LOGGING PLANNING VIA AERIAL FOREST SURVEY

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KASETSART UNIVERSITY

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Introduction:

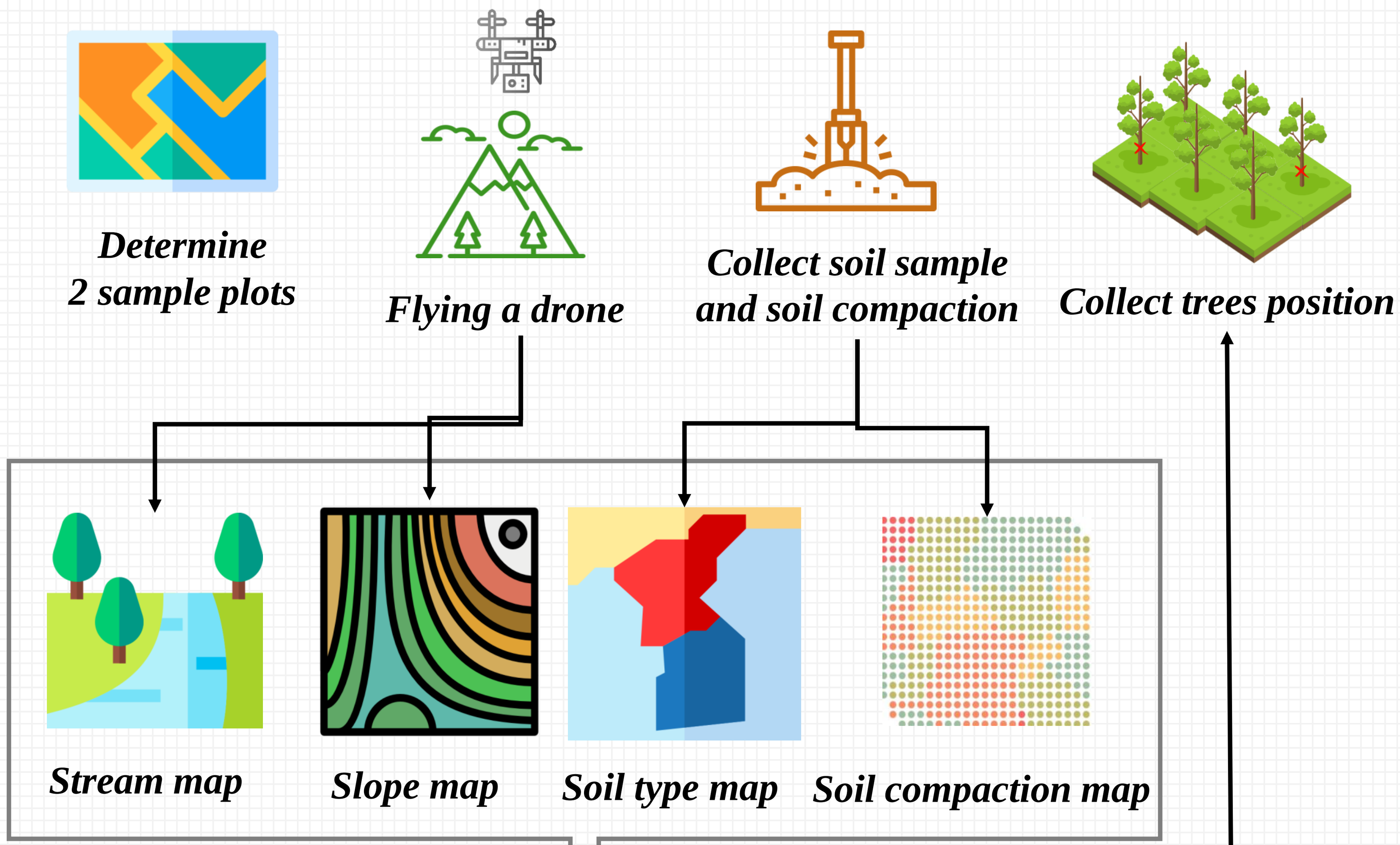
The Forest Industry Organization (FIO) is the largest producer of teak for domestic use in Thailand. FIO's teak logging is normally done by the tree-length method. Logging and skidding could damage the area and other remaining trees, the longer the tree, the more damage to the environment. So, timber extraction from the plantation needs carefully planned to find felling direction and suitable skidding trails to reduce damage to the remaining trees and improve management efficiency. Nowadays unmanned aerial vehicle (UAV) photography is used in forestry because of its flexibility, speed and ability. Identification of a suitable skidding trails should start from aerial survey with a UAV to collect the data, which will be analyzed for area stability map in the Geographic Information System (GIS). One popular analysis technique is Multi-Criteria Decision Analysis (MCDA) with varied objective and decision criteria to find the best route based on spatial information on GIS

