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REDUCED IMPACT LOGGING OF GMELINA PLANTATION IN OMO FOREST RESERVE, NIGERIA

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ABSTRACT

Logging induced damages associated with two different harvesting systems (Conventional Timber Harvesting and Reduced-Impact Logging (RIL)) were investigated in 1984 compartment of *Gmelina arborea* plantation in Omo Forest Reserve. The same equipment and felling crew were used for both methods. Felling was done using heavy chainsaw (Stihl 070) and skidding was carried out with crawler tractor. The types and severity of damage to the residual stand were determined for felling and skidding operations in both methods using visual assessment. Data collected were analyzed using a combination of percentages and descriptive statistics. The residual stand based on tree population were 68.28% for conventional logging and 34.88% for reduced-impact logging. The degree of damage was based on severity of injuries on individual trees. These were categorized as light injury, medium injury and heavy injury. Values obtained for the three categories of injury were 16.36, 11.06 and 42.01% and 5.34, 7.16 and 22.41% for conventional wood harvesting and reduced-impact logging respectively. This result shows that RIL, has the potential of considerably minimizing damages to residual stand by almost half when properly carried out.

INTRODUCTION

The impacts of logging on tropical rain forests and future timber production have been of great concern to all stakeholders in forestry. Increase in demand for wood and wood products has led to increased extraction of timber for structural application and other constructional works. Consequently, many unskilled screws participate in logging apparently oblivious of the implications of traditional wood harvesting system on the forest environment. There is high wastage of the harvested timber with considerable harvesting damage to the residual forest stand. The question of whether this increase in timber harvesting intensity can be compatible with other productive forest practices is pertinent. In other to achieve good results, timber-harvesting operations should be based careful planning and execution (Omole 2000).

Efforts to minimize damages associated with conventional wood harvesting have gained a global attention with various researches carried out both in homogeneous temperate forests and heterogeneous tropical forests. (Elias 1998, Suhartana 2000). The research findings and recommendations on the need for proper planning of logging operations have been adopted

and put into practice in some developed nations. This has helped in reducing environmental problems associated with timber harvesting in those countries.

Timber harvesting in some Nigerian natural forests and plantations is often the initial step in a process of conversion of forestlands to alternative uses. This would even be worse when logging operations are not properly carried out. Schimdt (1987), Fearnside (1989) Hendrison (1989) and FAO (1989) submit that there are considerable evidences that logging operations in tropical forests are rarely preceded by thorough planning of the kind that is common in temperate countries. This is because most tropical forests are government owned with timber being harvested through concession. Consequently, loggers ignore the negative environmental impacts of logging because of the poor environment of the rules and regulations guiding environmentally sound wood harvesting. Although, to a large extent, socio-political and economic considerations play significant role in the sustainability of tropical forests advances in technology should, however, ensure the use of harvesting practices that are not only environmentally acceptable but also protect both timber and non-timber forest values of the forest during and after wood exploitation.

Many research works have been carried out on wood harvesting and associated damages. (Dawkins 1958, Hawthorn 1993, Elias 1995, 1998, Batova and Scwager 1986, Omole 2000) Majority of these works were based on qualification and quantification of the damages associated with various harvesting methods. Only very few reports are available that examine and compare the damages associated with conventional (unplanned) and reduced impact logging (planned).

It therefore becomes necessary to investigate and compare harvesting induced damages in reduced impact logging (RIL) and conventional timber harvesting (CTH). It is also necessary to propose an appropriate and suitable harvesting method that will not only produce good quality logs but will also have economic and ecological benefits.

The main objective underlining the study was to carry out an investigation into the harvesting impact in a typical Nigerian plantation.

MATERIALS AND METHODS

The study was carried out in the 1984 *Gmelina* area stand in Omo forest Reserve, Area J4, Ijebu-Ode Ogun State Nigeria. Four hectares within the forest stand was demarcated with each hectare later subdivided into blocks of 50 by 50m, giving a total of 16 blocks for the two methods *(RIL* and *CTH)* of wood harvesting.

