

# AGROFORESTRI

# SISTEM PERTANIAN KONSERVASI

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# I. PENDAHULUAN

## SOILS AND ECOSYSTEM FUNCTIONS

300,000 Soil Series

Forest/Biodiversity

Water Resources

Animal Biodiversity

Energy /Biofuels

Aquaculture

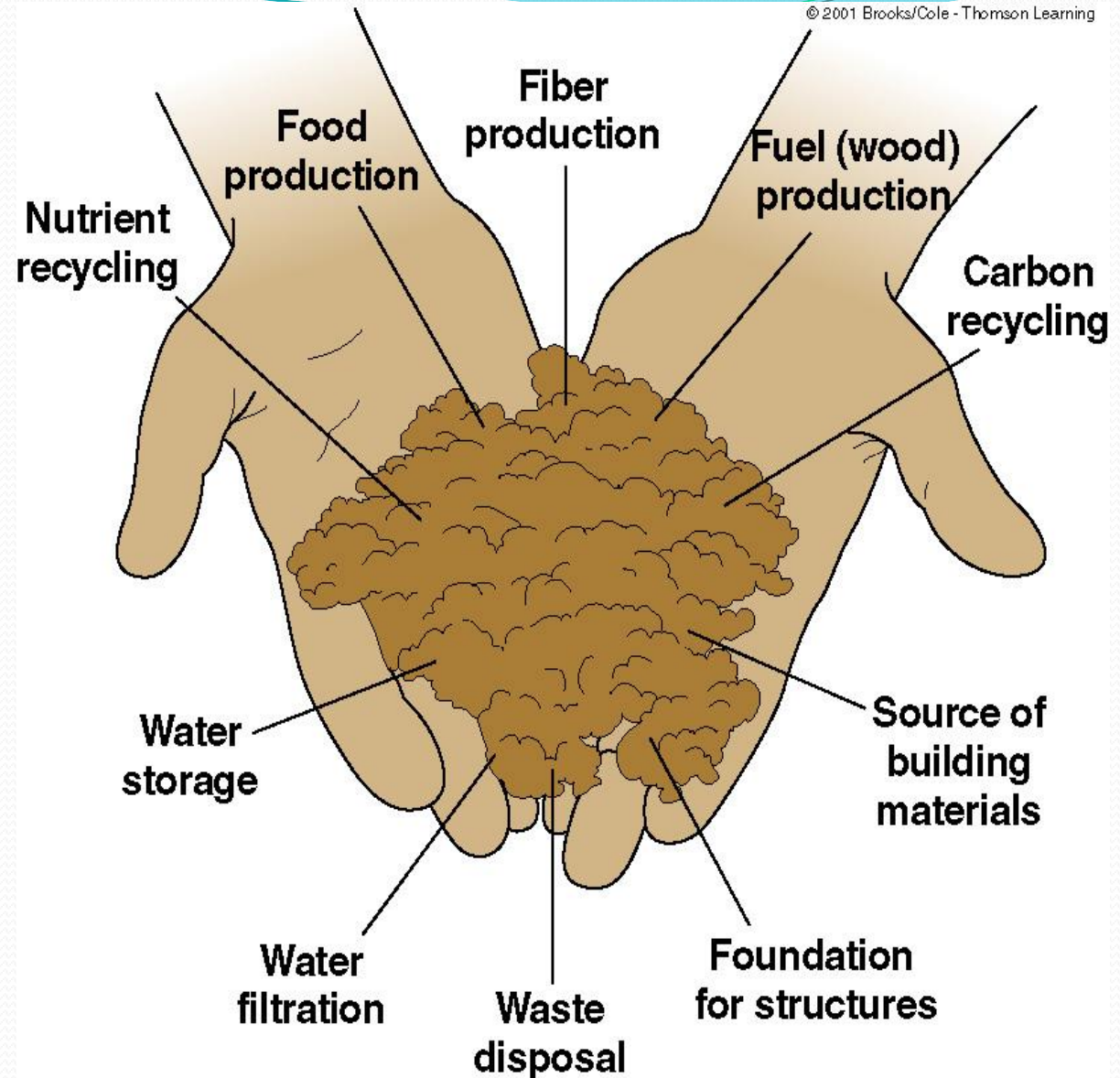
Climate Regulation

Food Production

Ecosystem Restoration



Soil's main important uses for humanity are summarized here.



