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DETERMINANT OF PROFITABILITY IN THE WOOD CARVING INDUSTRY IN OYO STATE, NIGERIA

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ABSTRACT

Wood, a major product of the wood carvers is obtained from trees in the forest which then necessitate the concept of sustainability. This study examines revenue function and conduct market analysis of wood carving in Ibadan metropolis and Oyo town in Oyo State, Nigeria with a view to assess the magnitude of production coefficients of the wood carvers. This serve as the base for determining optimum patterns of intrastate trade. Data for the exercise were obtained using purposive random sampling of a limited number of wood carving industries in the study area. .Sampling was 100%. Twenty two questionnaires were administered to wood carvers in Ibadan while ten questionnaires were administered to wood carvers in Oyo town. The results showed that out of the three functional forms tried for the revenue performance, Exponential function is the most fit for the study. It has the highest Coefficient of Determination (R^2 =76.03%). The explanatory variables (labour, wood utilized, finishing materials and transportation cost) were significant ($P<0.01$) and showed positive correlations to gross revenue. It is recommended that there should be a re-organization of the wood carving industry to enhance their productive potentials and profitability. The State government should motivate the wood carvers with incentives to expand the scale of production which in turn would foster tourist attractions.

Keywords: Wood Artifact, Revenue Function, Intrastate Trade, Profitability, Wood Carvers, Tourist Attraction

INTRODUCTION

According to Sayer *et al* (2005), no one disputes that sustainability involves satisfying present needs without compromising future options, but it is not always obvious what this means in terms of forest management. It is not merely an issue of natural forests versus plantations, or clear felling versus selection logging system, but involves more fundamental questions about the functions and services provided by forests and about stakeholders, equity and expectations. Sustainable forestry means managing our forest resources to meet the needs for today without interfering with our future generations' needs. Any management of the forest resource must include inventory and planning to provide the basis for evaluating and implementing the goals of the landowner. In Pennsylvania, individuals own about 75% of the land and nationwide that number reaches 59%. The Sustainable Forestry Initiative located in State College educates landowners on the difference between cutting timber for short term financial gain with environmental degradation and managing their stand for long term economic, environmental and wildlife benefits. Non-sustainable forestry activities generally involve some form of economic removal of the saw timber portion of a site. In these operations, the most valuable trees are harvested for their worth; while the poorly formed or undesirable species are left to grow. The resulting stand lacks most of the major species common to the location and no thought is given to maintaining the sustainability of the site nor addressing wildlife or wetland issues. Basically, this is a short-term money fix for most that leaves the landowner with limited options for future harvests. Sustainable forestry differs right from the very beginning. Initially, a forest professional reviews the landowner's goals and objectives for their woodlands. The forester takes the landowner through the following steps: conducting an inventory of the property, assembling a management plan, and implementing the plan to achieve the goals. Forest policies in Nigeria have been inadequate for over 40 years and this has affected the viability of forest business. Critically assessing the forest policies of Nigeria, it could be seen that it has most of the ingredients for sustainable forest development. What is, however, required now is an institutional reform that will re-organize the forestry services for more effective performance. The forestry sub sector should not be expected to perform major economic roles unless the sector is adequately supervised, provided for and developed. Unless there is regeneration and sustained yield to equate harvest, the depletion rates are bound to continue with adverse consequences on the environment (Faleyimu, 2010). Jonathan (2000) viewed sustainability from World Commission on Environment and Development, that Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs. He posited that an economically sustainable system must be able to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production. Also an environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources. Furthermore, a socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity, and political accountability and participation. According to *International Union for Conservation of Nature and Natural Resources* (1991), if an activity is sustainable, for all practical purposes it can continue forever. When people define an activity as sustainable, however, it is on the basis of what they know at the time. There can be no long-term guarantee of sustainability, because many factors remain

unknown or unpredictable. The moral drawn from this is: be conservative in actions that could affect the environment, study the effects of such actions carefully, and learn from your mistakes quickly.

