 1990; Adams et al. 1997). The abovementioned, together with the fact that collecting detailed income and/or expenditure information may also be prohibitively complex, time consuming, and expensive (Chambers 1994a; Worrall et al. 2003), has led to attempts to develop other more feasible approaches to estimating household socio-economic status.

An alternative measure has been the use wealth, measured as household ownership of assets, as proxy for income and expenditure. In this regard, initial effort was the use of single assets, like ownership of radio or television (Worrall et al. 2003) or indices made up of multiple assets (Worrall et al. 2003; Hargreaves et al. 2007b). In this instance the aggregation of data has been achieved through simple count, weighting of variables based on local consultation, or through application of statistical procedures like principal component analysis (Filmer and Pritchett 2001; Worrall et al. 2003; Hargreaves et al. 2007b). The asset index approach has its own potential problem arising from differences in the assets used across surveys, or that even the studies that use a common asset index cannot be readily compared (Worrall et al. 2003). Also, a variety of other proxy measures assumed to be correlated with income, including education, occupation, rural/urban location, and gender, has been used as proxy for socio-economic status. Yet, there remains limited evidence on the association between these indices and more established measures of wealth and socio-economic position (Hargreaves et al. 2007b).

As a response to the widespread disillusion with the formal survey questionnaire, the rapid rural appraisal (RRA) and other action-oriented approaches to data collection were advanced in the late 1970s (Adams et al. 1997). Consequently, the RRA participatory wealth ranking (PWR) technique was heralded as a quick and effective means of assessing SES that was perhaps more detailed and intuitive than the formal survey (Chambers 1994c). PWR method is an aspect of qualitative research, which advocates "participation" as a philosophy and mode of development.

More recently, proponents of multidisciplinary approach to rural poverty analysis have favored the joint use of quantitative and qualitative data collection and analytical techniques (Carvalho and White 1996; World Bank 2001; White 2002; Barrett 2004). The former uses the traditional survey with structured questionnaire while the latter adopts a wide range of interconnected methods, including case study, personal experience, introspective, life story, interview, observational, historical, interactional, and visual texts (Denzin and Lincoln 1994). Much has been said on the strengths of this emerging approach to scientific research. According to Njeru (2004) combining qualitative and quantitative approaches would certainly optimize the quality and value of the

rural household analysis. In the same vein, White (2002) observed that the oppositions between quantitative and qualitative approaches are false dichotomies because both approaches are complementing one another. According to him, when combined both methods can yield "more than the sum of the two approaches used independently" (White 2002: 513). This is because qualitative data can add context to quantitative data collected in surveys, while rapid and partici-patory appraisal techniques can meaningfully contribute to understandings of poverty (Chambers 1994a; Chambers 1994b; World Bank 2001).

This study was an effort to classify rural soybean growers into different wealth and socio-economic categories and consequently investigate the factors that influence households' socioeconomic status. To achieve this objective, the study applied a quantitative analytic procedure to qualitative data collected by PWR technique. First, we present the results of the participatory wealth ranking and examine how wealth ranking could compare with the standard economic variables like farm size and household incomes, which are alternative standard variables for measuring households' economic status (Reedy 1997). On the strength of the outcome, we use regression analysis to determine factors that influence the wealth and socio-economic status of respondents.

METHODOLOGY

The Study Area

The study was conducted in five villages in northern Nigeria. Three villages (Kaya, Gidan Hayaki and Ungwan Dan Mallam) were in Kaduna State, which lies between latitudes 9^o 042 to 11^o 502 N, and longitude 6^o 092 to 10^o 412 E and two villages (Ungwan Dawa and Mariri) were in Kano State, which lies between latitudes 10^o 332 to 12^o 372 N and longitude 7^o 342 to 9^o 252 E. The ecology of Kaduna is the guinea savanna with annual rainfall range of 600-1200 mm and length of growing period (LGP) of 150-200 days. The ecology of Kano is the sudan savanna. It has a rainfall range of 300-600 mm and 90-150 days LGP. Rainfall is unimodally distributed in both ecologies. The farming systems in the zone are generally cereal-based with small-scale farmers producing the bulk of the total output. Farming and cattle rearing constituted the main occupations of the rural population. The area also produced grain-legume crops, mainly grown in upland fields, but has great potential for irrigated agriculture.

