

# Agrobiodiversity and Resilience

Conserving **plant** and **animal genetic resources** as a key component of sustainable agriculture



## Objectives

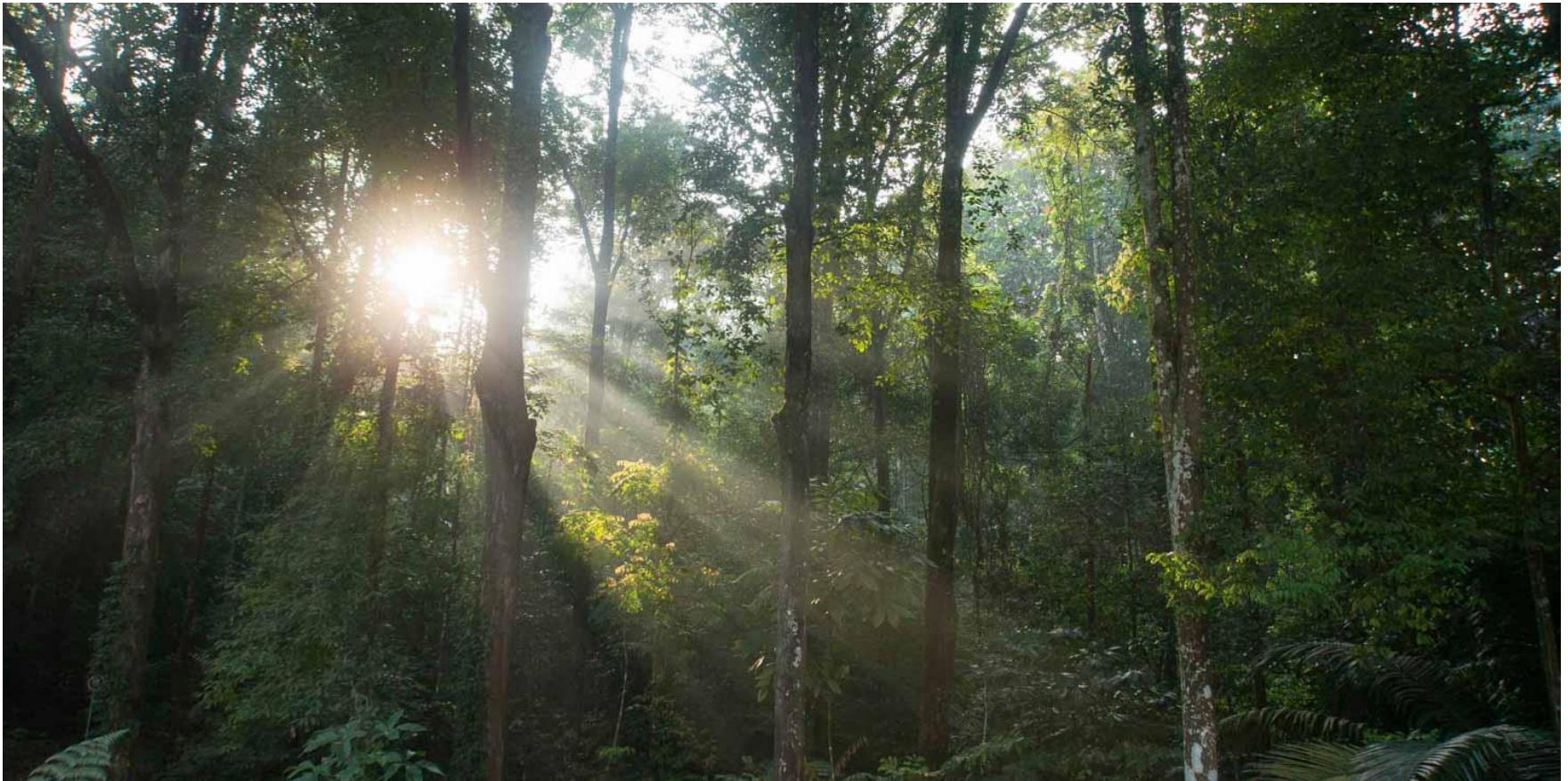
1. To identify biodiversity and agriculture biodiversity (ABD).
2. To assess the resilience of agrobiodiversity



# Agricultural Biodiversity (ABD)



# Rainforest



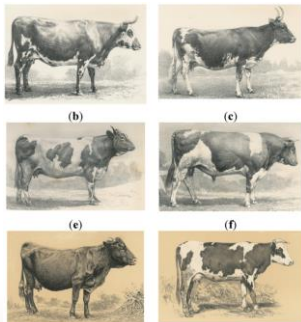
Source: <http://www.malaysiapavilion2015.com.my/>



# What is biodiversity / biological diversity?

Biological diversity – or biodiversity – is the term given to the variety of life on Earth. It is the variety within and between all living organisms and the ecosystems within which they live and interact.

