

## DEMOGRAPHIC DIFFERENTIALS OF FOREST BASED ENTERPRISES IN SOUTH WEST NIGERIA

**AIYELOJA, A.A. AND OYEBADE, B.A.**

**Department of Forestry and Wildlife Management, University of Port Harcourt, P.M.B, 5323, Choba, Port Harcourt, Nigeria**

**Corresponding author's Email: aiyeloja@yahoo.com**

### **ABSTRACT**

*This paper analyses the differential demographic variables that influence the profitability potential of some forest based enterprises in south western Nigeria, using empirical regression models. Best fit criteria techniques were employed to determine the best demographic variables models and their relationships in affecting the performance of the models expressing profitability. There were significant differences among various enterprises on which the demographic parameters were modeled. Wood furniture making activities in Oyo State under linear, semi-log and exponential regression modeling gave very significant models, Mortal making enterprises in Lagos State of Nigeria under the exponential, semi-log and double-log had significant regression relationship with coefficient of determination ( $R^2 = 0.78$ ). The similar trend was observed in Canoe making of Ondo State and Mat weaving activities in Osun State under semi-log cum double-log and exponential respectively when determining the regression relationship of the demographic parameters on the forest based enterprises in the State.*

*Keyword: socio-economic variables, empirical models, forest based, enterprises*

### **INTRODUCTION**

Demography is an interdisciplinary field involving mathematics and statistics, biology, sociology, economics, history, geography, and anthropology. The development of demography has been tied closely to the gradually increasing availability of data on births and deaths from parish and civil registers and on population size and composition from the censuses that became common in the 19th century. The growth of behavioral sciences in the 20th century and advances in the fields of statistics and computer sciences further stimulated demographic research. Subfields of mathematical, economic, and social demography have grown rapidly in recent decades. Demography deals with social characteristics of the population and their development through time. Demographic data may include analysis of the population on the basis of age, parentage, physical condition, ethnicity, occupation, and civil position, giving the size and density of each composite division; changes in the population as a result of birth, marriage, and death; statistics on migrations, their effects, and their relation to economic conditions; levels of education; and economic and social statistics. Odeboye 2005 pointed that forest provides a wide range of benefits at the local, national and global levels; and the contribution non-timber forest products (NTFPs) is very significant in many developing countries due to the greater population concentration relying directly on the forest. According to the United Nations 1989, the number of rural households living in abject poverty in the developing countries including Nigeria increased from 400 million

in 1965 to 600 million in 1988, and thus leading to increased urbanization and serious forest lands vulnerability to threat.

Forest-based industrialization has traditionally focused on large, capital intensive enterprises. However, large enterprises have high capital requirements and require large infrastructural bases. They involve multifaceted skills and training but still have low employment rates. Increasingly, forest-based small scale enterprises (FBSSEs) are being recognized as vital interface activities because they provide employment and generate income for millions of rural and urban poor worldwide. These activities involve the collection, processing, consumption and trade of forest products and they often provide essential full time, or supplemental sources of income. They benefit both those who cannot fully depend on agriculture in rural areas including forest dwellers, the landless, small holders, and marginal farmers and urban workers who cannot find employment in more organized sectors. FBSSEs also contribute significantly to village and household economies by producing food, fuel, fodder, implements, medicines and culturally significant artifacts for local consumption. In their total contribution, FBSSEs form an important component of many countries rural economies.

Forest based enterprises in Nigeria is among Small scale enterprises (SSEs) which have changed and developed over times following the sociopolitical and economic development in the country. There are many socio economic factors identifiable with Nigeria forest based enterprises which have impacted negatively on its profitability potentials simply from general economic strangulation and demographic pressure over the years in Nigeria.

Aworemi (2007) reported that the country's demographic profile in 1995 to be a population of 111.7 million with an average household of 5.0, population growth rate of 2.83%, rural population of 64% compared to 36% urban population and a 6.2% urban growth rate. He emphasized that the mean age of marriage is 16.9 years which is peculiar situation among young adolescent girls in the rural areas as a result of their lack of adequate education and training. These demographic parameters according to the study characteristically affect forest based entrepreneurial potentials and endeavour. Similarly, human capital or human resource such age, gender, education and experience is said to be significant influence on many forest based enterprises (Kristianen *et.al.*, 2003).