Informal economy in Africa, particularly in Nigeria, and particularly Oyo state, is growing steadily due to the failure of the formal economy to generate sufficient employment. The latter situation has been aggravated by the continuous increase of population and slow growth of the agriculture sector (Ligthelm and Wyk, 2004). Poverty and inequality as well as lack of employment are the main factors driving people into informal economy "survivalist activities", especially trade in Non Timber Forest Products (NTFPs). The latter is particularly carried out by the poor segment of the society (Mikolo, 2007). The ability of woodcarving to sustain the livelihood of people venturing in this trade has been well documented and case studies carried out around developing countries have been convincing (CIFOR, 2002; Campbell *et al,* 2005, Mikolo, 2007). However, the industry as well as woody resources used for carving purposes were unsustainably managed for example in Kenya (Choge *et al*, 2002) and Zimbabwe (Standa-Gunda, 2004). The role of wood products in sustaining livelihoods of forest dependent people (e.g. rural and urban communities) is increasingly recognized. The role ranges from daily subsistence to income generation. It contributes significantly to households and the national economy of many developing countries (Campbell et al, 2005). Commercialization of wood carved curios has therefore the potential to provide income and improve the livelihood of people involved in the trade. Indeed, in some cases woodcarving commercialization has lifted people out of poverty (Mikolo, 2007). In Oaxaca (Mexico), the trade of woodcarving provided an estimated US$2,500 per year to a carver's household (CIFOR, 2002). In Bali (Indonesia), trade based export of curios was annually worth US$ 100 million (Mikolo, 2007) while in Saharanpur (India), the industry is worth US$ 65 million, and provides employment to 50,000 people (CIFOR, 2002). It also offers employment to 80,000 carvers in Kenya. Woodcarving is a labour intensive activity requiring dedicated people and much effort (Faleyimu and Agbeja, 2004). Woodcarving is comprised of several activities, among them harvesting, collection and transportation, carving and adding value to wood. This latter stage determines the worthiness of the final product (Nkuna, 2004). CIFOR (2002) study highlighted in a sense that "highly" processed wood will fetch higher prices at marketplaces than less processed wood. As a result, poor final touch of the products will reduce considerably the chances of products being sold at a high price. A positive relationship exists between the growth of the woodcarving sector and tourism industry. The woodcarving sector is perceived as a benchmark for tourism growth as it attracts tourists, both foreign and local (CIFOR, 2002). Typical of forest based enterprises; the craft industry requires low capital investment (Faleyimu and Agbeja, 2004, Shackleton, 2006). Despite the good trends of the woodcarving industry and its potential to sustain the livelihood of many dependants, the industry is threatened by factors such as seasonality (Matose, 2006), access to resources (Shackleton and Shackleton, 2003), arrival of tourists (Matose, 2006), supply-demand imbalance (Sunderland and Ndoye, 2004), resource scarcity (CIFOR, 2002), quality of wood (Steenkamp, 1999), Consumption pattern, environmental conditions and products on sale (Faleyimu and Agbeja, 2004; CSG, 1988). Wood carving is an important and long established traditional artifact industry in Ibadan metropolis and Oyo town (Tiri, 1998). The industry has a very rich cultural background that has influenced in no small way, its organization, products and survival. In respect of cultural heritage of wood carving, Tiri (1998) states that there is mass production of decorative and souvenir art works of various styles, quality and designs by Nigerian artisans in an attempt to fulfill some economic demand. Different wood species are used in the wood carving industry and the beauty of finished products is enhanced artificially by the application of certain additives. The wood

species commonly used in wood carving industry are Ebony (Diospyros spp), Iroko (Milicia excelsa), Ire (Funania elastica), Omo (Cordia millenii), Emi (Butyrospermum paradoxum), Opepe (Nauclea diderrichii), Oro (Antiaris Africana), Mahogany (Khaya ivorensis),Teak (Tectona grandis), Afara (Terminalia ivorensis), Asin (Chenopodiom ambrosioides), Erimado (Ricmodendrum heudelotii) and Gmelina (Gmelina arborea). Nearly everyone is a user of timber in some way and many are engaged in occupations such as wood carving, carpentry, furniture making for which timber is a major raw material (Ifebueme, 1993). According to Faleyimu and Agbeja (2004), the structure of wood carving industry in Oyo state, Nigeria, revealed that the wood carving industry has three classifications- small, medium and large scale based on the number of people engaged and capital invested in production. Economic and social changes have caused a real break in cultural wood carving continuity. More importantly, the wood carvers have been forced to turn away from their traditional pre-occupation and carve for a new world, more and more frequently a world of tourist. The reasons are economic, rather than "religious". Wood carving industry has rich cultural heritage with strong tourist attractions that should be a pride of any nation.

