Deforestation Mechanisms and Sustainable Solutions

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ABSTRACT

Tropical deforestation is a global environmental problem and a major source of greenhouse gas emissions. Efforts to halt deforestation have been promoted worldwide, but they have not met the initial expectations. Effective efforts require an understanding of the causes of deforestation and the adoption of appropriate strategies.

Deforestation mechanisms can be explained by three factors: poverty, agricultural rent (agricultural profitability), and forest scarcity. Poverty, the chief underlying cause, has the strongest impact on deforestation. The main proximate causes (e.g., road construction and expansion of export crops) are related to the increase in agricultural rent. In contrast, forest scarcity is an important factor that decreases deforestation. Deforestation rates would be high if all the three conditions coexisted at high rates, i.e., high poverty rate, high increase in agricultural rent, and high forest coverage.

The current efforts to decrease deforestation mainly focus on lowering agricultural rent, which can be effective but may be unsustainable due to the high costs and social impacts. Studies have shown that poverty reduction strategies can sustainably reduce deforestation and, to this end, global efforts need to shift from agricultural rent reduction to poverty reduction.

Sustainable solutions to tropical deforestation require multifaceted strategies to reduce poverty rates in developing countries. In particular, it is necessary to develop comprehensive social infrastructure (agriculture, health care, education, etc.) to support impoverished populations in overcoming poverty.

[1] Miyamoto M. Poverty reduction saves forests sustainably: Lessons for deforestation policies. World Development, **127**, 104746 (2020).

[2] Miyamoto M. Causes and Solutions to Tropical Deforestation: The Role of Poverty Reduction in Halting Deforestation Effectively.　Journal of the Japanese Forest Society, **105**, 27—43 (2023) (In Japanese).
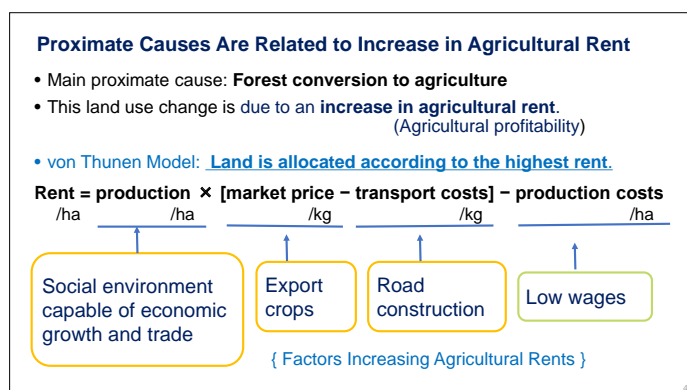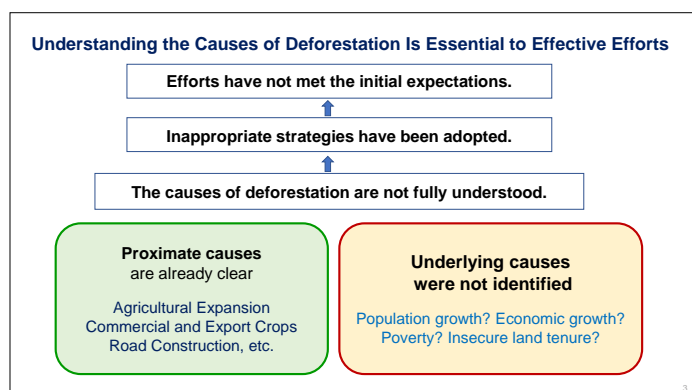
Slide 1

Deforestation Mechanisms and Sustainable Solutions

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Slide 2

Tropical Deforestation and Global Efforts

- **Deforestation** in the tropics has increased since the 1970s.
- It has become **a global environmental issue** and **a major source of greenhouse gas emissions**.
- **Global efforts to reduce deforestation** have increased via **climate change mitigation schemes**.
- Reducing emissions from deforestation and forest degradation in developing countries (**REDD+**) was first proposed at the **UNFCCC COP in 2005**.
- The **SDG Goal 15** includes halting deforestation as a target.
- **The results of the efforts** over the past 10 years have **not met the initial expectation**.

Slide 3

Understanding the Causes of Deforestation Is Essential to Effective Efforts

Efforts have not met the initial expectations.

↑

Inappropriate strategies have been adopted.

↑

The causes of deforestation are not fully understood.

Proximate causes
are already clear

Agricultural Expansion
Commercial and Export Crops
Road Construction, etc.

Underlying causes
were not identified

Population growth? Economic growth?
Poverty? Insecure land tenure?

