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Woodfuel Business as a Source of Livelihood in Makurdi Local Government Area, Central Nigeria

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Prompted by an observation that many people in the study area are selling firewood and charcoal, and thus relying so much on trees for their survival, this study sets out to assess the role of woodfuel business as a source of livelihood in Makurdi L.G.A. of Benue State, Central Nigeria. Using survey design, data for the study was obtained from the field through questionnaire and structured interviews. Descriptive statistical methods, as well as Pearson's Product Moment Correlation technique were used in analyzing the data. Results showed that people of diverse socio-economic status are involved in the business both in full and part time basis, as the business in the area serves both as primary and secondary sources of livelihood to the people. This is evidenced in the business yielding 99.8% to income in the area, an average of N3,600 per month. With this, they can attend to their pressing needs, hence reducing their poverty. Woodfuel is produced in the rural fringes of the L.G.A, with preferred tree species such as *Prosopis Africana Terminalia ivorenses*, *Isoberlina doka Erythrophelum suavalens* and *Sysgium guineese*. The study, therefore recommends the establishment of wood development programme to sustain this business, as well as urging the government to provide alternative cooking fuels such as kerosene, Liquefied Petroleum Gas (LPG) and electricity to reduce over dependence on woodfuel.

Keywords: Woodfuel, Livelihood, Socio-economic Characteristics.

INTRODUCTION

In most developing countries, including Nigeria, people in rural and semi-urban areas rely heavily on natural resources for their livelihoods. One of such natural resources is the trees in our environments which provide food, energy, income, fodder, medicines, constructing and fencing materials, agricultural implements and domestic utensils. The trees also provide fuel, and perform environmental functions as well as have socio-cultural and religious purposes (Gelder and O'Keefe, 1995).

Woodfuel which comprises of firewood (or fuelwood), charcoal and chips play a dual role in rural and semi-urban areas of developing Countries, including Nigeria. In the first place, it provides fuel for domestic and commercial cooking. Secondly, it is used as an article for business; hence, it provides a source of livelihood for those involved in the business. The charcoal sector alone, which has acquired considerable economic weight accounts for an annual turnover of several million dollars for a number of African countries (Arnold et al, 2003; Girard, 2002). Records indicate that as at 2008, 80% of Nigerian households still use woodfuel as the main source of fuel for cooking (Foley, 1986; NBS, 2009).

Whereas concerns over the environmental consequences of woodfuel explorations have led to the banning of the business at one time or the other, there has been no such ban

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in Nigeria, hence the business is booming in full force, as a livelihood strategy, especially in rural areas.

The ever-increasing population of Makurdi Metropolis inspires an increase in the demand for woodfuel and provides impetus for more people to engage in woodfuel business, with those involved therein seemingly making a living out of it. Meanwhile, woody vegetation is in abundance in the area and is being exploited for this business. There is the likelihood that sooner than later, supply sources would not cope with demand and the business would suffer. There is therefore the need to assess woodfuel business as a source of livelihood among the urban residents of Makurdi, in Benue State, Nigeria.

Patterns of Woodfuel Consumption in Developing Regions

Records show that some two billion people, most of them from less-developed countries of the world, depend on firewood and charcoal as their primary energy source (Cunningham and Saigo, 2001 and Meregini, 2002). The consumption of woodfuel occurs in households, commercial outlets as well as service centers. Table 1 below shows the patterns of woodfuel consumption in developing regions of the world since the 1970's as well as their projections for the next two and a half decades.

The Table shows that firewood consumption in Africa increased steadily from 261.1 million cubic metres in 1970 to 485.7 million cubic metres in 2010, with an expected all high projection of 544.8 million cubic metres in 2030. The same trend applies to the other developing regions of Asia and America. Similarly, the table shows that charcoal consumption in South Asia rose from 1.3 million tons to 2.2 million tons in 2010 and is expected to rise to 2.5 million tons in 2030; while its consumption in Africa rose steadily from 8.1 million tons in 1970 to 30.2 million tons in 2010, and is projected to rise to 46.1 million tons in the year 2030. The ever growing consumption rate of woodfuel as seen above reflects an even higher demand for the commodity, implying that supply needs to be high as well.