# I. PENDAHULUAN



# I. PENDAHULUAN

## COLLAPSE OF HISTORIC CIVILIZATIONS

Civilization	Region	Era	Cause of Collapse
Sumerian	Mesopotamia	10,000 BCE	Salinization
Harappan	Indus Valley	2,000-2,000 BCE	Desiccation
Inca	Andean Region	750-900 CE	Soil Erosion
Maya	Central America	750-900 CE	Soil Erosion
Axum	Northern Ethiopia	100-600 CE	Ecological Degradation
Roman	Mediterranean	27BC – 395 AD	Exhaustion of soil

# I. PENDAHULUAN

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## CAUSE OF INSECURITY

**Poverty and subsistence agriculture are root causes of national food insecurity in developing countries.**

*...Defra, Food security and the U.K. (2006)*

# I. PENDAHULUAN

- **Extractive Farming/Subsistence**

- Depletion of SOC and Nutrients
- Decline in Soil Structure

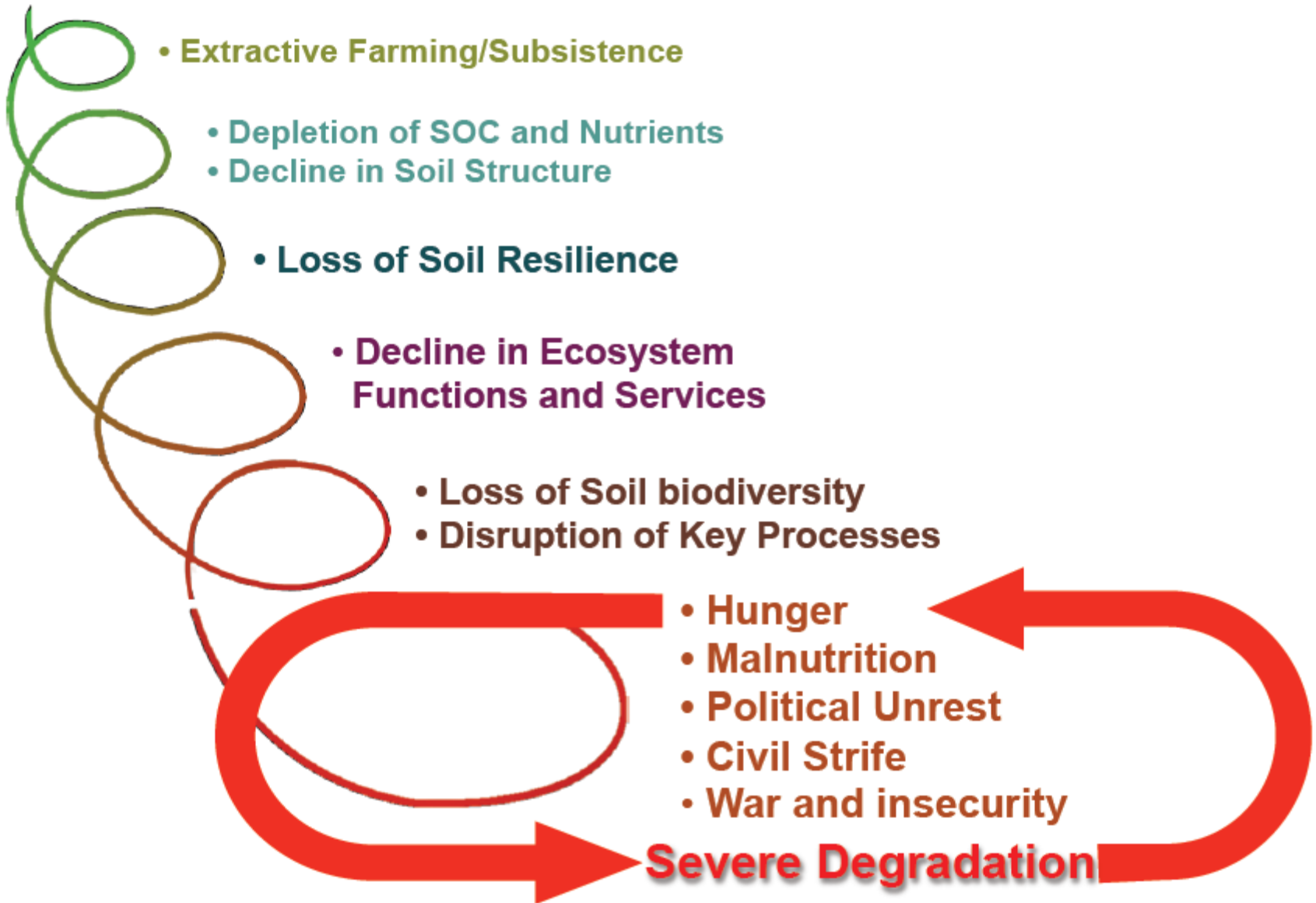
- **Loss of Soil Resilience**

- **Decline in Ecosystem Functions and Services**

- Loss of Soil biodiversity
- Disruption of Key Processes

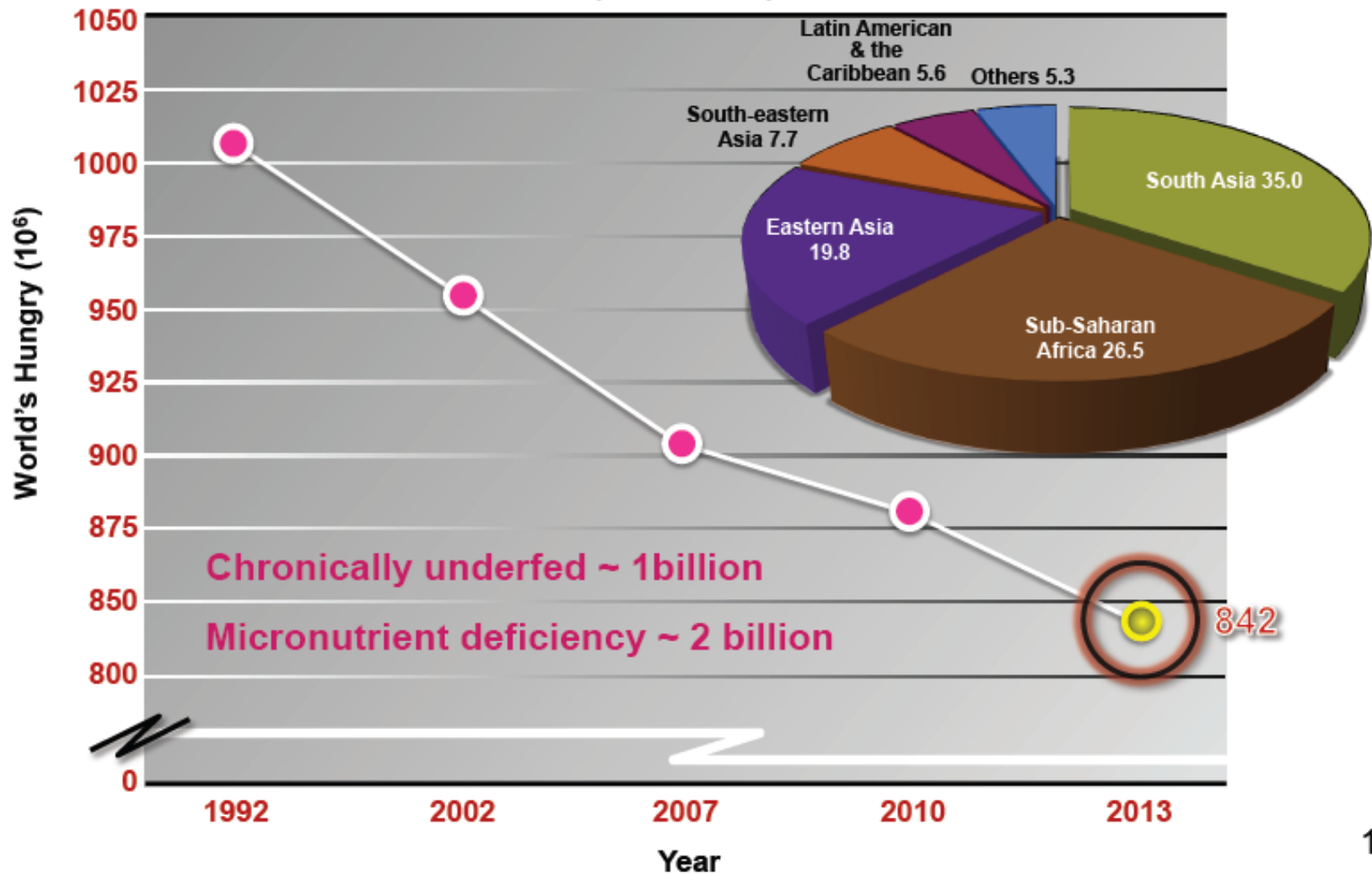
- Hunger
- Malnutrition
- Political Unrest
- Civil Strife
- War and insecurity