3

Slide 4

Proximate Causes Are Related to Increase in Agricultural Rent

- Main proximate cause: **Forest conversion to agriculture**
- This land use change is due to an **increase in agricultural rent**.
  (Agricultural profitability)

- von Thunen Model: **Land is allocated according to the highest rent**.

$$\text{Rent} = \text{production} \times [\text{market price} - \text{transport costs}] - \text{production costs}$$
/ha   /ha   /kg   /kg   /ha

| Social environment capable of economic growth and trade | Export crops | Road construction | Low wages |

{ Factors Increasing Agricultural Rents }

4

Slide 5

Empirical studies identify poverty as the main underlying cause.

Malaysian study (Peninsular Malaysia)
Statistical analysis of forest cover and 21 socio-economic variables in 1970–2010

1. **Poverty rates have the strongest impact on forest area change.**
2. Oil palm development was one of the main **poverty reduction strategies initiated by the Malaysian government**.
3. The Federal Land and Development Authority (**FELDA,** established in 1956) **developed oil palm and rubber plantations** and **gave** them to the **landless poor (112,000 households**) until 1992.

5

Slide 6

Empirical studies identify poverty as the main underlying cause.

Indonesian study (Sumatra, Kalimantan)
Household surveys on land tenure and forest clearing activities in 1970–1990s

1. **High agricultural population density** and **shortage of agricultural land** increased local forest clearing activities.
2. Forest conversion to agriculture was done **by farmers to improve their economic situation**.
3. Farmers **acquired land by clearing forests** based on their **customary law**.

6

Does deforestation (forest conversion to agriculture) increase poverty?
Yes & No. It depends on the **Profitability of Agricultural Land**.

Forest conversion to rubber
↓
Low profitability of jungle rubber
↓
Sale of rubber land for living expenses
↓
Inequality in land holdings increase.
↓
Households having little or no land increase.

Yes in Indonesian Sites: **Low profitability**

7

Does deforestation (forest conversion to agriculture) increase poverty?

No in Peninsular Malaysia: **High profitability**

- **Oil palm development reduced poverty (strongest impact)**.
- Oil palm and rubber **smallholders** received **full government support**.
- Rubber Industry Smallholders Development Authority (**RISDA**) provides **technical support**, such as **highly productive seedlings, fertilizers, and subsidies for replanting**.

8

Does reduction of poverty reduce deforestation?
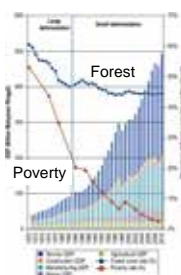
Yes **Evidence from Peninsular Malaysia**

Deforestation decreased when the poverty rate fell below 20%.

Houses in 1967
[FELDA oil palm village]   Houses in 2011

Forest

Poverty

(Miyamoto et al, 2014, Forest Policy and Economics)   9

Mechanisms of Deforestation

Poverty Underlying cause	**Agricultural Rent** Proximate cause	**Forest Scarcity** Factor that decreases deforestation

Deforestation can be explained by **three factors**.

High Poverty Rate
High Rate of Increase in Agricultural Rent
High Forest Coverage
→ **Deforestation will happen**

If all the conditions coexist

Mechanisms of Deforestation Reduction

Low Poverty Rate

Low or Negative Rate of Increase in Agricultural Rent

Low Forest Coverage

↓ If any of the conditions exist

Deforestation will be reduced

11
(Miyamoto et al, 2014, Forest Policy and Economics)
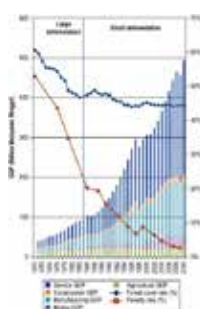
Current Efforts to Halt Deforestation:
Strategies to Reduce Agricultural Rent

Characteristics	**Strategies to Reduce Agricultural Rent in Tropical Rural Areas**
Examples	・ Protected area expansion ・ Moratorium on forest clearance ・ Investment restrictions on companies linked to deforestation (forest conversion to agriculture)
Effectiveness **Sustainability**	☐ **Effective, immediate impact** ☐ **Poor sustainability** due to high cost and socio-economic impact

12

Sustainable Solutions: Poverty Reduction Strategies

Characteristics

> **Strategies to Reduce Poverty Rates
> in Developing Countries**

Content

> **Developing a comprehensive social
> infrastructure to help impoverished populations
> overcome poverty**
> - Providing highly profitable agricultural land
> - Agricultural technical support
> - Education and medical support

Effectiveness ☐ **Meaningful impact of fundamental solutions**

Sustainability ☐ **High sustainability**

13

Sustainable Solutions to Deforestation

1. **Global efforts** to halt deforestation **require a shift in focus** from agricultural rent-reduction strategies **to poverty reduction strategies**.

2. **Multifaceted strategies to reduce poverty rates in developing countries** can be sustainable solutions to deforestation.

3. *Scope:* **Covering the impoverished population of the entire country or region**

4. *Objectives*: **To enable impoverished populations to overcome poverty**

5. *Content:* **Providing comprehensive social infrastructure, including agriculture, healthcare, and education**, to impoverished populations

14

53