The Study Area

Makurdi Local Government Area has a population of 300,000 persons (NPC, 2006), and lies between latitudes $7^0 40^l$N and $7^0 53^l$N of the equator, and between longitudes $8^0 22^l$E and $8^0 35^l$E of the Greenwich Meridian. It is a 16km radius circle, covering 804km^2 land mass (Fig.1).

Makurdi L.G.A comprises eleven (11) council wards, namely Mbalagh, Agan, North Bank I and North Bank II. Others are Fiidi, Wailomayo, Baa, Modern Market, Ankpa/Wadata, Clerk Market and Central/South Mission. Being situated in the Lower Benue Valley, the relief of the Local Government Area (L.G.A) is generally low, with heights ranging between 73 meters and 167 meters above sea level. The soils of Makurdi generally are highly ferruginous tropical soils (Areola, 1983; Nyagba, 1995). Climatically, Makurdi falls within the tropical, sub humid, wet and dry climate which has two distinct seasons, namely wet season and dry season. The wet season starts from April and lasts till October; while the dry season starts in November and lasts till March. Rainfall ranges from 775 millimeters to 1792 millimeters, with a mean annual value of 1190 millimeters. Mean Monthly Relative Humidity in Makurdi LGA varies between 43% in January to 81% in July-August period (Tyubee, 2009).

Makurdi L.G.A. falls within the Guinea Savannah belt of Nigeria (Fig 2). The Guinea Savannah belt is a transitional vegetation zone separating the forested belt of southern Nigeria from the true savannah of the north. It is characterized by a mixture of tall grasses and trees of average height. Most of the trees are deciduous and shed their leaves during dry season (Areola, 1983).

MATERIALS AND METHODS

There are eleven (11) Council Wards in Makurdi L.G.A Using a combination of stratified and purposive sampling techniques, three of the wards (North Bank II, Ankpa Ward/Wadata, and Fiidi) were selected for the study, with those so selected being the ones in which all components/aspects of woodfuel business were observed to be well pronounced. Through administration of 274 questionnaires, with 250 retrieved, an interview was conducted with key stakeholders in the business, such as woodfuel producers, choppers, loaders, transporters, traders and consumers, a motley array of information was acquired. The information related to source of wood for woodfuel production, tree-types in use; methods of harvesting/ extraction, number and category of persons involved in the business and their socio-economic characteristics. Others include markets for woodfuel, benefits derived from the business and perception of associated environmental issues related to the business in the study area. In addition to the use of descriptive statistical methods in analyzing the data collected, the Product Moment Correlation coefficient (r) was applied to establish the relationship between the two variables of interest, which are, woodfuel business as an independent variable (x) and income generated from the business as the dependent variable (y).

Furthermore, the bivariate regression analysis was applied in order to establish the extent of the link between woodfuel business and income generated from it. The bivariate regression analysis was used to determine the precise mathematical model of the relationship between the two variables. According to Anyadike (2009), it is given as:

$Y = a + bX$; where:
Y = the dependent variable,
X = the independent variable
a = intercept
b = slope or gradient term.

RESULTS AND DISCUSSION

The study found out the socio-economic characteristics of the respondents and summarized same as contained in Table 2.

Table 2 shows that 34% of respondents were males while 66% were females. This implies that two-thirds of those involved in woodfuel business in the study area are women. In terms of age, 17.2% were aged below 20 years, 56% were aged between 20 and 30 years, while 18.8% were aged above 30 years. This implies that majority of those involved in woodfuel business in the study area are young and active adults who are very productive. Occupationally, 18.8%, 15.2%, 16% and 5.6% of the respondents were farmers, woodfuel dealers, traders and transporters respectively, while the remaining 44.4% belonged to sundry occupations, including civil service, schooling, armed forces/ paramilitary, masonry, carpentry, mechanics, and printing.

This implies that people of varied occupations are involved in woodfuel business in the study area. These varied occupations are also indicative of the metropolitan nature of

Table 1: Patterns/Projections of Woodfuel Consumption in main Developing Regions to 2030