Though, many earlier studies have explored the problem related to socioeconomic factors influencing forest based enterprises in Nigeria and many topical regions of the world (Aworemi, 2007; Okafor, *et.al.*, 1994; Odebode, 2005; FAO 1990; Rudel 1998; Capistrano, 1994; Palo, 1994 ); there exist very little research and studies on analytical differentiation of the demographic parameters that affect forest based enterprises in Nigeria. This study therefore examines the demographic differential of the variables that significantly influence the forest based enterprises in South Western Nigeria as it affect the profitability prospects of the enterprises.

## **METHODOLOGY**

### *Data collection and sampling techniques*

Two hundred and forty forest based entrepreneurs were selected sampled according to the distribution pattern within the study area; which comprises of the stratification of three Nigerian's vegetational patterns of swamp forest zone, rain forest zone and savannah zone. These selected vegetation patterns fall within the South-Western Nigeria which

consists of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States; lying between longitude  $2^{\circ} 31'$  and  $6^{\circ} 00'$  East and latitude  $6^{\circ} 21'$  and  $8^{\circ} 37'N$  (Agboola, 1979) and with a total land area of  $77,818 \text{ Km}^2$  and a population of 27,581,982 (NPC, 2006). The study area is bounded in the East by Edo and Delta States, in the North by Kwara and Kogi States; in the West by the Republic of Benin and in the south by the Gulf of Guinea (Figures 1 & 2).

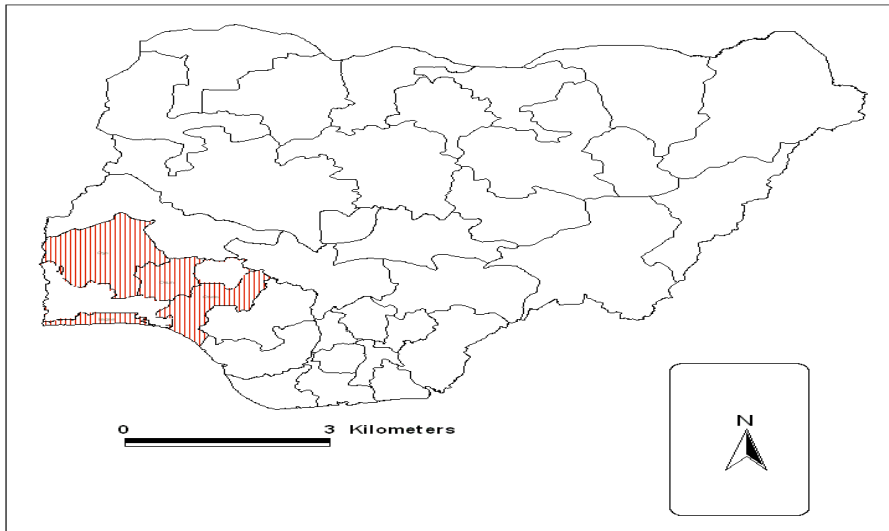


Fig. 1: Map of Nigeria showing the Study Area

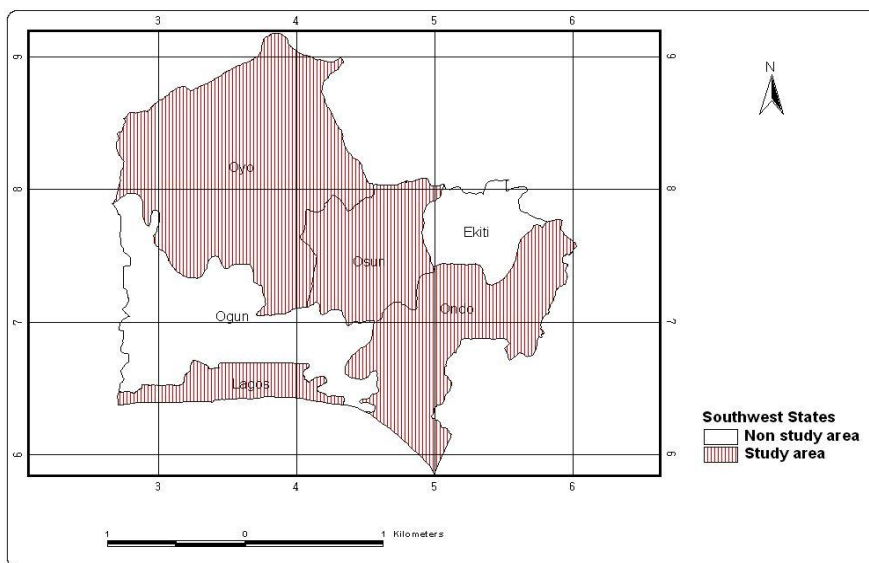


Fig. 2: Map of south Western Nigeria showing the Study Area

During this quantitative study, the relationship of demographic parameters (age, gender, marital status, family size and education) using different functional multiple regression models on the profitability of the forest based enterprises were explored.