Objectives:

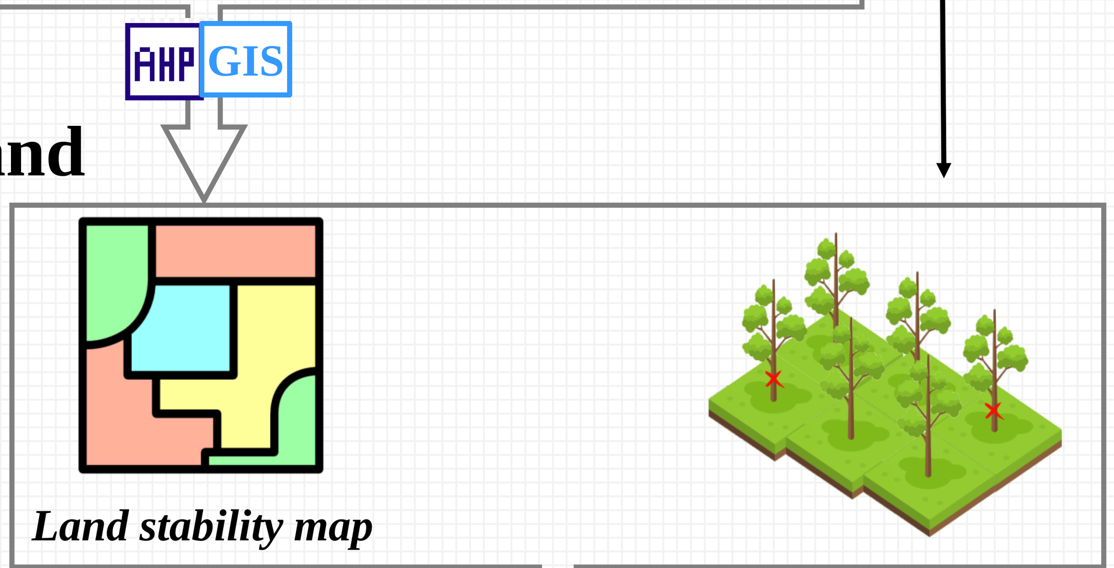
The objectives of this study are to plan skidding trails before thinning and to evaluate efficiency of skidding plan which reflects logging quality. Result of this study will lead to new techniques for more effective logging planning that reduce the environmental impact caused by logging activities in Thailand.

Materials and Methods:

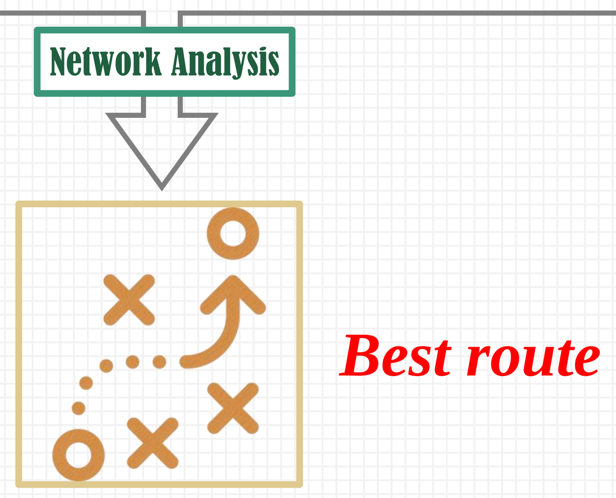
1. Data Collection



2. Generate Land Stability Map



3. Skid Trails Design



Acknowledgements:

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References:

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Elias, G. Applegate, K. Kartawinata, Machfudh and A. Klassen. (2001) "Reduce impact logging guidelines for Indonesia," Center for International Forestry Research, Bogor.
Contreras, M.A., D.L. Parrott, and W. Chung. (2016) "Designing Skid-Trail Networks to Reduce Skidding Cost and Soil Disturbance for Ground-Based Timber Harvesting Operations," For. Sci., 62(1):48–58.