	1970	1980	1990	2000	2010	2020	2030
Fuelwood (Million Cubic Metres)							
South Asia	234.5	286.6	336.4	359.9	372.5	361.5	338.6
Southeast Asia	294.6	263.1	221.7	178.0	139.1	107.5	81.3
East Asia	261.1	305.1	364.6	440.0	485.7	526.0	544.8
Africa	261.1	305.1	364.6	440.0	485.7	26.0	544.8
South America	88.6	92.0	96.4	100.2	107.1	114.9	122.0
World	**1,444.7**	**1,572.7**	**1,611.6**	**1,616.2**	**1,591.3**	**1,558.3**	**501.6**
Charcoal (Million Tons)							
South Asia	1.3	1.6	1.9	2.1	2.2	2.4	2.5
Southeast Asia	0.8	1.2	1.4	1.6	1.9	2.1	2.3
East Asia	2.1	2.3	2.3	2.2	2.1	2.0	1.8
Africa	8.1	11.0	16.1	23.0	30.2	38.4	46.1
South America	7.2	9.0	12.1	14.4	16.7	18.6	20.0
World	21.2	27.0	35.8	45.8	55.8	66.3	75.6

Source: *Culled from Arnold et al (2003)*

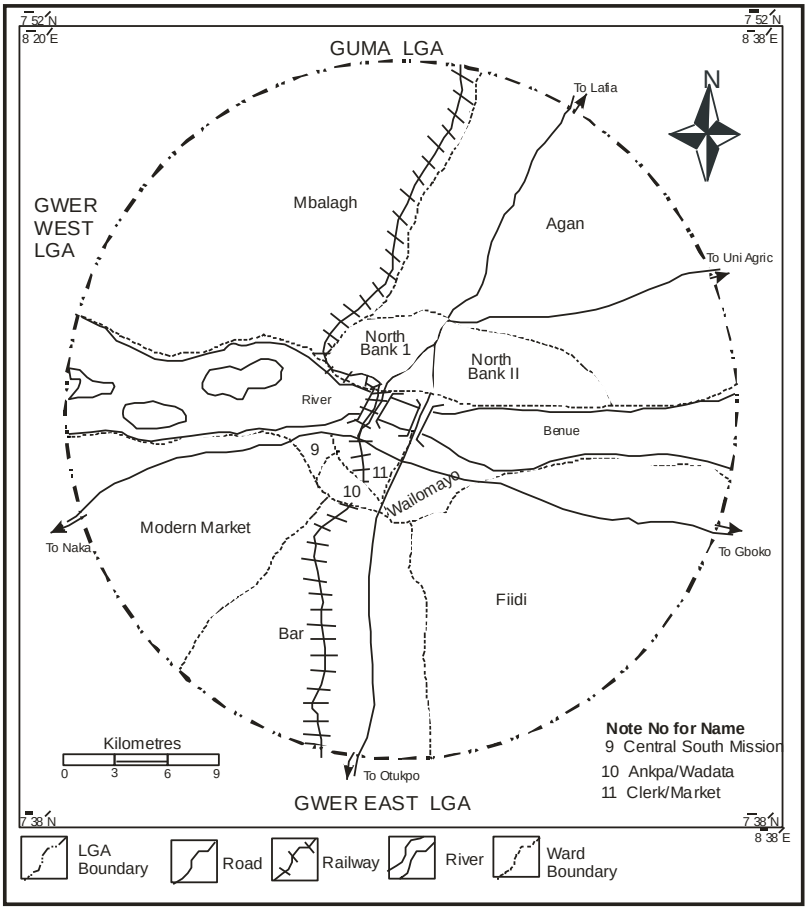

Figure 1 : Map of Makurdi Local Government Area..
Source : Ministry of Lands and Survey Makurdi

the study area. Furthermore, table 2 shows the specific components of the woodfuel business to which respondents were involved in. It shows that 45.6% of the respondents were involved in the consumption component, 35.2% in the trading component, and 6.8%, in the transportation component. Production, chopping and loading components had 5.2%, 4.8% and 2.4% of the respondents respectively. This implies that the consumption and trade of woodfuel in the study area is high; while the production of same within the study area is low. This is because woodfuel production is a rural-based activity, taking

