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ASSESSMENT OF TECHNICAL COMPLIANCES TO LANDOWNERS GUIDES IN FOREST ROADS OF OLUWA FOREST RESERVE, ONDO STATE NIGERIA

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ABSTRACT

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Forest road construction appears to be the most expensive single investment in forest operations and designing forest road to specification is a complex engineering problem involving economic, environmental and social factors. The study was carried out to assess the technical compliances to recommended land owners guide to building forest access road in a forest estate in Nigeria. The study was carried out at Ondo State Afforestation Project (OSAP) Headquarters, South West Nigeria. Data collected for the study involved collation of road parameters such as road length, carriage way, drain depth and width, and comparative analysis of these with standard road parameters. Data collected were then subjected to descriptive and inferential statistics. Result showed that the road width in all the locations ranged from 12.23m and 7.15 m with a mean of 9.42m as against the recommended 11.00m. The width of the carriage way ranged from 4.4m to 8.76m while the drain depth ranged from 0.51m and 1.20m in all the selected locations. The difference in the observed width and the standard width was significant at 5% level of probability. Both the observed carriage way width and drain depth were significantly different from the recommended standards. OSAP access roads therefore, fall short of the recommended standard landowners' guide to building forest access roads.

***Keywords**: Forest roads, landowners, technical compliance, road standards*

INTRODUCTION

Forest access road is very important in forestry and other development activities as well as to all people within the local communities. This is so because the roads connect the most remote parts of the forest land to existing township, state roads and highways thereby providing access to forest lands for timber management, fish and wildlife habitat improvement, fire control, hunting and a variety of recreational activities. Good forest access roads are crucial to sustainable forest management, regardless of its objectives. Forest management, wood harvesting, game control, recreational activities all require the accessibility provided by suitable road network (Amaranthus *et al.*, 1985, Omole *et al., 2011*). In spite of the beneficial effects of forest roads to sustainable forest management, forest road construction is often considered with suspicion because of its impact on the people, the forest estate and its potentials to encourage over exploitation of forest produce. Access to forests should never be considered as one of the stages of wood production alone but a major design to satisfy multiple needs. The construction of forest roads must adopt suitable practices that will promote proper forest management and prevent environmental degradation (Sedlak, 1982). Forest road is very peculiar to the land owners as well as other users of the forest. The existence of such roads therefore, has impact on the products and people. Another very important issue is the quality of the roads constructed and the service lives of such roads.. Changes in roads can also bring about change in some activities like primarily recreation and management activities. Recreational users are particularly attracted to or driven away from particular areas by the availability and ease of access (Omole *et al.*, 2011). Hindered access to forests estate could lead to impairments in various activities in forest; some users might drop out and give up outdoor recreation and tourism. The result would be "reduced economic activity" in the locale where forest access was decreased and "increased economic activity" in areas where displaced users moved into. In general, the effects would be reversed if access were enhanced. Anything that affects the demand for and benefits received from recreation and other uses of forest service land has subsequent economic effects, and it may alter development because land uses drive local economic activity (FAO, 2004, Omole *et. al.* 2011).

Considering the pivotal roles played by forest roads in natural resources management, roads according to FAO (2004) must be built to standard and be dictated by land owners' guide. Landowners' guides otherwise known as road construction strategies are the specific standards that lead to achieving the goals and objectives of a good road to be constructed, depending on the location, terrain, climate, etc. Different roads have different landowners' guide and type of impact and severity are dictated by construction techniques and equipment. (Gollison and Hardner, 1993).

In Nigeria the leading role of access to sustainable forest have not been fully appreciated as most of the built forest roads were seldom constructed to meet the standard, which would ease the forest operation and other forestry activities (Adabiri, 2005). It is therefore, pertinent to study the present state of the constructed forest roads taking

Ondo State Afforestation project (OSAP) access roads as case study, with a view to determining if the roads were constructed in compliance with accepted land owners' guide in terms of width of carriage way, depth of the drains and the presence or absence of culvert and bridges on the road.