**Models development and Quantitative Analysis**

Multiple regression models were used to quantitatively investigate the differential influence of demographic characteristics of the entrepreneur on the profitability of all the enterprises. The functional models were developed following the order of linear, exponential, semi logarithm and double logarithm for the determination of the best line of fit. The models used were given after the order of the following:

(a) Linear order

$$Y = b_0 + b_1x_1 \dots\dots\dots \text{Equation 1}$$

(b) Exponential order

$$\text{Ln}Y = ae^{b_0 + b_1x_1 + b_2x_2 + \dots\dots b_nx_n + e} \dots\dots\dots \text{Equation 2}$$

(c) Semi logarithm order

$$Y = \text{Ln}b_0 + b_1\text{Ln}x_1 + b_2\text{Ln}x_2 + \dots\dots b_n\text{Ln}x_n + e \dots\dots\dots \text{Equation 3}$$

(d) Double logarithm order

$$\text{Ln}Y = \text{Ln}b_0 + b_1\text{Ln}x_1 + b_2\text{Ln}x_2 + \dots\dots b_n\text{Ln}x_n + e \dots\dots\dots \text{Equation 4}$$

Four different statistical criteria were employed in determining or selecting the best fit models that show relationship between various demographic characteristics on the profitability of the considered forest based enterprises at the study area. This is pivotal in solving any dichotomous variables along parameters estimations as well as facilitating precision in the interpretation of the goodness of fit (Hamilton, 1974; Neter and Maynes 1970). Thus, for models evaluation and rational interpretation, the following criteria were applied:

(i) *Test For Significance of Regression Equation.*

The statistics employed conforms to F distribution.

$$F = \frac{Rss/p - 1}{Ess/n - p} \dots\dots\dots\text{Equation 6}$$

Rss = Regression sum of squares

Ess = Error sum of squares

p = Number of Parameters

n = Sample size

If F calculated is greater than the F tabulated, then the regression equation is significant at the specified level of confidence interval. This is an indication that at least one of the independent variables contributes significantly to the model.

(ii) *Coefficient of Multiple Determination (R<sup>2</sup>)*

The second criterion in choosing a best equation for regression is the magnitude of the coefficient of multiple determination, which is also known as the goodness of fit (R<sup>2</sup>). This criterion explains the proportion of the variation in the dependent variable that is jointly explained by the independent variables. Thus, the closer the R<sup>2</sup> to one, the greater the percentage of the variation explained by the variables and conversely, the closer the R<sup>2</sup> to zero, the worse the fit.

$$R^2 = \frac{Rss}{Tss} \dots\dots\dots\text{Equation 7}$$

Rss = Regression sum of squares.

Tss = Total sum of squares.

In the case of an additional independent variable, there is the need to adjust the R<sup>2</sup> in order to cater for the difference in the degrees of freedom. Thus

$$R^2 = 1 - (1 - R^2) \frac{n - 1}{n - p} \dots\dots\dots\text{Equation 8}$$

R<sup>2</sup> = adjusted R<sup>2</sup>

n = no. of observations in the sample

p = no. of parameters or variables

(iii) *Magnitude of Sum of Squares of Errors*

In using the magnitude of sum of squares of errors, the number of parameters must be equal in the equations being considered and the dependent variables must be defined in the same way (unit of measurements) in the equation. However the independent variable may be defined differently. The null hypothesis assumes statistical equality for the sum of squares of errors in the two equations under consideration. If they are found to be statistically different, the equation with the smaller sum of squares of errors is chosen as a better functional form. Thus;

$$d = {}^{n/2} \left| \log \frac{\sum e^2_{1t}}{\sum e^2_{2t}} \right| \dots\dots\dots\text{Equation 9}$$

Where

$\sum e^2_{1t}$  = sum of squares of errors in one equation

$\sum e^2_{2t}$  = sum of squares of errors in another equation

d = satisfies the student t distribution with one degree of freedom

n = sample size

(iv) *Standard Error Test (t-Test)*

When it has been established that at least one independent variable contributed significantly to the regression equation, t-test is often used to identify which of the independent variables is/are responsible for the change in the dependent variable.