In the RIL, trees to be felled in the 8 blocks were first identified and marked and few climbers interconnecting the trees at the crown region were cut. The felling directions,

escape as well as extraction routes or skidding trails were planned before actual felling. In the case of conventional harvesting, the trees were identified and felled at random without recourse to climber cutting, felling direction and extraction routes.

The logging crews for the two methods were required from the felling gang of Ogun State Forest Plantation Project and the felling were carried out using *Stihl 070* motor saws.

Assessment of Damages to Residual Stand.
Damages to stands were assessed at the felling and skidding. Damages assessed were: crown damages, bark and stem injuries, roots and buttresses, fallen trees and broken trees. The degree of damages to residual stand was assessed based on the method of Elias (1998).

Based on severity, injury were categorized as heavy, medium and light injury. The fallow analytical tool was used for Residual Stand Damage (^{o}K):

$$^{o}K = \frac{R}{P-Q} X100$$

Where R= number of damage trees with diameter ≥ 10 cm after harvesting.
P= number of trees with a diameter ≥ 10cm before timber harvesting.
Q= harvesting intensity.

RESULTS AND DISCUSSIONS

The harvesting impacts on residual stand were assessed and results are in tables 1 and 2.

Table 1: Damages associated with RIL and CTH based on tree population.

Harvesting Method	Average Harvesting Intensity	Stand Density Tree/Ha	Damages		Total Damages%	*RSD ^{o}K
			Felling%	Skidding%		
RIL	36	433	17.10	17.78	34.88	18.63%
CTH	57	435	37.70	30.58	68.28	43.38

*RSD = Residual Stand Damage.

Table 1 presents the degree of damages associated with reduced impact logging and conventional timber harvesting based on tree population. It was observed from that the degree of damage caused by felling ranged between 17.10 and 37.70 percent for the two methods. Damages associated with skidding operations were between 17.78 and 30.58 percent of the total damages.

Total damages to residual stand based on tree population accounted for 62.28% for conventional timber harvesting as against 34.88% for reduced impact logging. From this study it capable of minimizing incidental damages to residual stand by 45-50 percent, which would have result from conventional timber harvesting. This observation is in line with previous study by Elias (1998) on reduced impact logging in tropical national forest of Indonesia. He claims that impact damages to residual stand can be minimized up to 50% or more using RIL method.

Severity of damage caused to individual trees was 16.22% for conventional technique using RIL. During skidding operations, light injury damages were 14.29 and 20.30% medium injury 15.79 and 23.38 while heavy injury damages were ranged between 62.34 and 63.91% for RIL and CTH respectively. Majority of the residual trees were heavily injured due to impact.

Table2: Severity of damage to the individual trees.

Timber Harvest Method	Sources of Damage and Severity						Total Tree Damages (%)
	Felling (%)			Skidding (%)			
	Light injury	Medium injury	Heavy injury	Light injury	Medium injury	Heavy injury	
RIL	26.83 (1012)	16.46 (6.21)	56.79 (21.37)	20.30 (6.24)	15.79 (4.85)	63.91 (19.47)	68.28
CTH	16.22 (2.77)	17.57 (3.00)	66.22 (11.32)	14.29 (2.54)	23.38 (4.16)	62.34 (11.09)	34.88

As shown in table 2, the total tree damages recorded for RIL and CTH were 34.88% and 68.28% respectively. The results revealed that damage associated with RIL is significantly less than that associated with CTH due to better-planned harvesting system. It then goes to suggest that the magnitude of damages associated with conventional timber harvesting method has a lot of implications on future supply of timber on sustainable basis.

