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## **Comparative Analysis on the trends in the volume of logs supplied to sawmill in Edo State, Nigeria**

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**ABSTRACT:** The study was carried out to evaluate the trends in the volume of some commonly utilized timber species supplied to sawmill in Edo State for a period of eight years (2002 - 2009) and compare the results with the trend obtained in the last decade (1991-2000). Primary data used for the study were collected from randomly selected sawmills in Edo State. Data collected for the study include species, size, quantity and date of log supplied to the sawmill. The data were collated and analyzed using linear regression model and analysis of variance procedure to determine differences between means of the different variables. The results of the regression model showed that volume of logs supplied to sawmills between 2002 - 2009 decreased annually by 41.178m<sup>3</sup>. The results also showed that, the total volume of logs supplied to sawmill in Edo State for the period 2002-2009 was 64,938.3m<sup>3</sup> while the total volume supplied for the period 1991 - 2000 was 4,689,378m<sup>3</sup>. The results further revealed that, the volume of logs supplied to sawmill in Edo State decline from 10,414.95m<sup>3</sup> in 2002 to 6,058.95m<sup>3</sup> in 2009 compared with the volume obtained in the last decade with a decreasing trend of 813,006m<sup>3</sup> in 1991 to 183,864m<sup>3</sup> in 2000.

**Key words:** Sawmill, Logs supplied, Timber species, Comparative Analysis, Declining trend, Uncontrolled exploitation.

### **Introduction**

The tropical rainforest is one of the major vegetation types of the globe (Richards, 1996; Whitmore, 1998). It occupies a total area of 1818.43 million hectares, representing 47% of the total land area occupied by all forest types of the world (FAO, 2003). The Nigeria forest estate is estimated at about 10 million hectares with about 20 percent in reserve and consists of vegetation types ranging from mangrove swamp, lowland rainforest and savanna (Olaleye, 1999). Different tropical hardwood species are exploited to provide raw materials for the forest industries in the country. Effective forest management requires estimates of growing stock. The availability of such information guide forest managers in timber valuation as well as the allocation of forest areas for harvest. For timber production, an estimate of growing stock is often expressed in form of timber volume which can be estimated from easily measurable tree dimensions (Akindele and Lemay, 2006). The reliability of volume estimate depends on the range and extent of the available sample data (Akindele and Lemay, 2006).

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The rapid depletion of forest resources has put the environment in jeopardy causing life threatening problems as climate change, food insecurity, water scarcity, epidemics, erosion, poverty, deaths and conflicts due to competition for resources around the world (UNDP,2006). This situation has resulted in insufficient availability of raw materials for wood based industries (Fuwape, 1987). The economic value of a species has a major effect on its exploitation, hence its supply. Sawmill industry in Nigeria has an estimated capacity of approximately 12 million m<sup>3</sup> per year in log equivalent, though only 40 percent of this capacity is actually used (Tembe *et al*, 2010). Fuwape (1987), further reported that out of 100 percent volume of logs in sawmill, only 25% of these volume are used as finished products while 65 percent is left as waste and 10 percent as mill loss. However, as a result of the inadequate information for proper forest management planning and excessive exploitation of timber, the guarantee for continuous supply is limited. In Edo State, forest reserves have been intensively encroached by loggers and farmers due to poor forest regulation and control. This had led to further degradation of the once rich rainforest ecosystem. It is disturbing that, more than three quarters of the reserves have been converted to secondary forest ( Isikhuemen, 1998). This situation has resulted in a sharp decline in the volume of logs supplied to sawmill compared to what was obtainable some decades ago. This study was designed to evaluate the trends in the volume of some commonly utilized timber species supplied to sawmills in Edo State for the period 2002 - 2009 and compared its trend with the volume supplied to the state between 1991 - 2000.

## **Materials and Methods**

### **Study Area**

The study was carried out in Edo State, Nigeria. The State has a land area of 19,035km<sup>2</sup> (Beaks and Geomatics, 1999). Edo State is located within latitude 5<sup>o</sup> 45' and 7<sup>o</sup> 8' north and longitude 5<sup>o</sup>4' and 6<sup>o</sup>52' east. The climate of the state is characterized by humid conditions in the south and sub-humid conditions in the north with distinct wet and dry seasons (Okoro, 2004). The rainfall pattern in the state is bimodal and varies from over 2000mm a year in the humid southern part to about 1150mm a year in the sub-humid northern part of the state. The mean monthly temperature is about 27<sup>o</sup>C with a range of 22<sup>o</sup> - 35<sup>o</sup>C while the relative humidity range from 79- 90% (Beaks and Geomatics, 1999).