Methods of Data Collection

The study combined the qualitative and quantitative techniques of primary data collection and analysis. The participatory rural appraisal (PRA) wealth and well-being ranking technique was used to partition the selected households into three wealth categories, which was later allowed as a dependent variable into the empirical regression model. Card sorting by key informants and social mapping by community focus groups are two broad techniques of performing wealth and well-being ranking. Four key informants, who were individuals that have been resident in the villages for a very long time to have a good knowledge of the peoples' culture and way of life, were selected in each village. Card-sorting method of wealth ranking (Feulefack and Zeller 2005) was applied. The result from different key informants' rating was tabulated and scored for each farmer (Cramb and Purcell 2001). The resultant scores were used to classify the respondents into the rich, middle class and poor farmers. To collect the quantitative data, structured household questionnaires were administered to selected farmers by trained enumerators who were members of staff of the Agricultural Development Programs (ADPs) in the states.

Analytical Procedure

The multinomial logit model (MNLM) is used for analyzing unordered qualitative variables. It deals with truly nominal and mutually exclusive categories. Suppose a dependent variable (DV), y, has M categories that is y=1, 2, …M with p_1, p_2, …p_m as associated probabilities, such that $p_1+p_2+\ldots+p_m=1$. The usual thing is to designate one as the reference category. The probability of membership in other categories is then compared to the probability of membership in the reference category.

Consequently, for a DV with M categories, this requires the calculation of M-1 equations, one for each category relative to the reference category, to describe the relationship between the DV and the independent variables (IVs). The choice of the reference category is arbitrary but should be theoretically motivated.

The generalized form of probabilities for an outcome variable with M categories is:

$$pr(y_i = m \mid x_i) = P_{im} = \frac{\exp(x_i^{/}\beta_m)}{1+\sum_{m=2}^{M}\exp(x_i^{/}\beta_m)} \quad \text{, for m>1} \quad (1)$$

$$pr(y_i = 1 \mid x_i) = P_{i1} = \frac{1}{1+\sum_{m=2}^{M}\exp(x_i^{/}\beta_m)} \quad (2)$$

for K covariates, a total of (K+1)*(M-1) parameters will be estimated.

The odds and odds-ratios for a variable with M categories and baseline, M=1:

$$\frac{P_{im}}{P_{i1}} = \frac{\eta_{im}}{\eta_{i1}} = \exp(x_i^{/}\beta_m) \Rightarrow \log\left(\frac{P_{im}}{P_{i1}}\right) = x_i^{/}\beta_m \quad (3)$$

$$\log\left[\frac{(P_m \mid x_k = 1)/(P_1 \mid x_k = 1)}{(P_m \mid x_k = 0)/(P_1 \mid x_k = 0)}\right] = \beta_{mk} \quad (4)$$

$$\log\left[\frac{(P_m \mid x_k = x_k^0 + 1)/(P_1 \mid x_k = x_k^0 + 1)}{(P_m \mid x_k = x_k^0)/(P_1 \mid x_k = x_k^0)}\right] = \beta_{mk} \quad (5)$$

Specifically, the standard MNLM for a model with M=3 categories become:

$$pr(y_i = 1 \mid x_i) = P_{i1} = \frac{1}{1+\exp(x_i^{/}\beta_2)+\exp(x_i^{/}\beta_3)} = \frac{\eta_{i1}}{\eta_{i1}+\eta_{i2}+\eta_{i3}} \quad (6)$$

$$pr(y_i = 2 \mid x_i) = P_{i2} = \frac{\exp(x_i^{/}\beta_2)}{1+\exp(x_i^{/}\beta_2)+\exp(x_i^{/}\beta_3)} = \frac{\eta_{i2}}{\eta_{i1}+\eta_{i2}+\eta_{i3}} \quad (7)$$

$$pr(y_i = 3 \mid x_i) = P_{i3} = \frac{\exp(x_i^{/}\beta_3)}{1+\exp(x_i^{/}\beta_2)+\exp(x_i^{/}\beta_3)} = \frac{\eta_{i3}}{\eta_{i1}+\eta_{i2}+\eta_{i3}} \quad (8)$$