$$t_{a/2, n-p} = \frac{b_k}{SE} \dots\dots\dots\text{Equation 10}$$

$a/2$  = two tailed significant level or confidence interval

$n-p$  = degree of freedom

$b_k$  = regression coefficients ( $b_1, b_2, \dots, b_5$ )

SE = standard error

*(v) Magnitude of Beta Coefficients*

With this technique, it is possible to establish the degree of influence of each of the explanatory variables on the dependent variable. Beta coefficient is a standardised regression coefficient which measures the typical change in the dependent variable, arising from a typical change in the explanatory variable (Ajewole, 2001).

$$\beta_k = b_k \frac{s_{xk}}{s_w} \dots\dots\dots\text{Equation 11}$$

$\beta_k$  = beta coefficient

$b_k$  = regression coefficient

$s_{xk}$  = standard deviation of  $X_k$  independent variables

$s_w$  = standard deviation of the dependent variable

The explanatory variable with the highest beta coefficient is said to have the greatest influence on the dependent variable.

**RESULTS AND DISCUSSION**

The differential relationship of the regression models to illustrate the effect of demographic variables on the profitability of the enterprises considered showed that wood furniture making in Oyo State under the linear, semi-log and exponential regression models were significant at  $P < 0.05$  (Table 1). This means that at least one of the tested independent demographic variables was significant or had influence on the dependent variable (profitability of wood furniture making). Though linear regression had the highest coefficient of determination, exponential regression equation was chosen as the best equation for the regression model because of low standard error and smaller magnitude of sum of squares of error. Similarly, mortar marketing in Lagos State under the empirical models of the exponential, semi-log and double-log regression equations was significant (Table 2). However, the double-log function had the highest coefficient of determination  $R^2$  (0.78) and minimum standard error. Hence it was chosen as the best equation for the regression model

The canoe making in Ondo State under the semi-log and double-log regression equations were significant at  $P < 0.05$  (Table 3). The double-log equation was however chosen as the best equation for the regression model because of low standard error and smaller magnitude of sum of squares of error. Table 4 shows the performance of the exponential regression equation for mat weaving in Osun State and its significance at  $P < 0.05$ . Hence it was chosen as the best equation for the regression model

**Table 1: Model's Performance of the Effects of Demographic Factors on Profitability of Wood Furniture Making in Oyo State.**

Criteria	Linear	Exponential	Semi-log	Double-log
R <sup>2</sup>	0.81	0.72	0.71	0.64
Adjusted R <sup>2</sup>	0.71	0.58	0.57	0.47
Standard Error	124926.44	0.155	153670.16	0.175
F calculated	8.74	5.20	4.92	3.61
Significance	0.01*	0.04*	0.05*	0.09

\* = significant at p = 0.05

**Table 2: Model's Performance of the Effects of Demographic Factors on Profitability of Mortar Marketing in Lagos State.**

Criteria	Linear	Exponential	Semi-log	Double-log
R <sup>2</sup>	0.69	0.70	0.76	0.78
Adjusted R <sup>2</sup>	0.54	0.55	0.64	0.67
Standard Error	7637.1	0.157	6730.9	0.134
F calculated	4.45	4.69	6.30	7.19
Significance	0.06	0.05*	0.03**	0.02**

\*\* = highly significant at p = 0.05; \* = significant at p = 0.05

**Table 3: Model's Performance of the Effects of Demographic Factors on Profitability of Canoe Making in Ondo State.**

Criteria	Linear	Exponential	Semi-log	Double-log
R <sup>2</sup>	0.44	0.36	0.64	0.63
Adjusted R <sup>2</sup>	0.27	0.18	0.54	0.52
Standard Error	9732.20	0.181	772561	0.139
F calculated	2.69	1.99	6.32	5.89
Significance	0.14	0.21	0.03*	0.03*

\* = significant at p = 0.05

**Table 4: Model's Performance of the Effects of Demographic Factors on Profitability of Mat Weaving in Osun State.**

Criteria	Linear	Exponential	Semi-log	Double-log
R <sup>2</sup>	0.27	0.33	0.24	0.29
Adjusted R <sup>2</sup>	0.19	0.25	0.15	0.21
Standard Error	21343.5	0.153	21794.6	0.158
F calculated	3.15	4.23	2.68	3.46
Significance	0.07	0.03**	0.10	0.06

\*\* = highly significant at p = 0.05

The effect of demographic factors on profitability of enterprises investigated across the States revealed different F-values in relation with the models of assessment (Table 5). Cane rat farming across the States under the exponential regression model had the highest F-value as well as the highest level of significance, hence it was chosen as the best equation for the regression model; the wood furniture making enterprise across the state also showed significant linear relationship at P<0.05, while Canoe making under the

double log regression model and across the state was also chosen as the best fit model following its certification of the best fit model criteria.

