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luncheon seminar
Mikihiro Kato

Long-term trends in trunk diameter and tree height growth in planted forests in the humid tropics of West Java, Indonesia

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INTRODUCTION

インドネシア森林の現況

森林面積世界8位（原生林50%）、生物多様性が最も高い

世界有数の木材生産国

森林火災
違法伐採
土地開発

森林面積の減少
1970年～1990年：60～120万 ha/年
1990年～2010年：121万 ha/年

Indonesia has huge areas of forest(world's top 8, 50% of it is primary forest).
Indonesia is a one of the principal timber-producing countries in the world.

Forest fire
Illegal logging
Forest conversion

Indonesia lost huge area of forest.
1970-1990: 0.6-1.2 million ha/year
1990-2010: 1.21 million ha/year

木材需要の高まり

中国、インド等の経済発展
➡ 木材需要量の増加
➡ 原生林の伐採量増加
人工林での木材生産が求められる

各樹種の成長特性のデータに乏しい

With economic growth comes an increasing demand for wood products in China, India and so on.
➡ Deforestation of the primary forests has been increasing.
Production of timber in plantation is important.

However, there is a little information available on basic growth characteristics of such tree species in planted forests in the tropics.

人工林での木材生産に用いる樹種選抜のために
用材樹種の成長特性を調査する

In this study, we determined the growth characteristics of popular timber tree species.
The results can be used in the selection of tree species and also to predict the growth of planted trees.

STUDY SITES

5 experimental forests (established using seedlings after wild fire 1937-1956)
Plot size: 50 x 50 m (1111trees/ha)
No thinning
In 2003, many plots contained naturally regenerated trees, the parents of which were the planted trees.
There are 53 species.

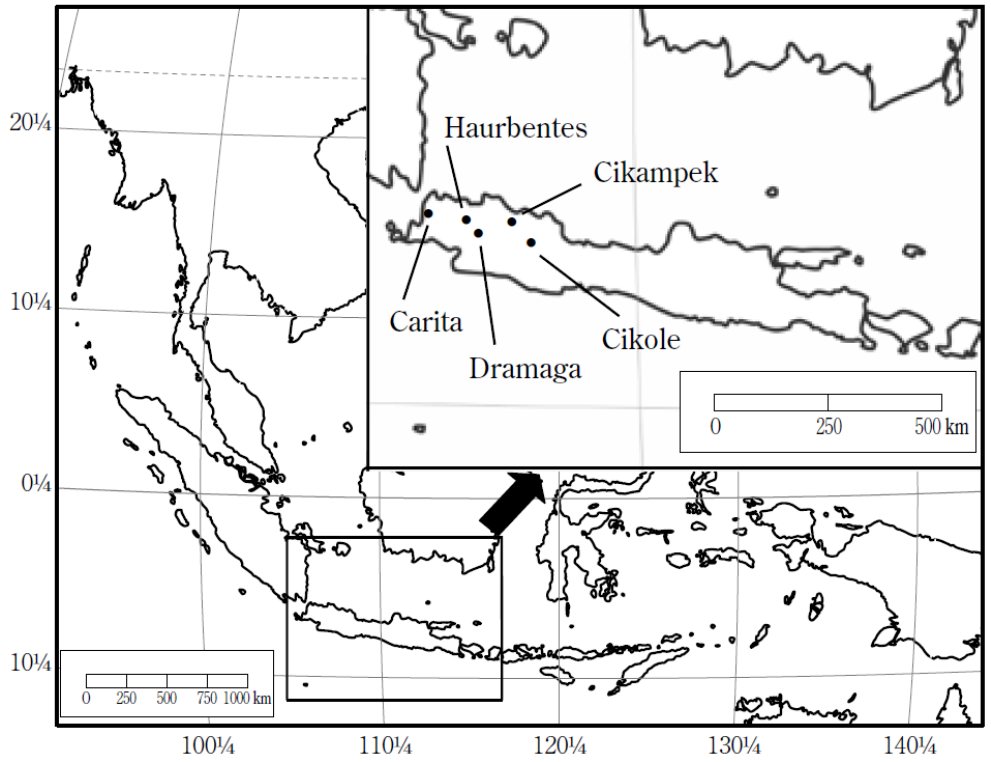


Fig. 1. Study sites in West Java, Indonesia.