The MNLM is built on the IIAs (Independence of Irrelevant Alternatives) assumptions. The Hausman-McFadden is used for the tests of IIA. The procedure is to first estimate the full model with M outcomes. Then, a restricted model is estimated by eliminating one or more M. The test of the difference between the two, which is asymptotically distributed as chi-squared with degrees of freedom equal to the rows in restricted model if IIA, is true. Significant χ^2 values indicate violation of the assumption that the difference between the two models is not equal to zero.

Empirical Model

The empirical multinomial logit model for this study is specified as:

$$y_i = f(x_1, x_2, \ldots, x_n)$$

where y_i, the dependent variable is the wealth and socio-economic status of farmers, $x_{i\,s}$ are the included explanatory variables. The dependent variable (y_i) is defined as 1 for the poor farmers, 2 for the middle class farmers, and 3 for the rich farmers. The x_2, for i=1,2,3 are the explanatory variables, defined as number of adult women resident in household (x_1), ownership of means of transport or mobility (x_2) and household size (x_3). The household size and resident adult women entered the empirical model as numerical numbers while household head's ownership of means of transport was defined as 1 if farmer owned no means of transport, 2 if he owned bicycle, 3 if he owned motorbike and 4 if he owned a motor vehicle. It is hypothesized that the three variables will have positive influence on the household's wealth and socioeconomic status.

Aside from the three retained variables, other variables initially considered for inclusion in the empirical model include: *age* of the farmer (measured in years), farmer's improved soybean *adoption stat*us (defined as 1 for an adopter and 0 for non-adopter) and *dependency ratio* (defined as number of children below fifteen years and ageing adults above sixty-five years divided by the number of household members aged 15-65 years). Others are *farming experience* (in years) and *level of educational* attainment (1 for no formal education, 2 for Koranic Education, 3 for Primary education, 4 for Secondary education, and 5 for Tertiary education). Apart from the dependency ratio all variables were expected to influence socio-economic status positively. Variables screening, aimed at ensuring that only relevant variables that do not have high correlation values were retained for use in the regression analysis, led to dropping of all variables except the first three: number of resident adult women, ownership of means of mobility and household size (x_3). Only the three retained variables were used for the empirical multinomial logit, which was run using the SPSS Version 11.0 for Windows.

RESULTS AND DISCUSSION

Comparison of SES Ranking with Other Economic Household Variables

The breakdown of farmers according to wealth

and socioeconomic categories shows that 12.0% of the households were classified as rich farmers, 46.6% were in the middle class while 41.4% were in the poor households' category. The descriptive information on the farmers' sizes of farm holding and other standard economic variables is presented in Table 1. The average annual farm income was ₦206377.48 for all households, ₦703459.46 for the rich, ₦173639.56 for the middle class, and ₦98430.76 for the poor households. On the other hand, the average annual non-farm income was ₦54745.00 for all households, ₦214340.54 for the rich, ₦36640.91 for the middle class, and ₦28633.59 for the poor. The average farm size was 1.23 hectares for all farmers; 0.75 ha for the poor; 1.14 ha for the middle class; and 3.23 ha for the rich farmer categories.

We also estimated the simple correlation coefficients between wealth ranks on the one hand and agricultural income, nonagricultural income, total income, and farm size on the other. The results (Table 2) reveal highly significant ($p<0.01$) association between each of the variables and wealth status of households.

Table 2: Relationship between wealth status and economic variables of farmers

Variable	*Wealth Status Ranking*	
	Correlation coefficient	*t-value*
Farm size	0.413***	5.72
Farm Income	0.434***	10.11
Non-farm Income	0.328***	6.91
Total Income	0.479***	11.06

a. ***=significant at 1%; **=significant at 5%; *=significant at 10%

Regression Results

The descriptive information on the explanatory variables that entered the regression model is presented in Table 3. The variables were those retained after screening aimed at ensuring that only relevant variables were used for the empirical analysis.