### **Data collection and Analysis**

A survey of operational sawmills in Edo State was carried out using the list of registered sawmills obtained from the Department of Forestry, Ministry of Environment, Benin City. Twenty representative sawmills were randomly selected for the study based on their daily output production and the number of headrigs in the sawmills (Izekor and Okoro, 2004). Primary data used for the study were collected from the record book obtained from the management of each of the selected sawmill. Information on logs supplied to sawmill for a period of eight years (2002 - 2009) were collected. Other parameters measured include date, species and girth of logs supplied to the sawmill (Izekor and Okoro, 2004). The volume of logs was computed from the Hoppus table using the girth of the log at the widest part of the stem. The Hoppus table gives the volume of in cubic feet, the volume obtained was converted to cubic meter by multiplying the volume of each log by a factor of 0.02832m<sup>3</sup>.

The data collected were analyzed using descriptive statistics of simple means and standard deviation. Regression analysis was also used to predict the rate of decline in the volume of logs supplied to sawmill in Edo State.

## **Results and Discussion**

A total of forty five timber species were identified during the study, fifteen of these species were observed to be common to all the twenty representatives sawmill used for the study. These timber species are Albizia, Alsonia, Bafia, Bombax, Ekhimi, Eki, Ewinwan, Iroko, Nikiba, Obobonofua, Ohia, Okan, Okwen, Ovinyin and Owewe. Details of these timber species and their trade names are presented in Table 1. The total volume of logs supplied to the sampled sawmill in Edo State for the period (2002-2009) was 64,938.3m<sup>3</sup> with an average annual volume of 8,117.2m<sup>3</sup> (Table 2). The result also showed that, the volume of logs supplied among the fifteen common timber tree

species supplied to sawmill in Edo State decreased from 10,414m<sup>3</sup> in 2002 to 6,058m<sup>3</sup> in 2009. The results further revealed that, the volume of logs supplied for each of the species over the period 2002-2009 were as follows; Albizia 4,851.15m<sup>3</sup>, Alstonia 4,074m<sup>3</sup>, Bafia 3,820.95m<sup>3</sup>, Bombax 5,607m<sup>3</sup>, Ekimi 4,335.9m<sup>3</sup>, Eki 6,080m<sup>3</sup>, Ewinwan 2,700m<sup>3</sup>, Iroko 781.95m<sup>3</sup>, Nikiba 4,829.85m<sup>3</sup>, Obobo 3,660m<sup>3</sup>, Ohia 4,356.9m<sup>3</sup>, Okan 5,303.1m<sup>3</sup>, Okwen 6,387m<sup>3</sup>, Ovinin 2947.95m<sup>3</sup> and Owewe, 5,202.15m<sup>3</sup>.

**Table 1: List of Fifteen common timber species supplied to sawmill in Edo State**

| S/N | TRADE NAME | BOTANICAL NAME                   | FAMILY           |
|-----|------------|----------------------------------|------------------|
| 1   | Albizia    | <i>Albizia zigia</i>             | MIMOSACEAE       |
| 2   | Alstonia   | <i>Alstonia boonei</i>           | APOCYNACEAE      |
| 3   | Bafia      | <i>Baphia nitida</i>             | PAPILIONOIDEAE   |
| 4   | Bombax     | <i>Bombax binopozense</i>        | BOMBACEAE        |
| 5   | Ekimi      | <i>Piptadeniastrum africanum</i> | MIMOSOIDEAE      |
| 6   | Eki        | <i>Lophira alata</i>             | OCHNACEAE        |
| 7   | Ewinwan    | <i>Lannea welwitschill</i>       | ANACARDIACEAE    |
| 8   | Iroko      | <i>Milicia excels</i>            | MORACEAE         |
| 9   | Nikiba     | <i>Pausinystalia macrophylla</i> | RUBIACEAE        |
| 10  | Obobonofua | <i>Guarea cedreta</i>            | MELIACEAE        |
| 11  | Ohia       | <i>Celtis zenkeri</i>            | ULMACEAE         |
| 12  | Okan       | <i>Cylicodiscus gabunensis</i>   | MIMOSOIDEAE      |
| 13  | Okwen      | <i>Brachystegia nigerica</i>     | CAESALPINIOIDEAE |
| 14  | Ovinin     | <i>Erythropheum ivorense</i>     | CAESALPINIACEAE  |
| 15  | Owewe      | <i>Petersianthus macrocarpus</i> | LECYTHIDACEAE    |