Table 2: Socio-Economic Characteristics of Respondents

Ward Sampled	Gender		Total No. of Respondents	Age Group			Occupation of Respondents					Major Component of Involvement						Livelihood Category	
	M	F	79	>20	20-30	<30	Farming	Wood fuel	Trading	Transportation	Others	Production	Loading	Transportation	Trading	Chopping	Consumption	Primary	Secondary
North Bank II	31	48	79	13	45	21	14	12	18	5	30	2	2	5	26	4	37	28	51
Ankpa/Wadata	28	55	83	16	48	19	15	10	14	4	40	3	1	5	34	6	34	39	44
Fiidi	26	62	88	14	47	27	18	16	8	5	41	8	3	7	28	2	43	32	56
Total	**85**	**165**	**250**	**43**	**140**	**67**	**47**	**38**	**40**	**14**	**111**	**13**	**6**	**17**	**88**	**12**	**114**	**99**	**151**
Percentage (%)	**34**	**66**	**100**	**17.2**	**56**	**26.8**	**18.8**	**15.2**	**16**	**5.6**	**44.4**	**5.2**	**2.4**	**6.8**	**35.2**	**4.8**	**45.6**	**39.6**	**60.4**

Table 3: Average Monthly Income of Respondents Prior to and Currently with their Involvement in Woodfuel Business

Monthly Income Range in N'000	North Bank II	Ankpa/Wadata	Fiidi	Total	Percentage
A: Prior to Involvement in Woodfuel Business					
1-10	46	39	48	133	53.2
11-20	26	34	32	92	36.8
21 & above	7	10	8	25	10
Total	**79**	**83**	**88**	**250**	**100**
B: Currently, with Involvement in Woodfuel Business					
1-10	39	29	33	101	40.4
11-20	31	42	43	116	45.4
21 & above	9	12	12	33	13.2
Total	**79**	**83**	**88**	**250**	**100**

Source: Author's Field Work (Sept, 2012)

Table 4: Average profit per month realized from woodfuel business in Makurdi LGA

Ward	Number of Respondents	Profit Realized per Month in N'000
North Bank II	79	4
Ankpa/Wadata	83	3
Fiidi	88	4
Total	**250**	**11+3=367**

Table 5: Net Profit Realized per Week from Charcoal Sale in Makurdi LGA

Number of Charcoal Seller (N)	Average Bags of Charcoal Sold (X)	Net Profit Realized per Week in N'000 (Y)
5	2	500
4	5	1100
7	3	700
5	6	1300
6	1	250
8	9	2000
4	10	2200
6	8	1800
5	4	900
4	7	1500
N=54	**∑X=55**	**∑Y=N12,250**

Table 6: Squares and Product of X & Y

X^2	Y^2	XY
4	250,000	1000
25	1,210,000	5,5000
9	490,000	2100
36	1,690,000	7800
1	62,500	250
81	4,000,000	18,000
100	4,840,000	22,000
64	3,240,000	14,400
16	810,000	3,600
49	2,250,000	10,500
$\sum X^2$=385	**$\sum Y^2$=18,842,500**	**$\sum$XY=85,150**

Table 7: Result of Correlation Analysis (Person's Product Moment Correlation)

Sum of variables	**N=54**	**X=55**	**Y=12250**	**X^2=385**	**Y^2=18842500**	**XY=85150**
Derived Statistics r=0.9995 Coefficient of determination (r^2) = 99.8						
Valued of t at 0.05 alpha level			Calculated valued		Critical (Table) value	
			88.39		1.85	
Standard Rule	Reject H0 when calculated value > Critical Value Accept H0 when calculated value < Critical value					

Table 8: Result of Regression Analysis

Variables	**N=10**	**$\sum$X=55**	**$\sum$Y=12250**	**$\sum X^2$=385**	**$\sum$XY=85150**
Derived Statistics					
A		**B**		**Y**	
1620		-71.82		1620-71.82	

Source: Authors' Field Work (Sept, 2012)

place only in the rural fringe zones of Makurdi L.G.A, as well as the adjoining rural L.G.As of Guma, Tarka, Gwer and Gwer West. Though the vegetation of Makurdi L.G.A. consists of a variety of tree species, those preferred for woodfuel exploitation by the producers includes *Erythophelum suavalense, Vitallaria paradoxa* and *Sysgium guinense.* These species are most preferred for woodfuel production because they are hard and weightier in nature, hence suits the purpose better than other species. These trees which require a long period to replenish naturally are removed by the producers without replacement. Thus, the majority of the producers agreed that stands of such tree species in the study area were fast decreasing, even nearing extinction, thereby threatening the sustainability of the business itself and the environment.