FIELD INVESTIGATION

林分調査

植栽翌年から3-5年毎に実施

DBH(*D*, cm): 樹高1.3 m以上の個体
樹高(*H*, m): DBH10 cm以上の個体

板根の高さが1.3m以上の個体は板根の頂端から20cm上の直径をDとした

A tree census has been conducted in each plot at intervals of three to five years since one year after establishment.

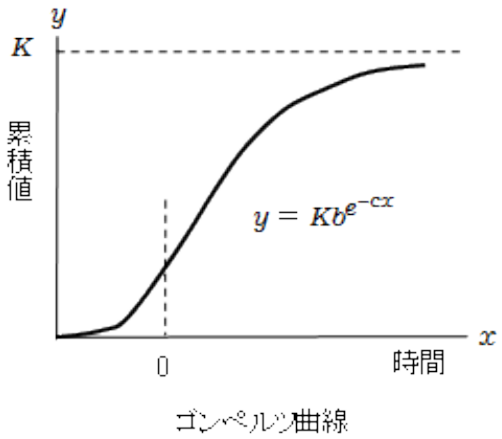
Trunk diameter 1.3 m high above the ground (D, cm) of all trees with a diameter of 10 cm or more and tree height (H, m) were recorded.

For trees with a buttress over 1.3 m high, the diameter was measured 20 cm above the upper ridge of the buttress.

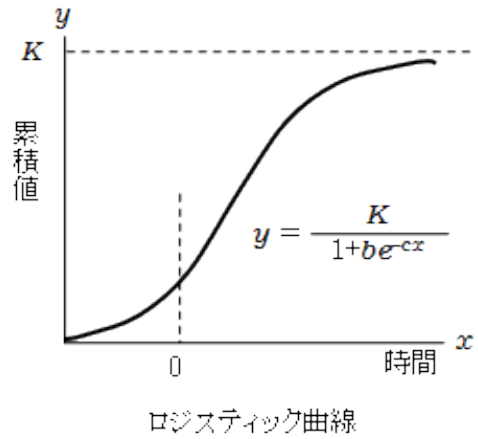
Gompertz growth function

$Y = A \cdot \exp\left[-b \cdot \exp\left(-kt\right)\right]$

- Y : D or H
- A : carrying capacity
- b : coefficient depending on the initial D or H
- k : coefficient of growth
- t : stand age



ゴンペルツ曲線



ロジスティック曲線

A and k can be regarded as indices of the mature size and the growth rate, respectively, of each tree species in this study