MATERIALS AND METHODS

Study area: The study was carried out at Ondo State Afforestation Project (OSAP) headquarters, Lisagbede in Odigbo Local Government Area of Ondo State Southwest Nigeria. The Forest reserve is located approximately between latitude $06^{0}52^{1}$ and $7^{0}20^{1}$North and longitude $3^{0}45^{1}$ and $04^{0}33^{1}$ East. The reserve is bounded in the north by Oke-Igbo in Ondo State, and in the South by Lagos – Benin expressway, river Oluwa in the East, and in the West by Omo Forest Reserve, Ogun state and the flow of river Oni that spans through to the northern boundary of OSAP. The topography is gently undulating with a well drained soil and outcrops of rocks of a basement complex of precambrian era in some part of the reserve. The soil type is grayish brown to brownish colour in nature and texture of most part of the study area is coarse and sandy with only a little part of it being clayey. The rainfall pattern of the area is bimodal in nature and characterized with heavy down pour in September and October with annual rainfall about 1500mm.

Data collection

Data collected for this study involved the collation of road parameters and comparative analysis of such parameters with standard forest road parameters as recommended by FAO (2004). The parameters measured in this study included, road length, road width, carriage way, drain depth and width. These parameters were taken at the following locations: Onipetesi, Makinde, Camp area, Burutun, Imorun, Leege, Modebiayo, Nursery and Head office of OSAP road

Data analysis

Data collected were subjected to statistical processing using a combination of descriptive and inferential statistics. T-test was used to determine the significant difference between the actual road parameters measured and the standard road parameters at different selected points.

RESULT AND DISCUSSIONS

Results of road width at the nine (9) road locations assessed in this study are shown in Table 1. The locations at which measurements were taken were Onipetesi, Makinde, Camp area, Burutun, Imorun, Leege, Modebiayo, Nursery and Head office road. Onipetesi had the highest mean road width of 12.23m, followed by Makinde (9.72m), Camp area (9.65m), Imorun (9.53m), Nursery (9.46m), Ilututun (9.16m), Head office (9.01m), Leege (8.87m) and the least was Modebiayo (7.15m) (Table 1). The highest road width of 12.23m at Onipetesi being more than all other road locations may have been due to the fact that the area serves as a road junction for most of the commercial vehicles in the project area, thereby leading to further clearing of disappearing plant species along the road side. As a result of this, the road width became wider than the original width. FAO (1985) recommended a standard forest access road of 11 metres in width. Considering the results of various mean road width at different locations obtained from this study, it can be concluded that none of these road widths met FAO (1985) standard. In case of Onipetesi, it was more than the required standard i.e. 12.23m. The implication of this is loss of biodiversity because more vegetation had been cleared that the required (Richard, 1992). In the same vein, all other road locations (Table 1) were less than the standard road width and this may result in collision of vehicles involved in forestry activities especially at road point where the sighting distance is small (Ivan and Marco, 2004, Omole *et al.*, 2011).

T-test analysis for various points in each road location showed that the difference in the observed width and the standard width was significant at $p< 0.05$ (Table 2). This implies that road width taken from various points in each road location were significantly different from each other. This result agrees with Gaumitz (1990) who revealed the shortcomings of the land owners' guide used in building roads in the study area if used at all. ANOVA result (Table 3) shows that the .road locations assessed in this study were significantly different from each other ($p<0.05$). The result was in conformity with Ivan and Marco (2004) who attributed such condition to the engagement of some of the road locations (e.g. Imorun) for landing purposes during logging activities in the project area. This , thereby leading to increase in the width or lack of use of proper land owners' guide while constructing the road and also of proper road maintenance, which have eventually resulted to reduction of the width as a result of weeds invading the road edges.

The residual result of the road width is presented on Table 4. The implication of the positive mean residual for all the selected stations for this study apart from Onipetesi being negative (i.e. -1.23) will lead to damages to forestry transportation equipments such as the skidder as well as the forest products being transported as reported by Bettinger *et.al.*, (1994) and Omole *et al.*, (2011). More so, the residuals for road locations were significantly different ($p<0.05$) (Table 5). This also complements the fact that OSAP's access roads were not built to meet land owners guide standard as at the time of construction. This may be due to the fact that the designer of the roads did not envisage the volume of traffic being experienced now as at the time the project idea was conceived.