The multinomial logistics regression analysis was performed to determine the variables that influence the wealth status of households. The results revealed a chi-square value of 93.49 with 6 degrees of freedom, which was highly significant ($p<0.01$). Also, the measure of the model's goodness of fit and explanatory power, the Nagelkerke's pseudo R^2, was calculated as 0.306. The likelihoods ratios tests associated with the regression are presented in Table 4 while Table 5 presents the parameter estimates.

In Table 5, the values 9.34 and 6.93 under estimates for intercepts are the log-odds ratios of being poor versus being rich, which is the reference category, if all independent variables are zero.

DISCUSSION

It is shown in Table 1 that there are high significant positive correlations between the different income components and farm size. The highest association is between farm income and total income of households, measured in Nigerian

Table 1: Descriptive information on the economic variables of farmers

Description	*Correlation coefficients*				*Mean (Std. deviation)*			
	FMSZ	*FMIN*	*NFIN*	*TINC*	*Poor (n=127)*	*Middle (n=143)*	*Rich (n=37)*	*All (n=307)*
FMSZ (ha)	1	-	-	-	0.75	1.14	3.23	1.23
					(0.61)	(1.05)	(3.31)	(1.59)
FMIN (₦/yr)+	0.71***	1	-	-	98420.76	173639.56	703459.46	206377.48
					(90886.8)	(181003.9)	(792690.7)	(357413.2)
NFIN (₦/yr)+	0.53***	0.42***	1	-	28633.59	36640.91	214340.54	54745
					(48120.6)	(58587.7)	(334774.4)	(138735.20)
TINC (₦/yr)+	0.76***	0.95***	0.65***	1	133309.47	218968.88	936272.97	269983.56
					(99901.3)	(203051.9)	(907966.2)	(427643.7)

a. ***=significant at 1%; **=significant at 5%; *=significant at 10%;
b. FMSZ=farm size; FMIN=farm income; NFIN=non-farm income; TINC=total income; Max=maximum; Min=minimum;
c. Figures in parentheses are standard deviations;
d. +Exchange rate as at the time of study was about Nigeria Naira ₦140/US$1

Table 3: Descriptive information on the included explanatory variables

Description	*Correlation Matrix*			*Mean (Std. deviation)*				*Max.*	*Min.*
	x_1	x_2	x_3	*Poor(n=127)*	*Middle(n=143)*	*Rich(n=37)*	*All(n=307)*		
x_1	1.00	-	-	1.52(0.79)	1.83(0.77)	2.49(0.77)	1.781(0.829)	4.00	0.00
x_2	0.17***	1.00	-	1.90(0.50)	2.08(0.48)	2.78(0.85)	2.084(0.609)	4.00	1.00
x_3	0.43***	0.14**	1.00	7.06(4.07)	9.30(4.69)	11.95(5.59)	8.69(4.821)	34.00	1.00

a. ***=significant at 1%; **=significant at 5%; *=significant at 10%;
b. x1= number of resident adult women; x2=ownership of means of mobility; x3=household size; Max=maximum; Min=minimum;
c. Values in parentheses are standard deviations

Table 4: The Likelihood Ratio Tests

Effect	*-2 Log Likelihood of Reduced Model*	*Chi-Square*	*Degrees of freedom*
Intercept	388.218	115.176***	2
x_1	281.273	8.231**	2
x_2	319.009	45.966***	2
x_3	278.919	5.877*	2

a. ***=significant at 1%; **=significant at 5%; *=significant at 10%;
b. x1= number of resident adult women; x2=ownership of means of mobility; x3=household size

Naira per annum. High associations were also found between farm size and total income indicating that rural soybean farmers earned most of their income from farming activities. Expectedly, the least association existed between farm size and non-farm incomes. Table 2 shows also that the association between each economic variables and wealth status is positive and significant. The significant positive correlation indicates that there is one to one correspondence between wealth ranking and the standard economic variables. This finding corroborates the view that wealth ranking could be comparable with other standard economic variables as far as generating information relating to households economic status is concerned and hence the use of wealth ranking is validated. Reddy (1997) established similar results.