**Table 5: Effect of Demographic Factors on Profitability of Enterprises Investigated Across the States**

Enterprises	Functional Form (Model)							
	F-Value				Significance			
	linear	semi log	exponential	double log	linear	semi log	exponential	double log
Wood Furniture Making	4.09	2.86	2.31	2.00	0.02*	0.06	0.10	0.14
Cane Furniture Making	2.25	2.25	2.35	2.44	0.09	0.09	0.08	0.07
Honey Production	1.33	2.70	1.15	2.05	0.29	0.09	0.34	0.16
Cane rat Farming	3.34	2.82	5.61	3.69	0.03	0.06	.004*	0.02
Canoe Making	11.03	7.92	11.34	12.98	.001	.0001	.0001	.0001*

\* = significant at p = 0.05

Quantitative demographic differential evaluation of forest based enterprises is so significant in providing analyses of the influence of the population parameters on the profitability potential of the enterprises. The study addresses the use of empirical models in solving explaining the relationship of the different demographic parameter on the success in the enterprises (Dabral and Malik 2004). In this study, the significant relationships of demographic parameters recorded correspond with the studies on the impact of demographic characteristics on the socio-economic of some particular enterprises when considering their profitability inclinations (Bromley, 1989, Besley 1995, Deacon 1991). Correspondingly, the relationship of the fitted models using demographic characteristics as dependent variables and having high values of coefficient of determination ( $R^2$ ) in many of the enterprises is indicative of the fact that the demographic parameters (age, gender, marital status, family size and education) can have positive influence on the enterprises; for instance, the high level of educational attainment of males having high family size may facilitate the profit potentials of the enterprise.

## REFERENCES

- Agboola S.A. (1979): An Agricultural Atlas of Nigeria, *Oxford University Press*, Nigeria 248 pp.
- Ajewole O.I. (2000): Economic Valuation of Environmental Service Functions of Forests in Ibadan Metropolis, Nigeria. M.Phil. Dissertation, University of Ibadan, Nigeria. 91-98.
- Aworemi, 2007. Impact of socio-economic factors on the performance of small-scale enterprises in Osun State, Nigeria. *International Business Management* 1(4): 88-93.
- Besley, T. 1995. Property Rights and Investment Incentives: Theory and Evidence from Ghana. *Journal of Political Economy* 103 (5): 903-937.
- Bromley, D. W. 1989. Property Relations and Economic Development: The Other Land Reform. *World Development* 17 (6): 867-877.



- Capistrano, A. D. 1994. Tropical Forest Depletion and the Changing Macroeconomy 1967-85. In: Brown, K. and Pearce, D. W. (eds) *The Causes of Tropical Deforestation*. UCL Press, London. pp. 68-85.
- Dabral, S. and Malik, S.L.: Demography study of Gujjars of Delhi: Population structure and socio-cultural profile. *Journal of Human Ecology*: 15(1): 17-24 (2004).
- Deacon, R. T. 1999. Deforestation and Ownership: Evidence from Historical Accounts and Contemporary Data. *Land Economics* 75 (3): 341-359.
- FAO 1990. The major significance of minor forest products. The local use and value of forest in the West African Humid forest Zone. Community Forestry Note 6, Rome.
- National Population Commission (2006): Nigeria's Census Summary, 2006 from the Office of National Population Commission, Abuja Nigeria in [www.nigeriannews.com](http://www.nigeriannews.com), retrieved January 28, 2006.
- Okafor, J.C., Omoradion, F.I. and Amaja 1994. Non –Timber Forest Products (Nigeria): Consultancy paper prepared by the Tropical Forest Actions Programme (TFAP) Forest Management, Evaluation and Co-ordination Unit (FORMECU) and Federal Department of Forestry (FDF) Abuja, Nigeria. p.8.
- Odebode, S.O., 2005. Contribution of selected non-timber forest products to household food security in Nigeria. *Journal of Food, Agriculture & Environment* Vol.3 (3&4):138-141.
- Palo, M. 1994. Population and deforestation. In *The Causes of Tropical Deforestation*. Edited by Brown, K. and Pearce, D. W. UCL Press, London. pp. 42-56.
- Rudel, T. K. 1998. Is There a Forest Transition? Deforestation, Reforestation, and Development. *Rural Sociology* 63 (4): 533-552.