It was also found out that though the Forestry Department of the Benue State Ministry of Water Resources and Environment has designated some of the said tree species, especially *Prosopis africana, Vitallaria paradoxa* and *Terminalia ivorensis*, as protected trees which should not be felled indiscriminately, in practice, government agents simply collect levies on wood products such as firewood and charcoal without necessarily ascertaining the stuff they are made of. In this way, government's regulation of the woodfuel business in the study area is rather lopsided as it is only tilted towards revenue generation to the exclusion of environmental protection.

Lastly, Table 2 also shows the livelihood categories respondents are engaged in, which is woodfuel business in the study area. It shows that 39. 6% of the respondents participated in the business as their primary source of livelihood, while 60.4% did so as their secondary source of livelihood alongside other activities such as civil service, fishing, transportation and trading.

The average monthly income of respondents prior to their involvement in woodfuel business as well as their current income now that they are involved in the business is as shown in Table 3. The table indicates that before being involved in woodfuel business, 53.2%, earned N10,000 per month, as 36.8% earned between N11,000 and N20,000 per month, while 10% earned above N 20,000 per month. Since they involved in woodfuel business, the number of respondents earning just up to N 10,000 per month dropped to 40.4%, while those earning between N11,000 and N 20,000 as well as above N20,000 per month rose to 45.4% and 13.2% respectively. In this way, Table 3 implies that the income of respondents has increased since their involvement in the business, thereby making them better placed to provide for some other basic needs which they hitherto could not do so.

Table 4 shows that in Northbank II and Fiidi Wards, respondents realized an average profit of N4000 per month, whereas in Ankpa/Wadata Ward, the amount realized is N3000. On the average, profit per month from woodfuel business in the study area is N3670. Even though this realized amount is actually handled by the producers, loaders, transporters, choppers and traders of woodfuel, to the consumers, this amount represents money saved as a result of

using woodfuel, which is easily accessible and costs less as against other alternatives, such as kerosene, gas and electricity. This money so saved is used in meeting other needs, such as purchase of food items, payment of medical bills, payment of school fees and re-investment in farm activities.

Table 5 shows that 54 charcoal traders who responded sold a total of 55 bags of charcoal per week and generated a net income of N12250, which brings the average to N220. This implies that, on the average, charcoal traders gain at least N220 every week, after deducting every other cost from the gross income realized.

Table 6 is an expansion of Table 5, in which the bags of charcoal sold are reckoned as the independent variable, X; and the net income realized from such sales, as the dependent variable, Y. The table shows the squares of the said variables, their products and the ensuing totals for each operation (that is, X^2, Y^2, X and Y).

Table 7 shows a correlation coefficient, r, of 0.9995, which implies that there is a strong positive relationship between woodfuel business and income generation in the study area. The table also shows a coefficient of determination of 99.8, which implies that 99.8% of the income generated by the respondents is accounted for by their involvement in woodfuel business. Furthermore, the table shows that by applying the student's t-test to r with an aim of testing the significance of the relationship, a calculated t value of 88.39 is obtained at a 0.05 level of significance. The critical value of t at the same level of significance is 1.86, which is far less than t-calculated. This result shows that there is a positive relationship between woodfuel business and income generation in the study area earlier arrived at did not occur by chance.

Lastly, table 8 shows the result of regression analysis carried out on the data in order to ascertain the extent of income generation in the study area through woodfuel business. The table shows an intercept, a, of 1620, and a gradient, b, of -71.82 and a linear regression equation, Y= 1620 – 71.82x. The regression equation, yields a model, which implies that, other things being equal, the income generated by woodfuel traders, especially charcoal traders, at any point in time, could be estimated by adding the constant,1620 to the product of -71.82 and the number of charcoal bags, (X), sold. In this way, given any of the two variables, Y and X, the other can be predicted.

CONCLUSION AND RECOMMENDATION

Makurdi Local Government Area in Central Nigeria comprises of an ever-increasing population of people of diverse socio-economic backgrounds who are variously engaged in all aspects of woodfuel business, ranging from its production, loading, transportation, chopping, trading and consumption. In order for the business to be sustainable, this study recommends the establishment of wood development programme which could encourage woodfuel producers to plant trees in large quantities for future use.

Equally recommended is the enlightenment of the citizenry on sustainable use of vegetal resources and the provision of alternative cooking fuels at subsidized rates in order to reduce dependence on woodfuel. Government and other stakeholders can achieve this if only they take bold steps towards liquefying the abundant gas, which is presently being flared from the few functional refineries in the country.

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