The significant chi-square of the regression model led to the rejection of the null hypothesis that all effects of the explanatory variables were zero at 1%. This meant that the included variables were relevant in distinguishing the SES categories from wealth ranking. The Nagelkerke's pseudo R^2 goodness of fit coefficient also corroborated this finding indicating that the model performed fairly well. Table 4 shows that the null hypothesis, H_0: that the effects of all log odds-ratios of the dependent variables are simultaneously equal to zero, can be rejected for the intercept at $p<0.01$, and for the included independent variables at $p<0.05$ for number of resident women (x_1), $p<0.01$ for ownership of means of transport (x_2), and $p<0.10$ for household size (x_3) respectively. Among the three variables, the loss of fit associated with ownership of means of transport was much stronger compared with those associated with the number of resident women and household size.

The parameter estimates indicate the impact of a unit change in the explanatory variables on

Table 5: Analysis of the parameter estimates

Wealth category	*Variable*	*Estimates (B)*	*Std. Error*	*Wald*	*Exp(B)*	*95% Confidence interval for Exp(B)*	
						Lower bound	*Upper bound*
Poor	Intercept	9.340***	1.161	64.691	-	-	-
	X_1	-1.049***	0.391	7.215	0.350	0.163	0.753
	X_2	-2.219**	0.377	34.622	0.109	5.189E-02	0.8228
	X_3	-0.111*	0.063	3.168	0.895	0.791	1.011
Middle Class:	Intercept	6.932***	1.038	44.569	-	-	-
	X_1	-0.938***	0.358	6.854	0.392	0.194	0.790
	X_2	-1.446***	0.298	23.607	0.235	0.131	0.422
	X_3	-1.16E-02	0.054	0.047	0.989	0.890	1.098

a.***=significant at 1%; **=significant at 5%; *=significant at 10%;
b. x1=number of resident adult women; x2=ownership of means of mobility; x3=household size;
c. Wald=[estimate/std. error] 2.

log-odds ratios. Table 5 shows that increases in the number of resident adult women (x_1), ownership of means of mobility (x_2) and household size (x_3) have the effects of reducing the probability of being either in the poor farmers category or in the middle class category compared to the probability of being in the rich class reference category. The associated negative values (effects) imply, in the case of the poor category of farmers, that a unit increase in the variable of interest reduces the probability of being a poor farmer compared to the probability of being a rich reference household. In the case of the middle class category, it means that a unit increase in the variable reduces the probability of being in the middle class compared to the probability of being in the rich reference category. In all cases the effects tend to be stronger for the poor versus the rich than for the middle class versus the rich. However, the impact on the probabilities was not significant for household size, as indicated by the Wald statistics.

The odds-ratios reported under the Exp(B) column show the magnitude of the already identified increases. For the number of resident adult women the odds-ratio of 0.350 for the poor versus the rich means that a unit increase in the number of resident adult women multiplies the odds of being in the poor category rather than in the rich category by 0.350 or simply that the increase reduces the odds of being in the poor instead of in the rich category by 65%. Similarly, a unit increase in the number of resident adult women multiplies the odds of being in the middle class rather than in the rich class by 0.392 or that it reduces the odds by 61%. For ownership of means of mobility (x_2), a unit increase would multiply the odds of being in the poor compared to being in the rich category by 0.109 and the odds of being in the middle class rather than in the rich category by 0.235, implying reduction in the odds by 91% and 76% respectively. Similar deductions can be made with respect to farm size (x_3).

The 95% confidence intervals show the low-high range values for Exp(B). Usually, if the low-high range contains the value 1.0, then being in that variable value category makes no difference on the odds of the dependent, compared to being in the reference value for that variable. For household size, the high confidence level is 1.01 and 1.09 respectively for the first and second equations, implying that a change in household size is not very much associated with the change in the odds of the wealth categories assuming a given value. In other words, a change in the household size makes no much difference on the odds of being in the poor or in the middle class wealth category compared to the rich category and consequently, household size cannot be considered a very strong predictor in the logistic model.