In view of the economic importance of wood carving in Ibadan metropolis and Oyo town, there is a need to apply revenue function model for the economic efficiency of wood artifacts industry with more emphasis on the economic implications rather than the cultural attributes. The revenue function model stipulates the technical relationships between inputs and output in any production processes (Olayide and Heady, 1982). In the same vein, Upton (1997) defines revenue function models as the relationship between the quantities of inputs used and the product obtained. The objective of this study is to determine the market analysis and the magnitude of production coefficients of the wood carvers in Ibadan metropolis and Oyo town.

METHODOLOGY

The study areas are Ibadan Metropolis and Oyo town in Oyo State, Nigeria (Figure 1). The state is located between latitude 7˚ 2211and 9˚ 171 North and longitude 2˚441 and 4˚ 451 East. Two geographical seasons are identifiable in the state. They are the rainy seasons stretching from November to early March. The mean annual temperature varies between 21.1˚C and 31.1˚C . The annual rainfall is within the range of 800mm in the derived eco-zone to 1500mm in the rainforest belt. It is bimodal with peak in July and September. Oyo State is in the Southwestern part of Nigeria. Ibadan metropolis has a population of 2,228,663 (NPC, 1991). It is 750m above sea level and has two distinct seasons: the rainy season runs from March to October while the dry season runs through November to February. Ibadan metropolis comprises eleven local government areas namely: Ibadan South-East with headquarters at Mapo, Ibadan South-West with headquarters at Oluyole Estate, Ring road, Ibadan North–west with headquarters at Onireke, Ibadan North East with headquarters at Agodi, Ibadan North with headquarters at Bodija, Akinyele with headquarters at Moniya, Egbeda with headquarters at Egbeda, Ido with headquarters at Ido, Oluyole with headquarters at Idi-Ayunre, Lagelu with headquarters at Lagelu and Ona-Ara with headquarters at Akanran. Ibadan has a total land area of 130km2. Oyo town has a total population of 260,898 people (NPC, 1991). Oyo town is made up of three local government areas namely: Oyo West Local Government, the Oyo East Local Government and the Atiba Local Government. Oyo town has derived Savanna vegetation with both favourable rainfall and adequate soils. Large area of the vegetation has been degraded by fire and farming into open savannna, hence, the place is usually swept by fire which has resulted in the area having a lot of fire tolerant tender tree species. Local variations in vegetation pattern are found due to soil variation where occasional rocky hills break the monotony of flat surfaces. The annual rainfall is about 1,133mm. There are two rainfall peaks (May –June and September – October).

