Abstract
The objectives of this research were to know residual stand damage and opened areas caused by conventional and reduced impact timber harvesting (RITH) in natural forest. This research show that the degree of residual stand damages based on tree population and stage of vegetation development in conventional timber harvesting and reduced impact timber harvesting was as follow: for seedlings 34.42 % and 23.17 %, for saplings 35.13 % and 21.72 %, for poles and trees 33.15 % and 19.53 %. The degree of opened caused by conventional timber harvesting was 32.47 % compared with reduced impact timber harvesting which is only 18.32 %. The research result indicated that that felling and skidding by reduced impact timber harvesting can diminish by up to 43 % the opened timberland otherwise caused by conventional timber harvesting.

Key words: Residual stand damage, Opened areas, Reduced impact timber harvesting

A. INTRODUCTION
In this time the problem of forest damage have come to important political issue in international level. Tropical forest of Indonesia have confessed as world lungs capable to take care of earth ecosystem of decline of environment. Besides, for the agenda of policy of management of forest which is everlasting to be, considered necessary to lessen residual stand damage and land and also its influence to flora and fauna. In terms of environmental impacts, timber harvesting is usually the most significant aspect of forest operation and management (Enters, 2001).

Several research results (e.g. Muhdi et. al, 2003; Sukanda, 1998; Dykstra, DP. And R. Heinrich, 1996; and Sularso, 1996) indicated that the conventional timber harvesting with insufficient planning, improve operational techniques and lack of control of operation and supervision would result in severe damage on soil and residual forest stand that results in environmental damage (damaged forest, erosion, compacted and infertile soil, turbid water and sedimentation, etc.).

Elias (1997) said that that during the time management of natural forest especially timber harvesting still not be done professionally, so that the overall of system of silviculture applied experience of failure. This matter for example because of: during the time especial consideration in applying of technique of silviculture is continual wood production, while consideration of to environment peculiarly not yet got competent attention; in applying of silviculture, there is no effort integrate system of timber harvesting with silviculture system, where during system and technique of timber harvesting still disregarded and disagree with silviculture system used.

Reduced Impact Timber Harvesting (RITH) have come to discussion focus and discussion of in Indonesia forestry society of during this last decade. Because technique of RIL is factor which is very determine in reaching management of everlasting forest, which have been qualified in ecobilabelling. But in general entrepreneurs still question and not yet earned to be assured that applying of RITH that RITH will be reduce environmental damage.
The objectives of this research is to know residual stand damage and opened areas caused by conventional and reduced impact timber harvesting (RITH) in natural forest.

B. RESEARCH METHODOLOGY

Research blocks consist of Conventional Timber Harvesting (CTH) (block A) and in Reduced Impact Timber Harvesting (RITH) (block B). Each of block of the research is in it made by 3 plots permanent/measurement that each of the size of plot is 100 m x 100 m (1 ha).

Plots of permanent/measurement put down in both the research location in such a manner so that represent places of as following: (1). In place location of gathering of wood (landing); (2.) in location of skidding road and (3.) in location of branch of skidding road.

The conventional timber harvesting is conducted in Block A by the concession holder. The typical conventional timber harvesting is tent to insufficient planned and improper technique application and lack of control e.g. the skidtrail network and directional felling are not planned and laid out on the ground before felling operation; felling technique is still inefficient (notch and back cut is still too high); the chainsaw operator and the tractor operator work independently and do not use tree location map to perform their activities; the tractor operator searches for logs by using his helper to look for logs on the ground.

The reduced impact timber harvesting is planned by the researcher and conducted under supervision of the researcher. The reduced impact timber harvesting is based on forest prospecting prior to harvesting, and using these data to design a layout of felling compartments and inventory units, and to plan the timber harvesting operations. A tree location and topographic map used for timber harvesting plan map serves as a guide for felling and skidding crew in timber harvesting operations.

C. RESULTS AND DISCUSSION

The result of this study show that the average skidding distance in conventional timber harvesting is 350.6 m, caused an opened area caused by felling in conventional timber harvesting is 1421.99 m$^2$/ha and in reduced impact logging is 335.2 m caused an opened area caused by felling in conventional timber harvesting is 981.92 m$^2$/ha. With a timber harvesting intensity of 5-6 tree/ha, the opened timberland caused by felling in conventional timber harvesting is 14.21% and in reduced impact logging is 9.81%.

The comparison between residual stand damage caused by conventional timber harvesting and reduced impact logging shows as Table 1.

This comparison shows that reduced impact timber harvesting can can diminish by up to 43% of damaged compared with conventional timber harvesting.

The degree of residual stand damages based on tree population and stage of vegetation development in conventional timber harvesting and reduced impact timber harvesting is as follow : for seedlings 34.42% and 23.17%, for saplings 35.13% and 21.72%, for poles and trees 33.15% and 19.53 %. Based on the size injury of every individual tree, the degree of the trees damages caused by timber harvesting in conventional timber harvesting and reduced impact timber harvesting is as follow : trees heavy injury 64.66% and 57.20%, trees...
medium injury 20.30% and 24.00% and trees light injury 15.03% and 18.80%. The degree of opened caused by conventional timber harvesting is 32.47% compared with reduced impact timber harvesting which is only 18.32%.

Table 1. Timber Harvesting Damage Caused by Conventional and Reduced Impact Timber Harvesting

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Conventional</th>
<th>Reduced Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Residual stand damages based on tree population and stage of vegetation development (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Seedlings</td>
<td>34.42</td>
<td>23.17</td>
</tr>
<tr>
<td></td>
<td>- Saplings</td>
<td>35.13</td>
<td>21.72</td>
</tr>
<tr>
<td></td>
<td>- Poles and trees</td>
<td>33.15</td>
<td>19.53</td>
</tr>
<tr>
<td>2.</td>
<td>Tree damages based on the injury size (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Light injury</td>
<td>7.23</td>
<td>4.16</td>
</tr>
<tr>
<td></td>
<td>- Medium injury</td>
<td>4.65</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td>- Heavy injury</td>
<td>28.99</td>
<td>11.99</td>
</tr>
<tr>
<td>3.</td>
<td>Opened areas (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Caused by felling</td>
<td>14.21</td>
<td>9.81</td>
</tr>
<tr>
<td></td>
<td>- Caused by skidding</td>
<td>18.25</td>
<td>8.50</td>
</tr>
</tbody>
</table>

D. CONCLUSION

1. The research result indicated that that felling and skidding by reduced impact timber harvesting can diminish by up to 43% the opened timberland otherwise caused by conventional timber harvesting.

2. The results of studies research indicated that the residual stand damages and opened area caused by conventional timber harvesting is heavier and larger than reduced impact timber harvesting.

E. REFERENCES