**Severe Degradation**



# I. PENDAHULUAN

## GLOBAL FOOD INSECURITY (FAO, 2013)





# I. PENDAHULUAN

## SOIL AND NATIONAL SECURITY

- **Soil is not just an economic development or an environmental/health concern, it is also a peace and security issue.**
- **Densely populated regions (China, India, etc.) have low and shrinking per capita arable land area.**
- **Scarcity of good quality soil/land can increase the risk of instability, land-grabbing, state failure, and exacerbate regional and international tensions.**
- **Land grab, presently estimated at ~200 Mha between 2000 and 2010, can be a future threat to peace and stability.**

# FOOD AND NATIONAL SECURITY

**Presently, China continues to consider agriculture as a matter of “national security”**



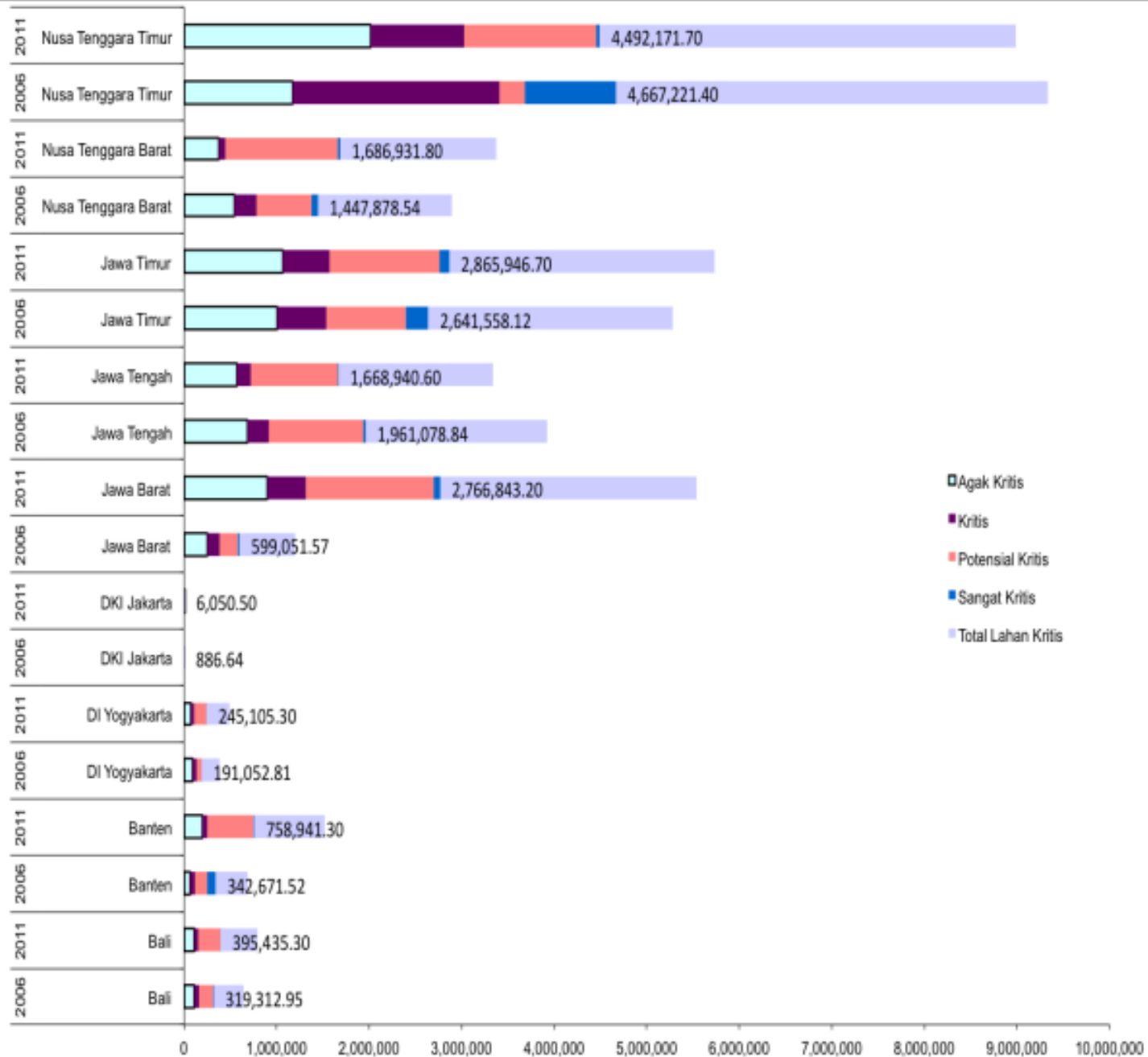
<http://resiliency-rising.blogspot.com/2013/10/nanjing-permaculture-to-pdc-or-not-to.html>