IMPLICATION AND CONCLUSION

The study used the technique of wealth ranking by selected key informants to classify rural soybean farming households into socio-economic categories. It identified number of resident adult women, ownership of means of mobility, and household size, as major indicators of SES of farming households in the area. Increases in each of these variables reduces the probability of being either in the poor or in the middle class farmers' category compared to the probability of being in the rich farmers' reference category. However, in all cases the effects tend to be stronger for the poor versus the rich than for the middle class versus the rich.

The emergence of these variables was not surprising considering the culture, religion, and occupation of the people of the area. The respondents covered in the study were full-time farmers who practiced Islamic faith. They engaged in farming for both subsistence and cash-generation and, although they embarked on some off-farm livelihood activities, they depended principally on the output of their farm work for meeting their household obligations and attaining desired heights in the community. Large sizes of household would guarantee for more hands in the farms and other things equal lead to increase in farm output. The average household size is nine people for all households, seven for the poor, nine for the middle class, and twelve for the rich category of farmers. During participatory focus group sessions conducted separately for adult men and women farmers as part of this survey, several role played by woman and children household members as active collaborators in farming business was highlighted by participants. This finding had been reported elsewhere (Ojiako 2006).

Related to household size is the number of resident adult women, majority of who were spouses of the male household heads. The

polygamous culture supported by the religious affiliation of the people of the area could explain why women are considered big assets in the rural farmers' households. The average number of resident women was two for all households, including the poor and middle class, and three for the rich. On its part, ownership of mobility means facilitated farming activities of the households, especially for conveying of farm inputs and products during harvesting. A household that has its own bicycle, motorbike, or motor vehicle is considered as one doing very well. Besides, such ownership would come with it lot of respect and recognition for the farmer in his immediate neighbourhood, underscoring its identification among the measures of high socio-economic status in the area.

In conclusion, since the study has revealed strong positive and significant association between key informants' rankings and standard economic variables hitherto used in assessing rural households' socio-economic status, it has validated participatory ranking as a reliable alternative method of generating information on rural households' wealth and socioeconomic status. We suggest that efforts directed at promoting the socioeconomic status of rural farming households should consider the use of the three identified measures of socio-economic status in the area.

REFERENCES

Adams AM, Evans TG, Mohammed R, Farnsworth J 1997. Socioeconomic Stratification by Wealth Ranking: Is it valid? *World Development*, 25(7): 1165-1172.

Barrett CB 2004. Mixing Qualitative and Quantitative Methods in Analyzing Poverty Dynamics. In: W Odhiambo, JM Omiti and DI Muthaka (Eds.): *Quantitative and Qualitative Methods for Poverty Analysis*. Proceedings of the Workshop on SAGA Qualitative-Quantitative Methods for Poverty Analysis in The Grand Regency Hotel, Nairobi, Kenya, March 11, 2004, pp. 37-58. Retrieved November 15, 2006 from http://www.saga.cornell.edu/saga/q-qconf/proceed.pdf.

Bellon MR 2001. *Participatory Research Methods for Technology Evaluation: A Manual for Scientists Working with Farmers*. Mexico, D.F.: International Maize and Wheat Improvement Center (CIMMYT). Retrieved November 16, 2006 from web page http://www.cimmyt.org/Research/Economics/map/research_tools/manual/pdfs/prm_all.pdf.

Carvalho S, White H 1996. Combining quantitative and qualitative approaches to poverty measurement and analysis. *World Bank Technical Paper No. 366*, Washington DC: World Bank.

Chambers R 1994a. The Origins and Practice of Participatory Rural Appraisal. *World Development*, 22(7): 953-969.

Chambers R 1994b. Participatory Rural Appraisal (PRA): Analysis of Experience. *World Development*, 22(9): 1253-1268.

Chambers R 1994c. Participatory rural appraisal: challenges, potentials, and paradigm. *World Development*, 22(10): 1437-1451.

Cramb R, Purcell T 2001. How to Monitor and Evaluate Impacts of Participatory Research Projects: A Case Study of Forages for Smallholders Project. *CIAT Workshop Document, No. 185*, Australia: CIAT and ACIAR.