RESULT AND DISCUSSION

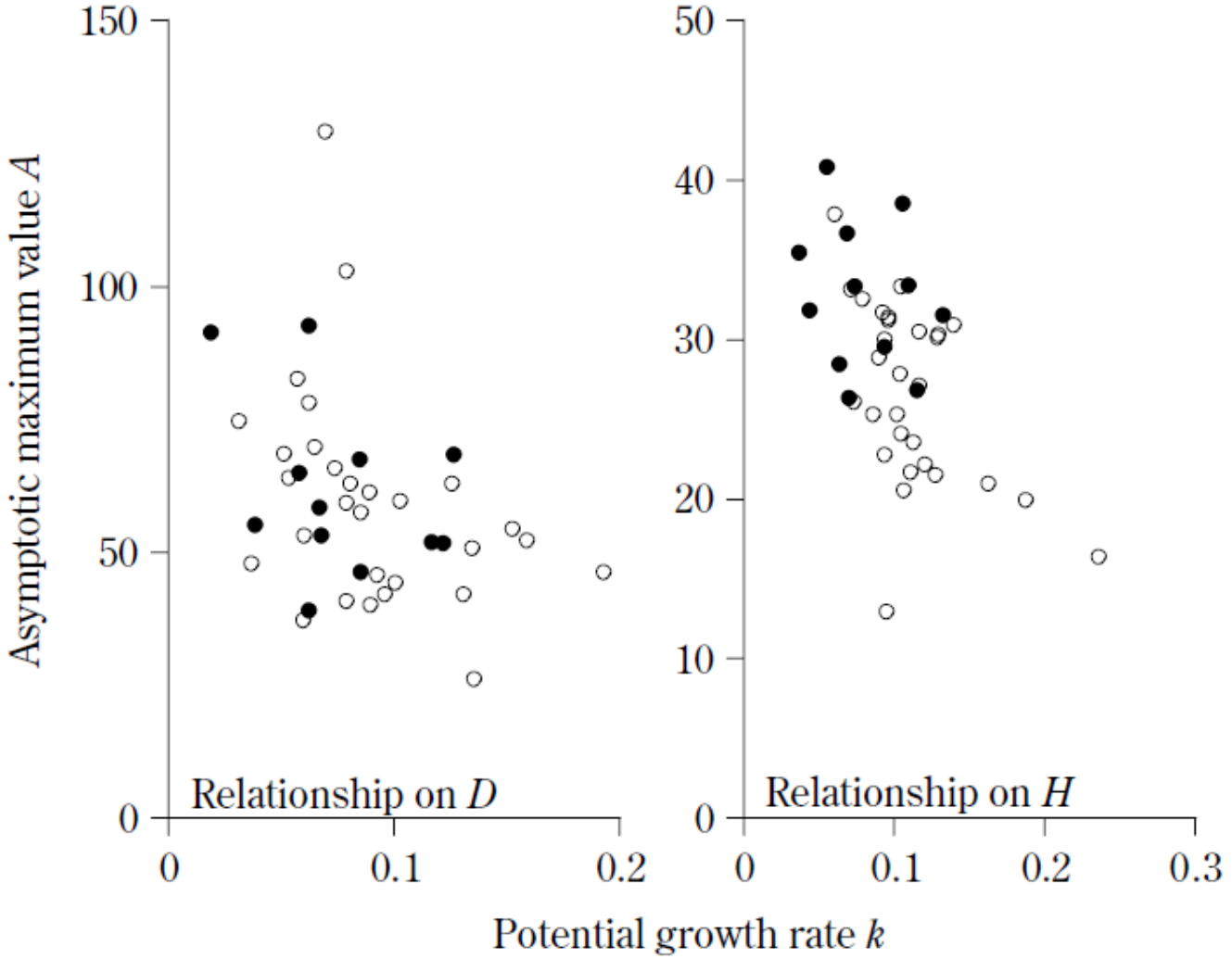


Fig. 4. The relationships between potential growth rate *k* and asymptotic maximum value *A* for trunk diameter (*D*, cm) and tree height (*H*, m) in the Carita, Cilampek, Haurbentes, and Dramaga experimental forests ($p < 0.05$). Closed circles indicate dipterocarps and open circles indicate other tree species.

D、Hともに*k*と*A*には負の相関($p < 0.05$)

Dipterocarpsと他の樹種では値に差があるが同様の傾向を示した

Potential growth rate *k* and the asymptotic maximum value *A* for *D* and *H* growth curves were negatively correlated ($p < 0.05$)

The growth characteristics of H tended to be similar, with lower k values and higher A values compared with other tree species.

Type of growth

A-type

成熟時のサイズ*A*は大きいが*k*は小さい
large mature size A despite a low k value

k-type

成熟時のサイズ*A*は小さいが*k*は大きい
high rate of k despite a low A value

このデータを用いれば植栽時に成長特性から
樹種を選抜できる
Using this sort of information, appropriate tree species could be
selected to fulfill specific requirements when planning new forest planting .

まとめ

各樹種を成長特性によって2タイプに大別することができた

今回の調査地は泥炭湿地ではなかったが、この調査結果が泥炭湿地での人工林造成、
特に用材生産を目的とした人工林造成に用いる樹種の予備選抜となるだろう

Tree species could be roughly separated into A-type and k-type, according to the relationships between A and k for D and H growth.

We suggest that data on the growth characteristics of each timber tree species are valuable for the preliminary selection of tree species to use in planted forests in the humid tropics, especially where timber production is the aim.