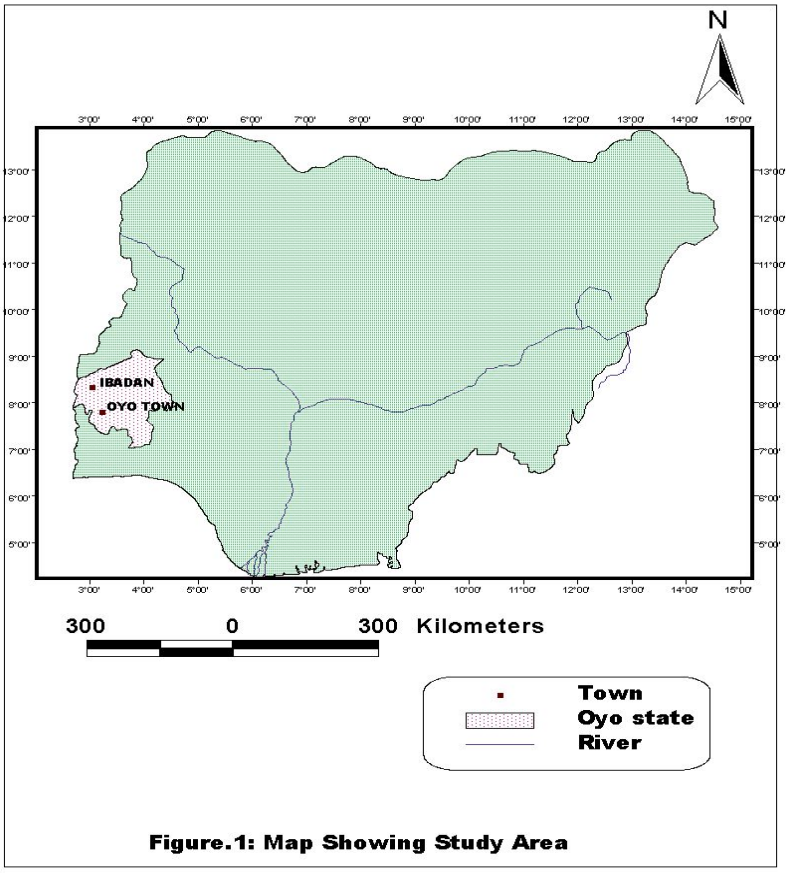

Figure.1: Map Showing Study Area

Methods of Data Collection

A purposive random sampling technique was employed based on the information given by wood carvers during the pre-tested survey that there are a limited number of wood carving workshops. Structured questionnaires were designed for the study. A total of twenty two questionnaires were administered to wood carvers in Ibadan while ten were administered to wood carvers in Oyo town to obtain information on annual revenue and annual costs of production in wood carving industry. Two procedures used for administering the questionnaire were oral interpretation of the questions in the questionnaire to illiterate respondents and self filling by the literate respondents. Inferential statistics using multiple regression analysis was used for analyzing the data to determine production coefficients.

ANALYTICAL TECHNIQUES

Revenue Function Model

A production function describes the mathematical relationship that exists between the quantity of output and the input or resource used. The need for production function analysis derives home the need to subject this technical relationship to economic analysis. This is done basically by the use of economics, statistics and econometric principles. Product output (Y) is a function of, or is determined by, the quantities of inputs used (Xi), thus; $Y = f(X1, X2, \ldots, Xn)$. In mathematical terms,

this function is assumed to be continuous and differentiable. Its differentiability enables us to establish the rates of return. In model formulation, there is often a need to decide whether a single equation or system of equations is appropriate. In this vital decision making, consideration should be given to whether the explanatory variables or independent variables are exogenously or endogenously determined in relation to the production process. If the explanatory variables are exogenously determined then a single equation is favoured. But if otherwise, a system of equation would best describe the production process. The study employed a single equation model to characterize the wood carving industry because the explanatory variables are exogenously determined in relation to the production process. A set of variables that are relevant to this model were selected based on the underlying mechanism of production process in the study area as well as resource available to the researchers. There are many algebraic forms of production functions and these include linear, square root, quadratic, semi-log, double-log (Cobb-Douglas), exponential and their variants. The criteria for choosing a functional form should be based on the understanding of the method of production and ease of computation. However, for the purpose of this study, three functional forms namely semi-log, exponential and double log were tried out of which the best fit for the production process was selected.

Q = f(X1, X2, X3, ……., Xn) Production function

Revenue = P*Q, hence

P*Q = P* f(X1, X2, X3, ..., Xn) Revenue function

Regression Analysis

Multiple regression analysis was used to determine the factors that critically influence the generation of gross income of the wood carving industry in the study area. This was also used to make forecast from the present information on the future production performance of the industry. Explicitly, the relationship between the gross revenue and input variables (costs) for the three functional forms of production used are expressed as follows:

Log Y = Log a + b1Logx1 +b2Logx2 +b3 Logx3+b4 log x4+e

Double log or Cobb-Douglas……...(1)

Log Y = a+b1x1+b2x2+b3x3+b4x4+e

Exponential or transformed semi-log……..(2)

Y = Log a +b1logx1+b2logx2+b3logx3+b4x4+e

Semi-log……..(3)

Where Y (Dependent variable) = Gross Revenue (N)

X1 = Wood utilized (N)

X2 = Labour utilized (N)

X3 = Finishing materials (N)

X4 = Annual depreciation value of the fixed cost (N)

X5= Transportation cost (N)

E = Error term

X1, X2, X3,X4 and X5 constitute the independent variables while the bs are regression coefficients.

RESULTS AND DISCUSSION

Table 1 indicates annual revenues, annual variable costs and annual depreciation values of fixed costs used in the 32 purposively sampled wood carving industry in Ibadan metropolis and Oyo town. On average, the annual revenue was more than annual costs in wood carving industry. The ratio of revenues to costs was 2.3: 1. This affirms that wood carving industry is profitable. This is an indication that average producer is able to cover his annual operating expenses.