# I. PENDAHULUAN

## 1.1 Produksi Biomassa dan Pertanian Berkelanjutan

- Keunggulan Indonesia
- Potensi Produksi Biomassa Indonesia
- Sektor yang terkait produksi Biomassa
- Ironi Indonesia saat ini

- 
- Peningkatan lahan terdegradasi
    - a. Luas lahan kritis



Gambar 4-1. Luas lahan kritis (ha) berdasarkan wilayah propinsi di wilayah Regional II tahun 2006-2011

- Peningkatan lahan terdegradasi

- a. Penyebab

- 1). Penggunaan lahan tidak sesuai kemampuannya
- 2). Tidak menerapkan usaha/tindakan KTA

- b. Pemicu

- 1). Pertambahan jumlah penduduk
- 2). Gaya hidup hedonis
- 3). Keserakahan

## Soil degradation types and subtypes

Type	Subtypes
W: Water erosion	Wt: loss topsoil Wd: terrain deformation/mass movement Wo: off-site effects Wo: reservoir sedimentation Wof: flooding Woc: coral reef and seaweed destruction
E: Wind erosion	Et: loss of topsoil Ed: terrain deformation Eo: overblowing
C: Chemical deterioration	Cn: Loss of nutrients and/or organic matters Cs: Salination Ca: Acidification Cp: Pollution Ct: Acid sulphate soils Ce: Eutrication
P: Physical deterioration	Pc: compaction, sealing, and crusting Pw: water logging Pa: lowering of water table Ps: subsidence of organic soils Po: other physical activities such as mining and urbanization
B: Degradation of biological activity	

# Tanah tdk subur vs Produktivitas rendah

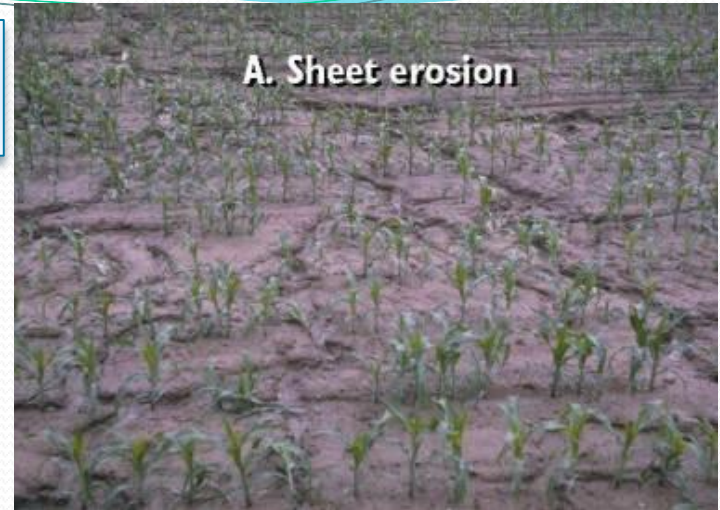




# Types of soil erosion



*Sheet erosion*



*Splash erosion*

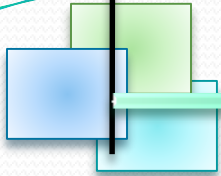


*Rill erosion*



*Gully erosion*

# DAMPAK EROSI



LAHN  
KRITI  
S



# EUTROFIKASI



# BANJIR





## KEKERINGAN



# Konsep Pertanian Berkelanjutan

- Sebagaimana konsep pembangunan berkelanjutan, Pertanian Berkelanjutan mengintegrasikan 3 sasaran utama: kualitas lingkungan, keberlanjutan ekonomis, dan keadilan sosial



