

## Optimum Labour Demand for Forest Management Operations in Osun and Oyo States

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**ABSTRACT:** This paper examines optimum labour requirements for forest management in Osun and Oyo states, Nigeria with a view to determining labour demand per unit area of forest plantation and natural forest management towards sustained yield of forest produce where exploitation should be equal to regeneration. Four randomly selected forest reserves in Osun and Oyo states were used for the study. Information were gathered through the use of secondary data. The information obtained for the period 1992-1997 were subjected to "Empirical Norms" of technical staff per unit area of forest and unit of production and then analyzed using optimum labour demand models. The results of this study indicated that the forestry staff in the four stations were under-employed. This impacted negatively on the productivity of workers. Exploitation exceeded regeneration, thereby, creating a lot of deficits for six years. The results also showed that Ago-Owu and Shasha forest reserves in Osun state required 25(44.6 %) and 17(41.5 %) forestry staff while Gambari and Ijaiye forest reserves in Oyo state required 6(35.3%) and 7(41.2%) forestry staff from 1992 to 1997 for sustained yield. It is recommended that feasible development strategies be put in place in Osun and Oyo states' forestry services to enhance sustained forestry contributions of the two states to the Gross Domestic Product. A procedure of estimating manpower requirements for forest production through the use of empirical norms of technical staff should be enforced from time to time and forest policy should be reviewed to detect skill gaps in the forestry services of the two states.

**Key words:** Empirical norms, exploitation, regeneration, sustained yield and under-employment.

### INTRODUCTION

Trained and skilled personnel increasingly constitute the catalyst for development in developing nations. In the wake of various macro-economic reforms, development efforts are once again being focused on the human factor (Moghaddam, 1996).

The total output of a community depends on the productivity of its labour force and on the number of people at work (FAO, 1974). Production can expand if the number of people employed expands and/or if productivity rises. Undoubtedly, human resources of different categories are vital to production. Smith (1976) indicates that "the nation will be better or worse off according to the proportion between the number of those who are employed in useful labour, and that of those who are not so employed". Olawoye (1975) has also observed that the provision of employment is one of the most effective strategies for reducing rural poverty.

Many countries have taken up forestry on a large scale as a tool against rural depression and unemployment and as a provider of momentum for rural rehabilitation.

According to the Forestry Association of Nigeria, FAN (1989), the forestry sub-sector has continued to provide employment opportunities for some 1.5 to 2

million Nigerians of which the vast majority are engaged in firewood and pole production.

Up to 1970, Nigeria was a net exporter of roundwood. The volume of timber exports in Nigeria peaked in 1964 at about 700,000m<sup>3</sup> and steadily declined to about 290,000m<sup>3</sup> in 1970 (Adeyoju, 1975). Due to increased domestic demand, the Federal Government of Nigeria banned all roundwood exports in 1976. Since then, Nigeria has lost her traditional external markets for timber.

In Africa, according to ACCORD (1990), the 'decade of the 1980s has been described as synonymous with the failure of the state, which in its current form has not managed to promote either development or popular participation. The increased demands on Nigerian forest resources is a result of economic development and rising living standards of the people. Nevertheless, it would be undesirable for Nigeria to rely on imports of wood products which could be provided locally at comparative cost by staff of forestry service. The forest resource is over-exploited without adequate replacement strategy. The capacity of the forest resources to meet future domestic demands is therefore, in serious doubt. The driving motive behind forest management is sustained yield of forest produce where exploitation should be equal to regeneration in such a way that the present generation would leave to the succeeding generation a

stock of quality of trees and assets (including the technical wherewithal) no less than those which they inherited. Montalembert (1995) argues that the effectiveness of future efforts in the conservation and wise development of forests depends on the ability to establish a coherent policy environment in support of the activities in the forests and to ensure that forests are fully recognized as a valid, competitive land option wherever appropriate.

However, under Nigerian constitution, forestry is a state subject, that is, the various state governments in Nigeria own and manage the forest estates. Consequently, each state government enunciates its own forest policy and thus only caters for the limited viewpoint foreseen by each state government. In Nigeria, most forest lands are regarded as public property (FORMECU, 1993). Public holdings pose the problem of what to maximize.