Table 1:

Annual Revenues and Costs of Production in the Wood Carving Industry in Ibadan Metropolis and Oyo Town

Serial Number of Wood Carving workshops	Revenue in Naira (₦) Y	Wood utilized in Naira (₦) X_1	Labour utilized in Naira (₦) X_2	Finishing materials in Naira (₦) X_3	Annual depreciation in Naira (₦) X_4	Transportation (₦) X_5
1	560,000	70,000	60,000	10,650	2,047	600
2	400,000	120,000	360,000	9,200	4,788	600
3	180,000	85,000	-	5,780	5,347	300
4	600,000	130,000	192,000	11,320	8,548	700
5	80,000	295,000	60,000	9,500	9,547	400
6	1,200,000	465,000	300,000	12,500	9,650	25000
7	425,000	200,000	-	10,900	5,106	1200
8	1,076,000	384,000	-	12,800	5,648	4600
9	130,000	100,000	-	5,680	4,348	800
10	4,000,000	370,000	567,000	15,000	7,347	10000
11	700,000	65,000	-	5,000	4,698	1100
12	800,000	300,000	198,000	10,500	2,840	2500
13	600,000	400,000	144,000	6,370	5,330	370
14	850,000	260,000	-	7,920	5,330	700
15	550,000	90,000	-	8,650	3,230	670
16	400,000	70,000	120,000	11,900	6,970	665
17	600,000	130,000	168,000	12,350	6,030	8000
18	185,000	60,000	-	4,000	5,280	300
19	250,000	50,000	72,000	5,950	1,330	500
20	400,000	80,000	60,000	6,820	6,210	555
21	650,000	150,000	-	10,400	3,672	700
22	140,000	60,000	-	4,820	1,125	800
23	1500,000	400,000	60,000	13,020	4,330	400
24	750,000	180,000	168,000	9,600	5,872	3000
25	900,000	260,000	96,000	9,000	2,330	580
26	300,000	80,000	-	9,250	3,330	440
27	690,000	120,000	120,000	10,520	7,530	600
28	130,000	70,000	-	3,950	4,030	250
29	110,000	50,000	-	3,100	2,630	400
30	550,000	100,000	66,000	7,500	4,030	1200
31	280,000	60,000	72,000	5,230	4,970	500
32	450,000	250,000	-	9,650	5,270	600
Total	**661,125**	**188,875**	**90,375**	**8,713**	**4,961**	**68530**

Determinant of profitability of wood carving industry

In table 2, it was observed that all the three forms of production function fitted to the model where fit used in the equation was y = f(x1, x2, x3, x4, x5). This led to the problem of which equation to be used as the lead equation for the research. The following criteria were therefore utilized to select the mathematical form of production function that serves as lead equation.

I. The goodness of fit, using the magnitude of the coefficient of determination (r^2)

Ii. The significance of the overall regression coefficient on the income as judged by f- value.

Iii. The significance of the t-value of regression coefficients

Iv. The ease of mathematical manipulation and economic interpretation of the production parameters.

The coefficients of determination (r^2) for the functional forms of production tried were 0.7226, 0.4531 and 0.7603 for cobb-douglas, semi-log and exponential respectively. If expressed in percentages, it gives 72.26, 45.31 and 76.05% respectively (table 2). The result shows from these percentages that all the forms are fitted for wood carving industry judging from the value of r^2. This means that the variability in the gross revenue is explained to about 45 percent by these functional forms. However, the form that has the highest r^2 value is exponential function with 76.03%. It is evident from this that the proportion of variation in y which is explained by variation in the independent variables using exponential function is 76.03%.