# Pertanian Berkelanjutan

- Indikator

- a. Ekonomi

- b. Lingkungan

- c. Sosial

- Ciri

- Lahan dengan usikan kecil, tanaman adaptif

- Target

## 1.2 Penggunaan SDL saat ini dan dampaknya

- Sering tidak sesuai kelas kemampuannya
- Menekankan pada aspek ekonomi
- Mengabaikan aspek lingkungan
- Mengabaikan aspek sosial,
- **Dampak:**
- Degradasi lahan: run off, erosi, banjir, kekeringan
- Gambut: emisi, subsidensi, kebakaran tinggi, penurunan Kehati



## 1.2 Penggunaan SDL tradisional dan dampaknya

- Sesuai kelas kemampuannya
- Produktivitas rendah
- Aspek lingkungan cukup baik
- Aspek sosial cukup baik
- **Dampak:**
- Degradasi lahan: tidak terjadi

## 1.3 Definisi dan Konsep Agroforestri

- **Definisi**

Agroforestry denotes a sustainable land and crop management system that strives to increase yields on a continuing basis, by combining the production of woody forestry crops (including fruit and other tree crops) with arable or field crops and/or animals simultaneously or sequentially on the same unit of land, and applying management practices that are compatible with the cultural practices of the local population. (ICRAF, 1982)

- **Konsep**

Combination of woody perennial crops with agricultural crops and/or livestock in space or time on a single unit of land.

# Definisi Agroforestri



- Dalam Bahasa Indonesia, kata *Agroforestry* dikenal dengan istilah wanatani atau agroforestri yang arti sederhananya adalah menanam pepohonan di lahan pertanian.
- Koppelman (1996) mendefinisikan Agroforestry sebagai bentuk menumbuhkan dengan sengaja dan mengelola pohon secara bersama-sama dengan tanaman pertanian dan atau makanan ternak dalam sistem yang bertujuan menjadi berkelanjutan secara ekologi, sosial dan ekonomi.

Menurut De Foresta dan Michon (1997), agroforestri dapat dikelompokkan menjadi dua sistem, yaitu :

- sistem *agroforestri sederhana*
- sistem *agroforestri kompleks*



- Reijntjes (1999) : Agroforestry sebagai pemanfaatan tanaman kayu tahunan (pepohonan, belukar, palem, bambu) pada suatu unit pengelolaan lahan yang sama sebagai tanaman yang layak tanam, padang rumput dan atau hewan, baik dengan pengaturan ruang secara campuran atau ditempat dan saat yang sama maupun secara berurutan dari waktu ke waktu.
- King and Chandler, (1978) : agroforestry adalah Suatu system pengelolaan lahan yang lestari untuk meningkatkan hasil, dengan cara memadukan produksi hasil tanaman pangan (termasuk hasil pohon-pohonan) dengan tanaman kehutanan dan/atau kegiatan peternakan baik secara bersama-sama maupun berurutan pada sebidang lahan yang sama, dan menggunakan cara-cara pengelolaan yang sesuai dengan pola kebudayaan penduduk setempat



# What is Agroforestry

- Agroforestry is an **integrated approach** that seeks to improve livelihoods and ecosystem services by combining trees and shrubs with crops and/or livestock.
- In a context of **global change**, agroforestry is an approach to strengthen **resilience** of farmers and communities in the face of stress and shocks, mainly by building on **diversification**.
- The World Agroforestry Center has adopted a **landscape approach** to its operations which considers agroforestry as one of many components of complex landscapes.

## 1.4 Sejarah Agroforestri

Cultivating trees and agricultural crops in intimate combination with one another is an ancient practice that farmers have used throughout the world. Tracing the history of agroforestry, King (1987) states that in Europe, until the Middle Ages, it was the general custom to clear-fell degraded forest, burn the slash, cultivate food crops for varying periods on the cleared area, and plant or sow trees before, along with, or after sowing agricultural crops. This "farming system" is no longer popular in Europe, but was widely practiced in Finland up to the end of the last century, and was being practiced in a few areas in Germany as late as the 1920s.