Supply of adequately trained manpower is essential for successful execution of intensive forest management programmes. A common practice in estimating manpower requirements for forestry is to develop empirical norms of technical staff per unit area of forest and unit of production. Estimates of professional staff requirements are then derived from the number of technical staff using supervision ratios (FAO, 1970).

According to Agbeja (1999), the development of forestry in Osun and Oyo States in respect of management has been influenced to a large extent by the demand for forest products and services. The study is therefore, justified by providing estimates of man power requirements for forestry services in the two states in six years (1992-1997) and to give recommendations on measures necessary to resolve any discrepancies between supply of and demand for various categories of staff based on their job descriptions and work loads bearing in mind the size and the terrain of the forest reserve.

#### STUDY AREA

The study area covers Ago-Owu and Shasha forest reserves of Osun state and Gambari and Ijaiye forest reserves of Oyo state in the South-Western Nigeria located between Latitudes 6° and 9° North and Longitudes 2° and 6° East. The land areas for Ago-Owu, Shasha, Gambari and Ijaiye forest reserves are 321.16km<sup>2</sup>, 310.80km<sup>2</sup>, 104.80km<sup>2</sup> and 261.80km<sup>2</sup> respectively. The total land area for both Osun and Oyo states is 35,742.84km<sup>2</sup> of which 6,779.58km<sup>2</sup> (18.9%) are forest reserves.

#### METHODOLOGY

A common practice in estimating manpower requirements for forestry is to develop empirical norms of technical staff per unit area of forest and unit of production. Estimates of professional staff requirements are then derived from the numbers of

technical staff using supervision ratios. Using 100 km<sup>2</sup> as base line for forest area, empirical norms of technical staff suggested for use (FORMEU, 1981) in all the states of the Federal Republic of Nigeria were employed as follows:

- i. Each plantation establishment and management should have a ratio of two professional staff to nine technical staff;
- ii. Natural Forest Management should have a ratio of one professional staff to seven technical staff;
- iii. Extension services should have a ratio of one professional staff to six technical staff; and
- iv. Multiple use should have a ratio of one professional staff to four technical staff.

Secondary data were used and the technique used in analyzing these data are Optimum Labour Demand Models. Based on the estimated full strength labour (empirical norms) and actual labour on board, the study employed the structure of employment, category of labour and activity of labour for the models. The objective of these models was aimed at determining optimum labour required for an activity for a specific period.

#### MODEL SPECIFICATION FOR LABOUR DEMAND

$$LD = f(\lambda, \kappa, \alpha)$$

Where;

LD = labour demand for production

$\lambda$  = structure of employment, i.e. the distribution of staff between the various ranks in each staff cadre.

$\kappa$  = full strength labour, i.e. the total number of staff that should manage an activity

$\alpha$  = activity level of labour, i.e. the productivity of staff in each category should be equal to one

#### FUNCTIONAL FORM

$$LD = \sum_{i=1}^4 \lambda_i k_i \alpha_i = f(\lambda k \alpha)$$

Where;

LD = labour demand for production

$\lambda_i$  = structure of employment in each category of labour and i ranges from 1 to 4

$\kappa_i$  = full strength in each category of labour and i ranges from 1 to 4

$\alpha_i$  = activity level in each category of labour and i ranges from 1 to 4

$f$  = product of  $\lambda k \alpha$

#### RESULTS

The sustained yield in terms of exploitation and regeneration in Ago-Owu and Shasha forest reserves of Osun state suffered deficits of 69.12 km<sup>2</sup> and 67.2 km<sup>2</sup> from 1992 to 1997 (Tables 1 and 2). In Gambari and Ijaiye forest reserves of Oyo state on the other hand, the gaps in regeneration activities for six years

indicated 6.52 km<sup>2</sup> and 1.0 km<sup>2</sup> deficits respectively (Tables 3 and 4).