Source: Field Survey 2009

The mean volume of logs supplied to sampled sawmill in Edo State for the fifteen most common timber species are presented in Table 3. The results showed that Albizia has a mean volume of 40.42m<sup>3</sup>, Alstonia 33.95m<sup>3</sup>, Baphia 31.84m<sup>3</sup>, Bombax 46.73m<sup>3</sup>, Ekimi 36.13m<sup>3</sup>, Eki 50.67m<sup>3</sup>, Ewinwan 22.50m<sup>3</sup>, Iroko 6.25m<sup>3</sup>, Nikiba 40.25m<sup>3</sup>, Obobo 30.50m<sup>3</sup>, Ohia 36.31m<sup>3</sup>, Okan 44.19m<sup>3</sup>, Okwen 55.23m<sup>3</sup>, Oviyin 24.57m<sup>3</sup> and Owewe 43.35m<sup>3</sup>. The percentage rate of decline for these species are presented in Table 4. The results showed that all the timber species supplied to sawmill decline rapidly from 2002-2009 with the exception of Eki and Baphia which has increased supply of 15.95% and 15.75% respectively. Alstonia has a declining rate of 9.54%, Alstonia 11.28%, Bombax 10.52%, Ekimi 11.51%, Ewinwan 12.53%, Iroko 18.63%, Nikiba 9.78%, Obobo 12.40%, Ohia 11.45%, Okan 9.60%, Okwen 11.26%, Ovinin 11.71%, Owewe 13.50%.

The results showing the trends in the volume of some common timber species supplied to sawmill in Edo State from 1991-2000 and 2002-2009 are presented in Table 5. Six timber tree species were identified to be common among the logs supplied to sawmill between 1991-2000 and 2001 and 2008. Significant differences (p<0.05) was observed in the trends of these common timber species supplied to sawmill in Edo State in the past decade (1991-2000) compared to its trends of decline in 2002-2009.

**Table 2: Total volume of logs supplied to sampled sawmills (000m<sup>3</sup>)**

| S/N | Trade Name | 2002    | 2003    | 2004   | 2005   | 2006   | 2007   | 2008    | 2009    | Total   |
|-----|------------|---------|---------|--------|--------|--------|--------|---------|---------|---------|
| 1   | Albizia    | 817.05  | 745.95  | 702.00 | 634.05 | 565.05 | 522.00 | 460.05  | 405.00  | 4851.15 |
| 2   | Alstonia   | 706.95  | 655.95  | 592.05 | 538.05 | 481.05 | 433.95 | 360.00  | 306.00  | 4074.00 |
| 3   | Bafia      | 253.95  | 315.00  | 367.95 | 429.00 | 531.00 | 574.05 | 643.05  | 706.95  | 3820.95 |
| 4   | Bombax     | 960.00  | 873.00  | 840.00 | 720.00 | 663.00 | 597.00 | 513.00  | 441.00  | 5607.00 |
| 5   | Ekhimi     | 790.95  | 705.00  | 630.00 | 582.00 | 490.95 | 424.05 | 376.95  | 336.00  | 4335.90 |
| 6   | Eki        | 397.05  | 469.05  | 586.05 | 681.00 | 853.95 | 939.00 | 1035.00 | 1119.00 | 6080.10 |
| 7   | Ewinwan    | 490.05  | 445.05  | 397.95 | 358.95 | 315.00 | 274.95 | 226.05  | 192.00  | 2700.00 |
| 8   | Iroko      | 172.95  | 141.00  | 118.95 | 100.95 | 82.05  | 70.95  | 55.05   | 40.05   | 781.95  |
| 9   | Likiba     | 826.05  | 760.95  | 699.00 | 633.00 | 550.95 | 505.95 | 451.95  | 402.00  | 4829.85 |
| 10  | Obobonofua | 667.05  | 613.05  | 538.05 | 468.00 | 415.05 | 370.05 | 325.05  | 264.00  | 3660.30 |
| 11  | Ohia       | 766.05  | 709.95  | 468.00 | 577.95 | 514.95 | 430.05 | 382.95  | 327.70  | 4356.90 |
| 12  | Okan       | 901.95  | 813.00  | 763.05 | 685.05 | 616.95 | 571.05 | 508.05  | 444.00  | 5303.10 |
| 13  | Okwen      | 1140.00 | 1053.00 | 927.00 | 832.95 | 741.00 | 631.05 | 568.05  | 493.95  | 6387.00 |
| 14  | Ovinyin    | 520.95  | 469.05  | 450.00 | 387.00 | 360.00 | 295.05 | 247.95  | 217.95  | 2947.95 |
| 15  | Owewe      | 1003.95 | 864.00  | 756.00 | 682.05 | 595.05 | 504.00 | 433.05  | 364.05  | 5202.15 |