Deaton A 1997. *Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore, Maryland: Johns Hopkins University Press.

Denzin NK, Lincoln YS (Eds.) 1994. *Handbook of Qualitative Research*. London: SAGE Publications.

Feulefack JF, Zeller M 2005. How accurate is Participatory Wealth Ranking (PWR) in Targeting the Poor? A Case Study from Bangladesh. *Paper delivered at the Conference on International Agricultural Research for Development (Tropentag 2005*) in Stuttgart-Hohenheim, October 11-13, 2005. Retrieved May 15, 2008 from the web page http://www.tropentag.de/2005/abstracts/full/512.pdf.

Filmer D, Pritchett LH 2001. Estimating Wealth Effects Without Expenditure Data - Or Tears: An Application to Educational Enrollments in States of India. *Demography*, 38 (1): 115-132.

Glewwe P, van der Gaag J 1990. Identifying the poor in developing countries: Do different definitions matter? *World Development*, 18(6): 803-814.

Hargreaves JR, Morison LA, Gear JSS, Makhubele MB, Porter JDH, Busza J, Watts C, Kim JC, Pronyk PM 2007a. "Hearing the voices of the poor": Assigning poverty lines on the basis of local perceptions of poverty; a quantitative analysis of qualitative data from participatory wealth ranking in rural South Africa. *World Development*, 35(2): 212-229.

Hargreaves JR, Morison LA, Gear JSS, Kim JC, Makhubele MB, Porter JDH, Busza J, Watts C, Pronyk PM 2007b. Assessing household wealth in health studies in developing countries: a comparison of participatory wealth ranking and survey techniques from rural South Africa. *Emerging Themes in Epidemiology*, 4(4). Retrieved April 15, 2008 from web page http://www.ete-online.com/content/4/1/4.

Njeru EHN 2004. Bridging the Qualitative-Quantitative Methods of Poverty Analysis. In: W Odhiambo, JM Omiti and DI Muthaka (Eds.): *Quantitative and Qualitative Methods for Poverty Analysis*. Proceedings of the Workshop on SAGA Qualitative-Quantitative Methods for Poverty Analysis in The Grand Regency Hotel, Nairobi, Kenya, March 11, 2004, pp. 23-35. Retrieved November 15, 2006 from web page http://www.saga.cornell.edu/saga/q-qconf/proceed.pdf.

Ojiako IA 2006. Soybean Production and Processing for Promoting Food Security: a Participatory Appraisal of Smallholder Households in Northern Nigeria. In: GN Asumugha, AO Olojede, JG Ikeorgu, AO Ano and U Herbert (Eds.): *Repositioning Agriculture for*

Sustainable Millennium Development Goals in Nigeria. Proceedings of the 40th Annual Conference of the Agricultural Society of Nigeria (ASN) in the National Root Crops Research Institute, Umudike, Abia State, Nigeria, October 16-20, 2006, pp. 672-675.

Reddy RV 1997. "Wealth Ranking" in Socio-economic Research: Substitute or Complement?" *Discussion Paper 65*. Diskussionsschriften der Forschungsstelle für Internationale Wirtschafts- und Agrarentwicklung eV (FIA), Nr. 65, Heidelberg. Retrieved October 15, 2006 from web page http://www.sai.uni-heidelberg.de/abt/intwep/fia/DISKUS65.htm.

Tiwari SC, Kumar A, Kumar A 2005. Development and standardization of a scale to measure socio-economic status in urban and rural communities in India. *Ind J of Med Res*, 122: 309-314.

White H 2002. Combining Quantitative and Qualitative Approaches in Poverty Analysis. *World Development*, 30(3): 511-522.

World Bank 2001. *World Development Report 2000/2001*. New York: Oxford University Press.

Worrall E, Basu S, Hanson K 2003. The relationship between socio-economic status and malaria: a review of the literature. Background of Paper prepared for Ensuring that malaria control interventions reach the poor. London, September 5-6, 2002. Retrieved May 16, 2008 from web page http://www.rbm.who.int/cmc_upload/0/000/016/249/SESMalaria_BackgroundPaper.pdf.