Table 1: Production Efficiency from 1992 to 1997 at Ago-Owu Forest Reserve in Osun State

Year	Exploitation (km <sup>2</sup> )	Regeneration (km <sup>2</sup> )	Surplus+/Deficit*
1992	7.77	0.60	7.17*
1993	14.68	0.35	14.33*
1994	6.94	0.48	6.86*
1995	7.77	0.20	7.57*
1996	12.95	0.00	12.95*
1997	20.64	0.40	20.24*

+ Surplus in forest management

\* Deficit in forest management

Source: Forestry Division, Ikire, Osun State, 1998.

Table 2: Production Efficiency from 1992 to 1997 at Shasha Forest Reserve in Osun State

Year	Exploitation (km <sup>2</sup> )	Regeneration (km <sup>2</sup> )	Surplus+/Deficit*
1992	6.48	0.73	5.75*
1993	14.68	0.50	14.18*
1994	5.18	0.09	5.09*
1995	12.95	0.45	12.50*
1996	12.95	0.05	12.90*
1997	16.99	0.17	16.82*

+ Surplus in forest management

\* Deficit in forest management

Source: Forestry Division, Ile-Ife, Osun State, 1998.

Table 3: Production Efficiency from 1992 to 1997 at Gambari Forest Reserve in Oyo State

Year	Exploitation (km <sup>2</sup> )	Regeneration (km <sup>2</sup> )	Surplus+/Deficit*
1992	0.86	0.025	0.835*
1993	0.80	0.06	0.74*
1994	2.16	0.12	2.04*
1995	0.65	0.10	0.55*
1996	1.61	0.10	1.50*
1997	1.02	0.16	0.86*

+ Surplus in forest management

\* Deficit in forest management

Source: Dept. of Forestry, Sec., Ibadan, Oyo State, 1998

The optimum labour required (Models 1 and 2) for forest management in Ago-owu and Shasha forest reserves in six years based on empirical norms were 25(44.6%) and 17(41.5%) instead of 56 and 41 forestry staff on board (Tables 5 and 6).

Model 1: Optimum Labour Demand from 1992 to 1997 at Ago-Owu Forest Reserve, Osun State

$$LD = \sum \lambda_i x k_i x \alpha_{ii}$$

(i) Structure of Employment

$$\lambda = \frac{\text{number of category of labour}}{\text{total number of staff on board}}$$

$$\text{Professional staff} = 2/56 = 0.04$$

$$\text{Technical staff} = 7/56 = 0.12$$

$$\text{Uniformed staff} = 34/56 = 0.61$$

$$\text{Semi-skilled and Unskilled staff} = 13/56 = 0.23$$

(ii) Category of Full Strength Labour

$$k_i = \text{full strength labour in each category of labour}$$

$$\text{Professional staff} = 3$$

$$\text{Technical staff} = 12$$

$$\text{Uniformed staff} = 48$$

$$\text{Semi-skilled and Unskilled} = 120$$

(iii) Labour Activity Level

$$\alpha_{ii} = \frac{\text{actual number of staff per each category on board}}{\text{full strength of staff based on empirical norms}}$$

$$\text{Professional staff} = 2/3 = 0.67$$

$$\text{Technical staff} = 7/12 = 0.58$$

$$\text{Uniformed staff} = 34/48 = 0.71$$

Table 4: Production Efficiency from 1992 to 1997 at Ijaiye Forest Reserve, Oyo State

Year	Exploitation (km <sup>2</sup> )	Regeneration (km <sup>2</sup> )	Surplus+/Deficit*
1992	0.33	0.04	0.29*
1993	0.14	0.25	0.11+
1994	0.27	-	0.27*
1995	0.20	-	0.20*
1996	0.21	0.04	0.17*
1997	0.23	0.10	0.13*

+ Surplus in forest management

\* Deficit in forest management

Source: Dept. of Forestry, Sec., Ibadan, Oyo State, 1998.