Source: Field survey 2009

Table 3: Average volume of logs supplied to sampled sawmill in Edo State (000m<sup>3</sup>)

| S/N | Trade Name | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | Mean                |
|-----|------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------|
| 1   | Albizia    | 54.47 | 49.73 | 46.80 | 42.27 | 37.67 | 34.80 | 30.67 | 27.00 | 40.42 <sup>cd</sup> |
| 2   | Alstonia   | 47.13 | 43.73 | 39.47 | 35.87 | 32.07 | 28.93 | 24.00 | 27.00 | 33.95 <sup>gh</sup> |
| 3   | Bafia      | 16.93 | 21.00 | 24.53 | 28.60 | 35.40 | 38.27 | 42.87 | 47.13 | 31.84 <sup>gh</sup> |
| 4   | Bombax     | 64.00 | 58.20 | 56.00 | 48.00 | 44.20 | 39.80 | 34.20 | 29.40 | 46.73 <sup>cb</sup> |
| 5   | Ekhimi     | 52.73 | 47.00 | 42.00 | 38.80 | 32.73 | 28.27 | 25.13 | 22.40 | 36.13 <sup>fc</sup> |
| 6   | Eki        | 26.47 | 31.27 | 39.07 | 45.40 | 56.93 | 62.60 | 69.00 | 74.60 | 50.67 <sup>ab</sup> |
| 7   | Ewinwan    | 32.67 | 29.67 | 26.53 | 23.93 | 21.00 | 18.33 | 15.07 | 12.80 | 22.50 <sup>h</sup>  |
| 8   | Iroko      | 11.53 | 9.40  | 7.93  | 6.73  | 5.47  | 4.73  | 3.67  | 2.67  | 6.52 <sup>i</sup>   |
| 9   | Nikiba     | 55.07 | 50.73 | 46.60 | 42.20 | 36.73 | 33.73 | 30.13 | 26.80 | 40.25 <sup>de</sup> |
| 10  | Obobonofua | 44.47 | 40.87 | 35.87 | 31.20 | 27.67 | 24.67 | 21.67 | 17.60 | 30.50 <sup>f</sup>  |
| 11  | Ohia       | 51.07 | 47.33 | 43.20 | 38.53 | 34.33 | 28.67 | 25.53 | 21.80 | 36.31 <sup>ef</sup> |
| 12  | Okan       | 60.13 | 54.20 | 50.87 | 45.67 | 41.13 | 38.07 | 33.87 | 29.60 | 44.19 <sup>cd</sup> |
| 13  | Okwen      | 76.00 | 70.27 | 61.80 | 55.53 | 49.40 | 42.07 | 37.87 | 32.93 | 53.23 <sup>a</sup>  |
| 14  | Ovinyin    | 34.73 | 31.27 | 30.00 | 25.80 | 24.00 | 19.67 | 16.53 | 14.53 | 24.57 <sup>h</sup>  |
| 15  | Owewe      | 66.93 | 57.60 | 50.40 | 45.47 | 39.67 | 33.60 | 28.87 | 24.27 | 43.35 <sup>cd</sup> |

Source: Field survey 2009

The volume of logs supplied to sawmill in Edo State have declined rapidly since the last decade. This rapid declining rate of the once buoyant forest estate of Edo State could be attributed to the uncontrolled exploitation of the forest estate through illegal felling activities, dereservation for agriculture and urbanization. There was 41.8% decline in the total volume of logs supplied to sawmill in Edo State for the period 2002-2009. The findings in this study are similar to the published work earlier reported in literature (Okojie and Akande, 1995; Izekor and Okoro, 2004). The authors attributed the declining rate of logs supplied to sawmill in Edo State to the increasing demand for wood and wood products as a result of population growth, deforestation, clearance for agriculture and other infrastructural development. Osemeobor (1991) had also attributed the high rate of decline in the Nigeria tropical forest to human influence and that the deficit in timber supply has put increased pressured on logging and illegal timber trade. Okwen had the highest volume (6,387m<sup>3</sup>) of logs supplied while Iroko had the least supply (781.95m<sup>3</sup>) among the fifteen commonly supplied timber species for the period 2002-2009. The reason for these differences may be due to low economic value attached to the former compared to the high economic value of the latter. Commercial timber of high quality is in great demand hence the rapid depletion of these timber species. The supply of quality timber to sawmill in Edo State are no longer available to sustain the continuous existence of these sawmill industries in the state. Most saw millers in Edo State have resorted to sourcing for timber from neighbouring state in order to meet the ever increasing demand for wood and its products.