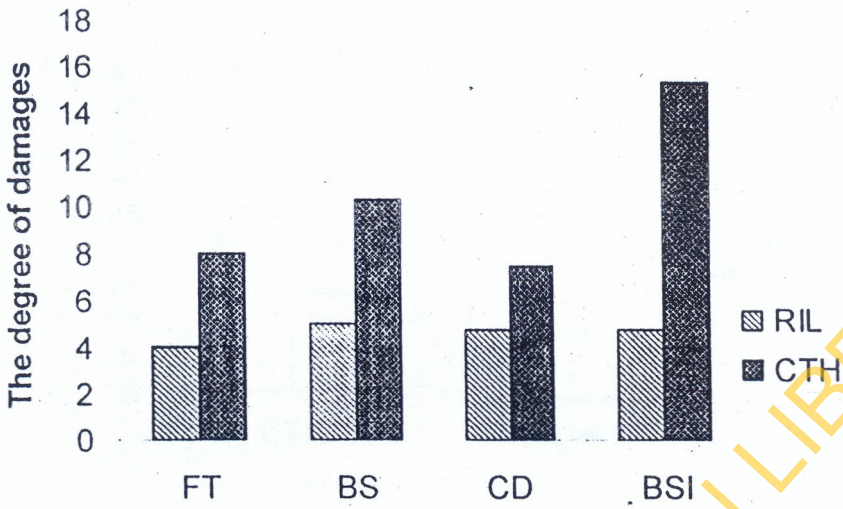

Fig. 1: Comparison of felling Damages by Logging Methods

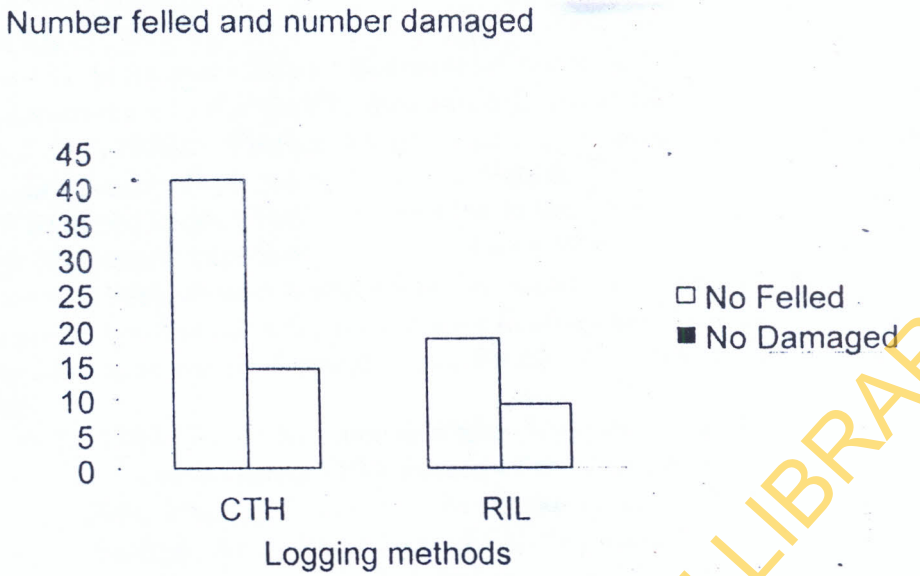

Fig.2: Comparison of number of trees felled and number damaged by logging methods

CONCLUSION

The demand for wood and wood products from both natural and plantation forests will continue to increase and this will in turn put a heavy pressure on the nation's forest stands. With the present conventional timber harvesting method, sustainable management of the resource-base may not be guaranteed.

Within the scope of this study the following conclusions may therefore be drawn.

Conventional logging operations cause heavier damages to the residual stand, thus resulting in environmental damage.

Reduced impact logging can minimize damage up to 50% or more within a harvesting coupe.

The adoption of reduced impact logging is thus preferable in logging operations to promote environmentally sound wood exploitation that will not only reduce incidental damage to residual stands but also reduce work stress.

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