Result of mean road carriage way is shown in Table 6. It could be seen that none of the road locations was actually up to the standard. Though Onipetesi, which has the widest carriageway out of the stations, may be approximated to meet with

the standard according to FAO (1985), the standard average forest access road carriage way is 9m. Low carriage way values are inimical to a successful forest operation. Values in Table 7 indicate that there were significant differences ($P<0.05$) in the nine (9) location road carriage way. This means that the road carriage way were significantly different in with from one station to the other. The result of mean drain depth is as shown in table 8. As at the time of carrying out the study, none of the road locations was up to recommended standard of 1.5 metres. This low value of the drain depth might have been culminating factors of road problems such as erosion on the access road which is a major source of sedimentation. Although the observed drains were lower than standard, statistical analysis however indicates no significance difference exists between the observed drains and the standard recommended.

Presence / absence of bridges and rock outcrops

During the course of this study, it was discovered that OSAP's access road lacks adequate culverts and bridges in some areas within the Road locations. Nineteen (19) culverts were present while one (1) bridge was constructed on a stream at Modebiayo community. Obviously, the inadequacy of bridges and culverts has caused some environmental problems that will require enormous financial resources for remedy. For instance, there is a stream of 1.7m in width that cuts across the road at Imorun, which requires culvert for the direction of its course. Unfortunately, the stream has widened its course and has caused a serious gully on the access road. The resulting problem may have occurred due to neglect of recommended landowners' guide during the construction of the access road. FAO (2004) noted that, a good landowners' guide must begin preparatory with reconnaissance and adequate planning before construction.

Table 1: OSAP's access road width at selected sampling stations

Road Location	Recommended Standard Road Width (m)	Present Road Width (m)	Residual (m)
Onipetesi	11.00	12.23	-1.23
Makinde	11.00	9.71	1.28
Camp area	11.00	9.65	1.35
Ilututun	11.00	9.16	1.84
Imorun	11.00	9.53	1.47
Leege	11.00	8.87	2.13
Modebiayo	11.00	7.15	3.85
Nursery	11.00	9.46	1.54
Head Office	11.00	9.01	1.99
Mean	11.00	9.42	1.58

Table 2 T-Test Result of Different OSAP's Access Road Locations

Road Location	t-value	Degree of Freedom	P-Level
Onipetesi	3.012	26	0.0057*
Makinde	6.099	10	0.0001*
Camp area	6.591	26	0.0000*
Ilututun	2.700	8	0.0271*
Imorun	3.427	10	0.0065*
Leege	5.828	18	0.0000*
Modebiayo	17.665	6	0.0000*
Nursery	4.483	14	0.0005
Head Office	7.494	12	0.0000*

* Significant at $p < 0.05$

Table 3: Mean Carriage way and Drain depth of the OSAP's access road

Road Location	Mean carriage way (m)	Mean drain depth (m)
Onipetesi	8.76	1.20
Makinde	7.42	0.90
Camp area	7.06	0.73
Ilututun	4.38	1.07
Imorun	7.60	0.63
Leege	4.82	0.51
Modebiayo	4.4	0.59
Nursery	4.66	0.79
Head Office	4.53	0.79

Table 4: ANOVA of the various road parameters measured in the study area

Source of variation	Degree of freedom	Mean square	P - level
Road Width			
Road location	8	15.9172	0.0000*
Present road residual			
Access Road Residual	8	15.9172	0.0000*
Carriage way			
Carriage way	8	26.0998	0.0000*
Road drain depth			
Drain depth	8	0.3669	0.0000*

* Significant at $p < 0.05$

CONCLUSION

The study revealed that building forest access road without appropriate landowner's guide leads to various kinds of problems in forestry activities. The widths of OSAP's access, a miniature copy of Ondo State Forest access roads were less than the recommended standard landowners' guide to building forest access road. Furthermore, the drains were not built to the tune capable enough to control heavy erosion from spreading to the entire carriage way.

RECOMMENDATIONS

Based on the results of this study, the following recommendations are made.
1. There should be a general maintenance of the OSAP's access road in order to restore the road and rectify the damages already created on the carriage way.
2. There should be a reassessment of the road characteristics such as the width so that improvement could be made in order to meet with the required standard of a good forest access road.
3. There is urgent need for proper supervision and monitoring during construction in order to achieve set plan on the landowners guide so as to renew the skill in road construction method that is less detrimental to the environment and disappearing forest biodiversity.

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