**Table 4: Mean percentage change in the volume of logs supplied to sawmill in Edo State**

| S/N | Species    | Mean<br>(2002) | Volume | Mean<br>(2009) | Volume | Rate of<br>Decline (%) | Rate of<br>Increase (%) |
|-----|------------|----------------|--------|----------------|--------|------------------------|-------------------------|
| 1   | Albizia    | 54.47          |        | 27.00          |        | 9.54                   | -                       |
| 2   | Alstonia   | 47.13          |        | 20.40          |        | 11.28                  | -                       |
| 3   | Bafia      | 64.00          |        | 29.40          |        | 10.52                  | -                       |
| 4   | Bombax     | 52.73          |        | 22.40          |        | 11.51                  | -                       |
| 5   | Ekhimi     | 32.67          |        | 12.80          |        | 12.53                  | -                       |
| 6   | Eki        | 11.53          |        | 2.67           |        | 18.63                  | -                       |
| 7   | Ewinwan    | 55.07          |        | 26.80          |        | 9.78                   | -                       |
| 8   | Iroko      | 44.47          |        | 17.60          |        | 12.40                  | -                       |
| 9   | Nikiba     | 51.07          |        | 21.80          |        | 11.45                  | -                       |
| 10  | Obobonofua | 60.13          |        | 29.60          |        | 9.60                   | -                       |
| 11  | Ohia       | 76.00          |        | 32.93          |        | 11.26                  | -                       |
| 12  | Okan       | 34.73          |        | 14.53          |        | 11.71                  | -                       |
| 13  | Okwen      | 66.93          |        | 24.27          |        | 13.50                  | -                       |
| 14  | Ovinyin    | 26.47          |        | 74.60          |        | -                      | 15.95                   |
| 15  | Owewe      | 16.93          |        | 47.13          |        | -                      | 15.75                   |

Source: Field Survey 2009

**Table 5: Comparison on the decline in the volume of some common timber species supplied to sawmill in Edo State between 1991-2000 and 2002-2009 (000m<sup>3</sup>)**

| Species    | Volume Supplied<br>1991-2000 | Volume Supplied<br>2002-2009 | Percentage decline |
|------------|------------------------------|------------------------------|--------------------|
| Albizia    | 20318.10                     | 4851.15                      | 87                 |
| Iroko      | 10645.50                     | 781.95                       | 90                 |
| Obobonofua | 24223.80                     | 3660.30                      | 92                 |
| Ohia       | 65381.70                     | 4356.90                      | 92                 |
| Okwen      | 13931.00                     | 6387.00                      | 85                 |
| Owewe      | 59939.10                     | 5202.15                      | 92                 |
| Total      | 1984439.20                   | 25239.15                     |                    |
| Mean       | 32406.50                     | 4206.53                      |                    |

**Source: Field Survey 2009**

### **Conclusion**

There has been a rapid decline in the supply of quality logs to sawmill in Edo State since the last two decades. The volume of logs supplied to sawmill in the State within the period of the study (2002 -2009) has declined considerably in both quality and quantity to such an extent that sawmill owners now depends on logs supply from neighbouring states in order to meet the wood and wood products needs of the people.

A comparison in the volume and trends of logs supplied to sawmill in Edo State between 1991-2000 and 2002-2009 showed that there has been about 92% decline in the volume of logs supplied to sawmill in the state. If this trend is not check, there might be a total deficit in logs supply to sawmill and other wood based industry in the state before the year 2020.

There is therefore the need for the immediate adoption of conservation policies and implementation of forestry laws, aimed at reducing illegal logging and timber trade while promoting afforestation and regeneration programme. There should also be public awareness on the benefit of afforestation and the need to manage the forest on a sustained yield basis.

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