## 1.4 Sejarah Agroforestri

In tropical America many societies have simulated forest conditions to obtain the beneficial effects of the forest ecosystem. For example, in Central America, it has been a traditional practice for a long time for farmers to plant an average of two dozen species of plants on plots no larger than one-tenth of a hectare. A farmer would plant coconut or papaya with a lower layer of bananas or citrus, a shrub layer of coffee or cacao, annuals of different stature such as maize, and finally a spreading ground cover such as squash. Such an intimate mixture of various plants, each with a different structure, imitated the layered configuration of mixed tropical forests (Wilken, 1977).

# 1.4 Sejarah Agroforestri

In Asia, the Hanunoo of the Philippines practiced a complex and somewhat sophisticated type of "shifting" cultivation. In clearing the forest for agricultural use, they deliberately spared certain trees which, by the end of the rice-growing season, provided a partial canopy of new foliage to prevent excessive exposure of the soil to the sun. Trees were an indispensable part of the Hanunoo farming system and were either planted or preserved from the original forest to provide food, medicines, construction wood, and cosmetics (Conklin, 1957). Similar farming systems have also been common in many other parts of the humid lowland tropics of Asia.

The situation was little different in Africa. In southern Nigeria, yams, maize, pumpkins, and beans were typically grown together under a cover of scattered trees (Forde, 1937). The Yoruba of western Nigeria, who have long practiced an intensive system of mixing herbaceous, shrub, and tree crops, claim that the system is a means of conserving human energy by making full use



# 1.5 Sistem Pertanian Konservasi

- Definisi

Sistem pertanian yang menerapkan kaidah/tindakan konservasi tanah dan air.


- Untuk lahan kering: no tillage, minimum tillage, terasering, penanaman LCC, pemberian mulsa organik,
- Untuk lahan gambut: Best Practice water management plant/crop management and nutrient management,

# Why Agroforestry

- *Clean water and air*
- *Safe and healthy food*
- *Abundant wildlife*
- *Beautiful places*
- *Clean renewable energy*
- *Sustainable family farms and ranches*

# Why Agroforestry

- *Produces salable products*
- *Provides value-added opportunities*
- *Diversifies risk*
- *Increases property values*
- *Increases crop yields & livestock production*
- *May be eligible for cost-share & land rental payments*



The viability and sustainability of these systems can be attributed to some combination of the following factors:

- A reduced fallow period and a greater ability to cultivate on a long-term basis, thereby eliminating the need to move to new land;
- Reduced use of chemical fertilizers and other fossil-fuel-based inputs due to enhancement of soil organic matter and improvement in soil fertility;
- Improved soil structure and physical properties (for example, better sizes of pores and channels in the soil that allow better water penetration and drainage);
- Decreased risks of soil degradation from accelerated erosion and other degenerative processes;
- Increased production and a rise in economic status from subsistence to partially commercialized farm; and
- Decreased need for clearing new land.

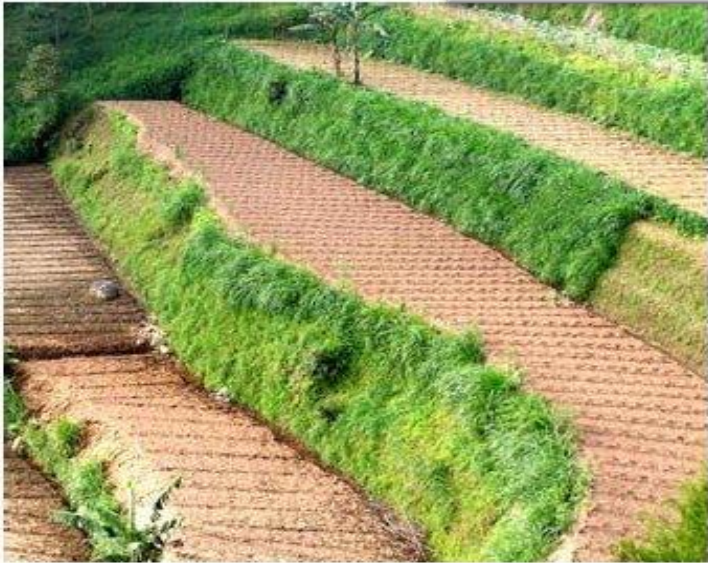
# Penanaman Dalam Strip



# Pola tanam ganda (multiple cropping)



# Penguat Teras



# Terasering

Bidang olah

Gbr 3 : Teras datar





# Rorak



## LUBANG RESAPAN BIOPORI