Optimum Labour Demand (LD) from 1992 to 1997

$$LD = \sum \lambda_i x k_i x \alpha_{ii}$$

$$\text{Professional staff} = 0.04 \times 3 \times 0.67 = 0.08 \approx 0$$

$$\text{Technical staff} = 0.12 \times 12 \times 0.58 = 0.84 \approx 1$$

$$\text{Uniformed staff} = 0.61 \times 48 \times 0.71 = 20.78 \approx 21$$

$$\text{Semi-skilled and Unskilled staff} = 0.23 \times 120 \times 0.10 = 2.76 \approx 3$$

$$LD = 0 + 1 + 21 + 3$$

$$LD = 25$$

Model 2: Optimum Labour Demand from 1992 to 1997 at Shasha Forest Reserve, Osun State

Optimum Labour Demand (LD) from 1992 to 1997 as defined for Model 1

$$LD = \sum \lambda_i x k_i x \alpha_{ii}$$

$$\text{Professional staff} = 0.07 \times 3 \times 1 = 0.21 \approx 0$$

$$\text{Technical staff} = 0.17 \times 12 \times 0.58 = 1.18 \approx 1$$

$$\text{Uniformed staff} = 0.61 \times 48 \times 0.52 = 15.2 \approx 15$$

$$\begin{aligned} \text{Semi-skilled and Unskilled staff} &= 0.15 \times 120 \times 0.05 \\ &= 1 \\ \text{LD} &= 0 + 1 + 15 + 1 \\ \text{LD} &= 17 \end{aligned}$$

Table 5: Optimum Labour Demand from 1992 to 1997 at Ago-Owu Forest Reserve, Osun State

Category of Labour	Actual Number of Labour on Board	*Full Strength Labour Based on Empirical Norms
Professional Staff	2	3
Technical Staff	7	12
Uniformed Staff	34	48
Semi-Skilled and Unskilled Staff	13	120
Total	56	183

Source: Forestry Division, Ikire, Osun State, 1998

\* Empirical Norms

Table 6: Optimum Labour Demand from 1992 to 1997 at Shasha Forest Reserve, Osun State

Category of Labour	Actual Number of Labour on Board	*Full Strength Labour Based on Empirical Norms
Professional Staff	3	3
Technical Staff	7	12
Uniformed Staff	25	48
Semi-Skilled and Unskilled Staff	6	120
Total	41	183

Source: Forestry Division, Ile-Ife, Osun State, 1998

\* Empirical Norms

In Gambari and Ijaiye forest reserves of Oyo state, the optimum labour requirements (Models 3 and 4) for forest management in six years were 6(35.3%) and 7(41.2%) instead of 17 and 17 forestry staff on board.

Model 3: Optimum Labour Demand from 1992 to 1997 at Gambari Forest Reserve, Oyo State

Optimum Labour Demand (LD) from 1992 to 1997 as defined for Model 1

$$\text{LD} = \sum \lambda_i x k_i x \alpha_{ii}$$

$$\text{Professional staff} = 0.12 \times 1 \times 12 = 0.029 \approx 0$$

$$\text{Technical staff} = 0.06 \times 5 \times 0.20 = 0.06 \approx 0$$

$$\text{Uniformed staff} = 0.29 \times 20 \times 0.25 = 1.45 \approx 1$$

$$\begin{aligned} \text{Semi-skilled and Unskilled staff} &= 0.53 \times 50 \times 0.18 \\ &= 4.77 \approx 5 \end{aligned}$$

$$\text{LD} = 0 + 0 + 1 + 5$$

$$\text{LD} = 6$$

Model 4: Optimum Labour Demand from 1992 to 1997 at Ijaiye Forest Reserve, Oyo State

Optimum Labour Demand (LD) from 1992 to 1997 as defined for Model 1

$$\text{LD} = \sum \lambda_i x k_i x \alpha_{ii}$$

$$\text{Professional staff} = 0.12 \times 3 \times 0.67 = 0.24 \approx 0$$

$$\text{Technical staff} = 0.06 \times 10 \times 0.10 = 0.06 \approx 0$$

$$\text{Uniformed staff} = 0.24 \times 42 \times 0.095 = 0.96 \approx 1$$

$$\begin{aligned} \text{Semi-skilled and Unskilled staff} &= \\ &0.59 \times 105 \times 0.095 = 5.89 \approx 6 \end{aligned}$$

$$\text{LD} = 0 + 0 + 1 + 6$$

$$\text{LD} = 7$$

Table 7: Optimum Labour Demand from 1992 to 1997 at Gambari Forest Reserve, Oyo State