TABLE 2:

Results of multiple Regression Analysis

Functional form	**Constant term**	**X_1**	**X_2**	**X_3**	**X_4**	**X_5**	**R^2**	**R^{-2}**	**F-value**
Double-Log Function	0.3815 (0.6732)	0.0088 (0.4265)	0.1860 (0.0726)*	0.0423 (0.7429)	0.6472 (0.0015)*	0.4148 (0.0483)*	0.8501	0.7226	13.54
Semi-Log Function	-12662669.7 (0.0018)	20616.96 (0.6456)	389369.22 (0.03456)*	145590.16 (0.7820)	1188814.86 (0.1233)	1439319.56 (0.0896)*	0.6731	0.4531	4.31
Exponential Function	5.2881 (0.000)	$3.80992*10^{-7}$ (0.0957)*	$3.63546*10^{-7}$ (0.0583)*	$-3.99323*10^{-6}$ (0.7534)	$4.10317*10^{-5}$ (0.0002)*	$5.40525*10^{-6}$ (0.0888)*	0.8720	0.7603	16.49

*Coefficient is significant at 1% & 5% -level.

Considering the significance of the overall regression coefficients of explanatory variables as judged by F- value, the F- value of exponential function is the highest with 16.49 followed by double-log with 13.54 and semi-log function with 4.31. Also putting into consideration the ease of mathematical manipulation and economic interpretation of production parameters, exponential function is the most favoured.

All the coefficients have the appropriate signs in line with economic theory. The gross income is expected to vary positively with the wood utilized, labour, finishing materials and transportation cost. Annual depreciation value is expected to have a direct negative relationship with gross income.

The coefficient of the regression is also the elasticity coefficient and it is easy to calculate, and it is useful to know which of the inputs to be increased and which to be reduced in production line. Therefore, base on the fact that exponential function is

able to satisfy all the four criteria mentioned earlier, it is considered as the lead equation for wood carving industry under investigation. The discussion on production function analysis will strictly be restricted to exponential function

Thus, the lead equation as presented by exponential function is shown as:

$$\text{Log } Y = 5.2881 + 3.80992*10^{-7} + 3.63546*10^{-7} + -3.99323*10^{-6} + 4.10317*10^{-5} + 5.40525*10^{-6}$$

(0.000) (0.0957)* (0.0583)* (0.7534) (0.0002)* (0.0888)*

(X1) (X2) (X3) (X4) (X5)

$R = 0.8720$

$R^2 = 0.7603$

F-Value = 16.49

The above equation and figures revealed a high performance of this model in term of the high value of R^2. The high value of R^2 implies that 76.03% variability in gross income generated from wood carving industry is explained by combined effect of the independent variables. The joint significance of the explanatory variables is high since F-value is significant at both 1% and 5%. This tells us that all the exogenous variables are significant factors, accounting for all variability in the gross income generated from the industry. Wood utilized, labour, transportation cost and finishing material are highly significant at 1% t-value of significance. Annual depreciation value of the fixed cost is not significant. The annual depreciation value of the fixed input in the industry (x4) showed a negative correlation with gross income the industry. This implies that a unit increase in quantity of depreciation value will lead to a reduction in gross income. This can be attributed to the fact that if the annual depreciation values of the fixed inputs are increased without necessary expansion in the scale of production, more cost will be incurred and this will reduce the gross income.

CONCLUSION AND RECOMMENDATION

According to FAO (2006) and Faleyimu (2010), there are several obstacles to sustainable forest management in Nigeria. These include the discretionary power of government to de-reserve or harvest the forests; the lack of a coherent forest policy; the prevalence of illegal logging, chronic under-resourcing of forestry programmes and forest management, excessive bureaucracy, the lack of inter-sectoral coordination; and the overall absence of reliable data on which to base forestry planning and development. Nigeria has a long history of forest management and the formal goal is to achieve self-sufficiency in all aspects of forest production; however; the country, once a significant exporter; is now a net importer of primary forest products. Sustainable forest management is essential for guaranteed supply goods (wood for carved products) and services.

Exponential function was selected as the lead equation because of its fitness. It has the highest multiple coefficient of determination. F-value was equally high and mathematically, was also easy to compute. The annual depreciation value of fixed inputs did not significantly influence the level of gross income from the wood carving area. However, wood utilized, labour, finishing materials and transportation cost were found to exert significant influence on the level of gross income generated from the industry. Therefore in order to operate successfully, wood carvers should employ more of the input that shows positive correlation with gross income. Having realized that operating on a large scale will result into increasing national income and per capita income, it is therefore, recommended that there should be a re-organization of the industry to enhance its productive potentials and profitability. The state government should motivate the wood carvers with incentives to

expand the scale of production which in turn would foster tourist attractions and would also generate more revenue to the wood carvers and development levy into purse of the state government.

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