Result:

- Weights of Effective Factors on Land Stability Map

Results showed that the criteria affecting the land stability were slope, distance from stream, soil type and soil compaction with the relative weights of 0.542,0.144,0.144 and 0.017, respectively. Stability values was increased by increasing a distance from the stream and soil compaction values.

Because the area that is far from the stream is highly stable, the area is harder to collapse and areas that are highly compressed tend to have high stability. Moreover, Stability values decreased with increasing percentage of slope. The land stability zonation map was classified into three categories: high, moderate and low stability. Concerning planning plot, the total area of experimental plot is 1.53 ha. Stability zonation is 64.93%, 25.23% and 9.84%, respectively (Figure 1).

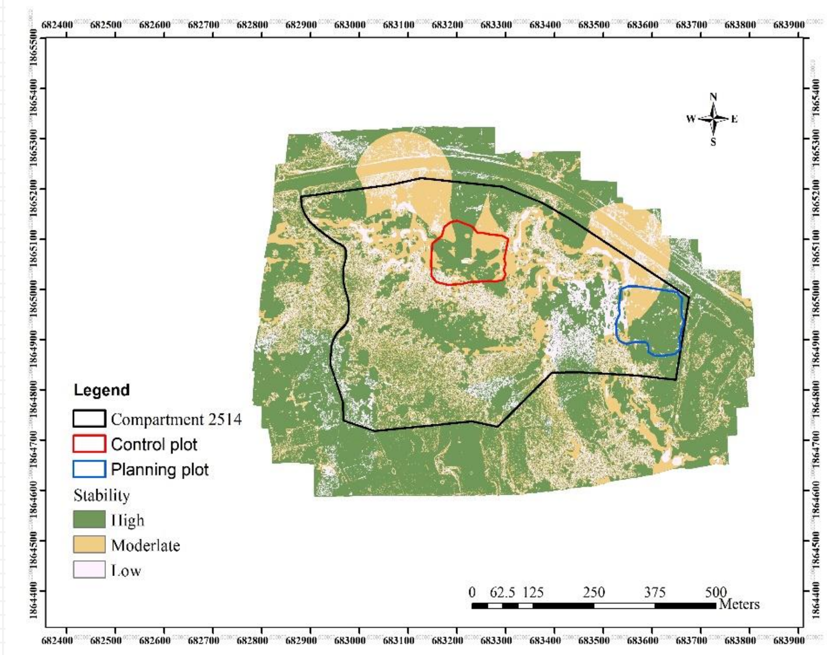

Figure 1 Land stability map of compartment 2514

- Designed Skidding Trails According to Land Stability

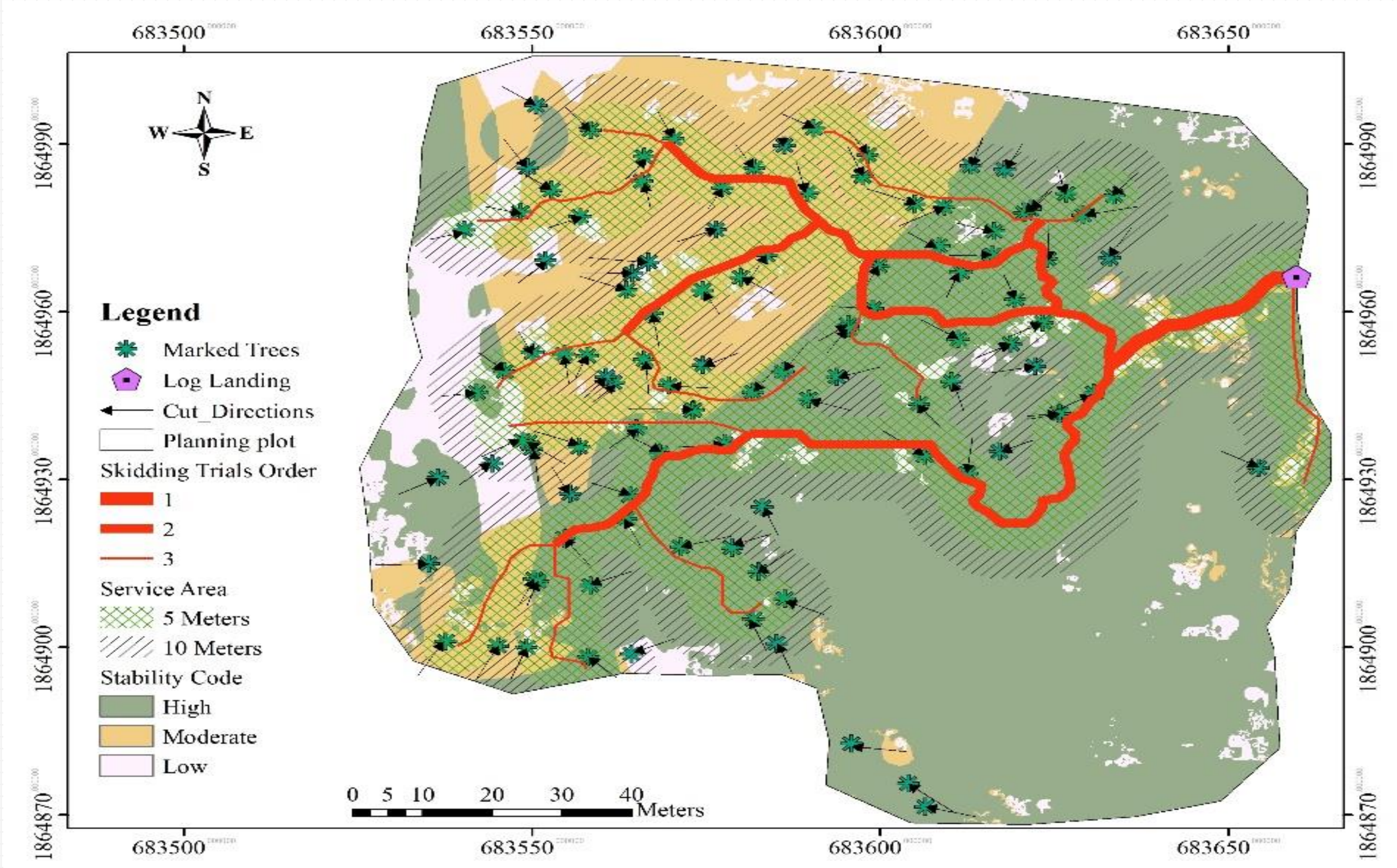

Figure 2 Distribution and service area of skid trails in compartment 2514

The result of designed the skidding trail between all marked trees for felling. The total length of the skidding trail is 716.11 meters. The distance of the skidding trail through the areas of high, medium and low stability is 429.30, 257.70 and 29.11 meters, respectively. The density of the skidding trail is 468.04 square meters per hectares. More than 95% of the skidding trail passed through the areas with moderate to high stability. The radians of service area around any skid trail can be reached within 5 and 10 meters. Most of the marked trees are located within 0-5 and 5–10 meters of service areas. In some cases, the marked trees are located far away from the service area of designed skid trails. These trees are called inaccessible (Figure 2).

Conclusion:

The study provided the best route from the marked trees to the log landing.

The total distance of skidding trail was 716.11 meters

The skidding trail density were 468.04 meters per hectares.

This study just a preliminary result on planning stage. Afterwards, the implementation will be carried out in the study site then logging impacts will be evaluated and compared between controlled plot and planned plot.

Discussion:

Some of the marked trees located in an inaccessible area. Sometimes it is not worth the effort just to reach couple trees in an inaccessible area. However, it depends on the decision of the owner of the plantation. There is some information that should take into consideration while making a decision i.e. cost, traveling time and harvest volume in order to find the best solution.

In case of skidding on the low stability skidding trails, the operation and working techniques must be intensively planned.

The distance and density of skidding trail are relatively dense due to avoid damage that may occur on the standing trees. Since this experimental plot is first thinning, so there are still many trees left in the area.

In this study, the felling direction was determined manually. In the future, the automated selection of felling direction shall be considered.