Category of Labour	Actual Number of Labour on Board	*Full Strength Labour Based on Empirical Norms
Professional Staff	2	1
Technical Staff	1	5
Uniformed Staff	5	20
Semi-Skilled and Unskilled Staff	9	50
Total	17	76

Source: Forestry Div., Jericho-Ibadan, Oyo State, 1998

\* Empirical Norms

Table 8: Optimum Labour Demand from 1992 to 1997 at Ijaiye Forest Reserve, Oyo State

Category of Labour	Actual Number of Labour on Board	*Full Strength Labour Based on Empirical Norms
Professional Staff	2	3
Technical Staff	1	10
Uniformed Staff	4	12
Semi-Skilled and Unskilled Staff	10	105
Total	17	160

Source: Forestry Div, Jericho-Ibadan; Oyo State, 1998

\* Empirical Norms

## DISCUSSION

The study employed labour demand models for forest management in Osun and Oyo States. The development of the model was aimed at determining optimum labour required in an activity for a specific period.

In six years, with the category and activity of labour based on estimated full strength labour (empirical norms) and actual labour on board in the study locations, instead of actual 56 and 41 forestry staff on board at Ago-Owu and Shasha forest reserves in Osun state, only 25 and 17 forestry staff were optimally required from 1992 to 1997. In Oyo state, on the other hand, instead of actual 17 forestry staff each on board at Gambari and Ijaiye forest reserves, only 6 and 7 forestry staff were optimally required respectively for

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the period of six years. There were deficits in sustained yield activity of the forest management from 1992 to 1997 in Osun and Oyo states. Exploitation was more than regeneration.

**CONCLUSION AND RECOMMENDATIONS**

Forests are of prime importance in the development of Osun and Oyo states. Using such resources productively and at a sustainable level is of crucial need, if socio-economic development is to be achieved. This goal can be attained only when the forests are managed properly, when annual allowable cut is contained within the annual incremental growth. The study revealed labour inefficiency in forest management. Exploitation exceeded regeneration from 1992 to 1997. Majority of forestry staff were under-employed and this impacted negatively on the productivity of workers. At present, no new forest reserves are being constituted in Osun and Oyo states. With an alarming rate of over exploitation, there is the likelihood that continuing exploitation without adequate regeneration will lead to capital depletion in the two states. It is recommended that feasible development strategies be put in place in Osun and Oyo states' forestry services to enhance forestry contributions of the two states to the Gross Domestic Product. A procedure of estimating manpower requirements for forest production through the use of empirical norms of technical staff should be enforced from time to time and forest administration should be reviewed to detect skill gaps and thereby enhance prospects of higher productivity in Osun and Oyo states.

10	1	Technical staff
12	4	Untrained staff
103	10	Semi-skilled and Unskilled staff
160	17	Total

**DISCUSSION**

The study employed labour demand models for forest management in Osun and Oyo states. The development of the model was aimed at determining optimum labour required in an activity for a specific period. In six years, with the category and activity of labour based on estimated full strength labour (empirical norms) and actual labour on board in the study locations, instead of actual 56 and 41 forestry staff on board at Ago-Owu and Shasha forest reserves in Osun state, only 25 and 17 forestry staff were optimally required from 1992 to 1997 in Oyo state, on the other hand, instead of actual 17 forestry staff each on board at Gambani and Ijaye forest reserves, only 6 and 7 forestry staff were optimally required respectively for

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Model 3: Optimum Labour Demand from 1992 to 1997 at Gambani Forest Reserve, Oyo State

Optimum Labour Demand (LD) from 1992 to 1997 as defined for Model 1

$$LD = \sum_{k=1}^n x_k \cdot x_k$$

Professional staff =  $0.12 \times 1 \times 12 = 0.029 \approx 0$   
 Technical staff =  $0.06 \times 2 \times 20 = 0.06 \approx 0$   
 Untrained staff =  $0.29 \times 20 \times 25 = 1.45 \approx 1$   
 Semi-skilled and Unskilled staff =  $0.23 \times 20 \times 18 = 4.77 \approx 2$

LD = 0 + 0 + 1 + 2 = 3

Model 4: Optimum Labour Demand from 1992 to 1997 at Ijaye Forest Reserve, Oyo State