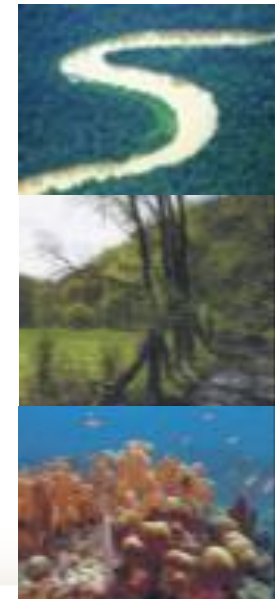
## Genetic diversity



## Species diversity



## Ecosystem diversity





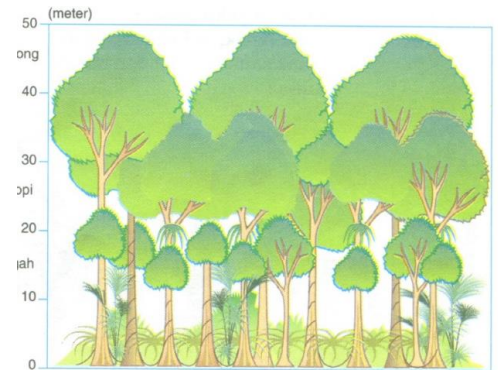
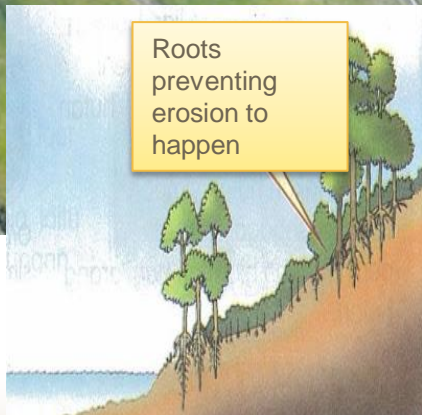
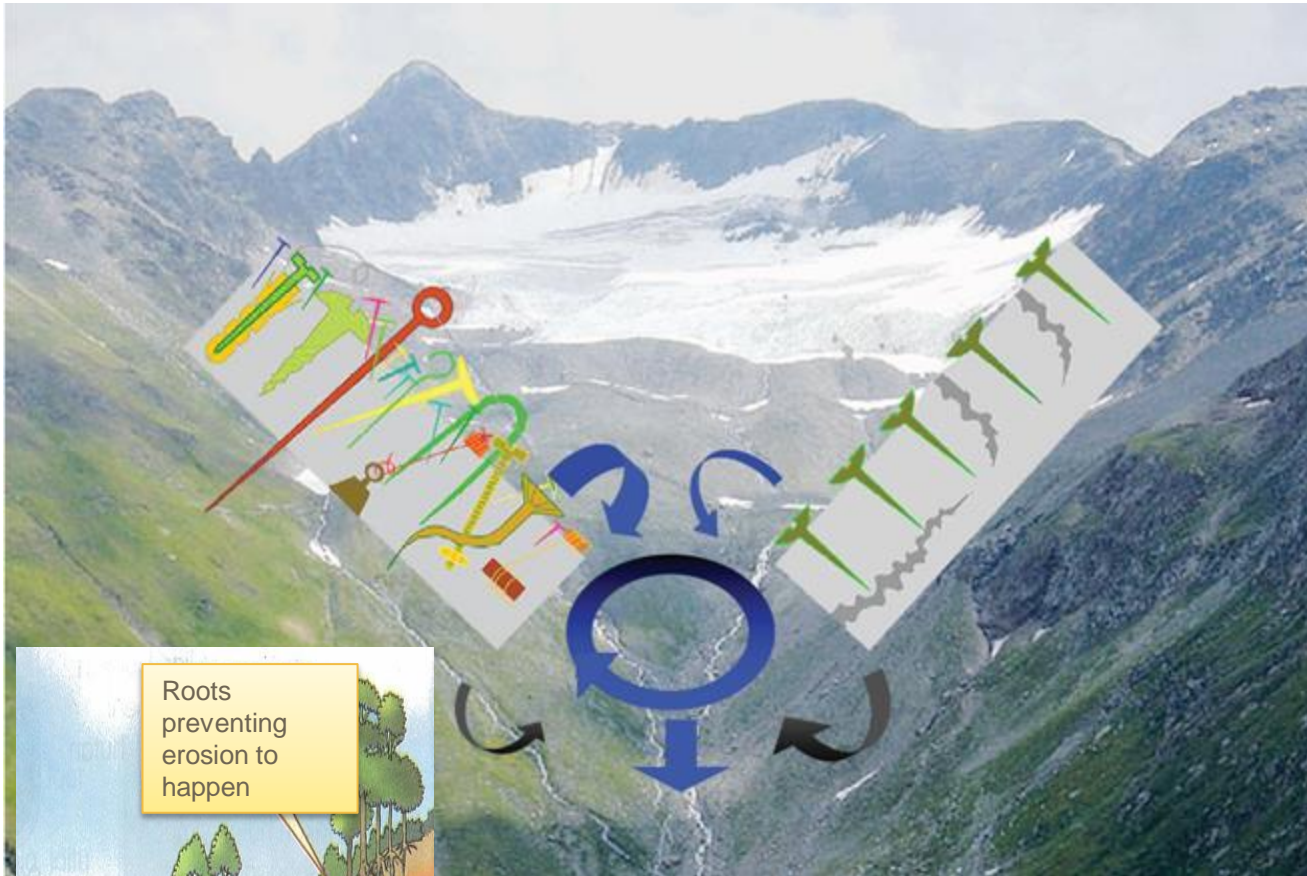
# Why is biodiversity important?



- **Ecosystem services, such as**
  - Protection of water resources
  - Soils formation and protection
  - Nutrient storage and recycling
  - Pollution breakdown and absorption
  - Contribution to climate stability
  - Maintenance of ecosystems
  - Recovery from unpredictable events
- **Biological resources, such as**
  - Food
  - Medicinal resources and pharmaceutical drugs
  - Wood products
  - Ornamental plants
  - Breeding stocks, population reservoirs
  - Future resources
  - Diversity in genes, species and ecosystems
- **Social benefits, such as**
  - Research, education and monitoring
  - Recreation and tourism
  - Cultural values

# Why is biodiversity important?

## Example of erosion prevention by stabilization of soils



© Christian Körner, Uni Basel.

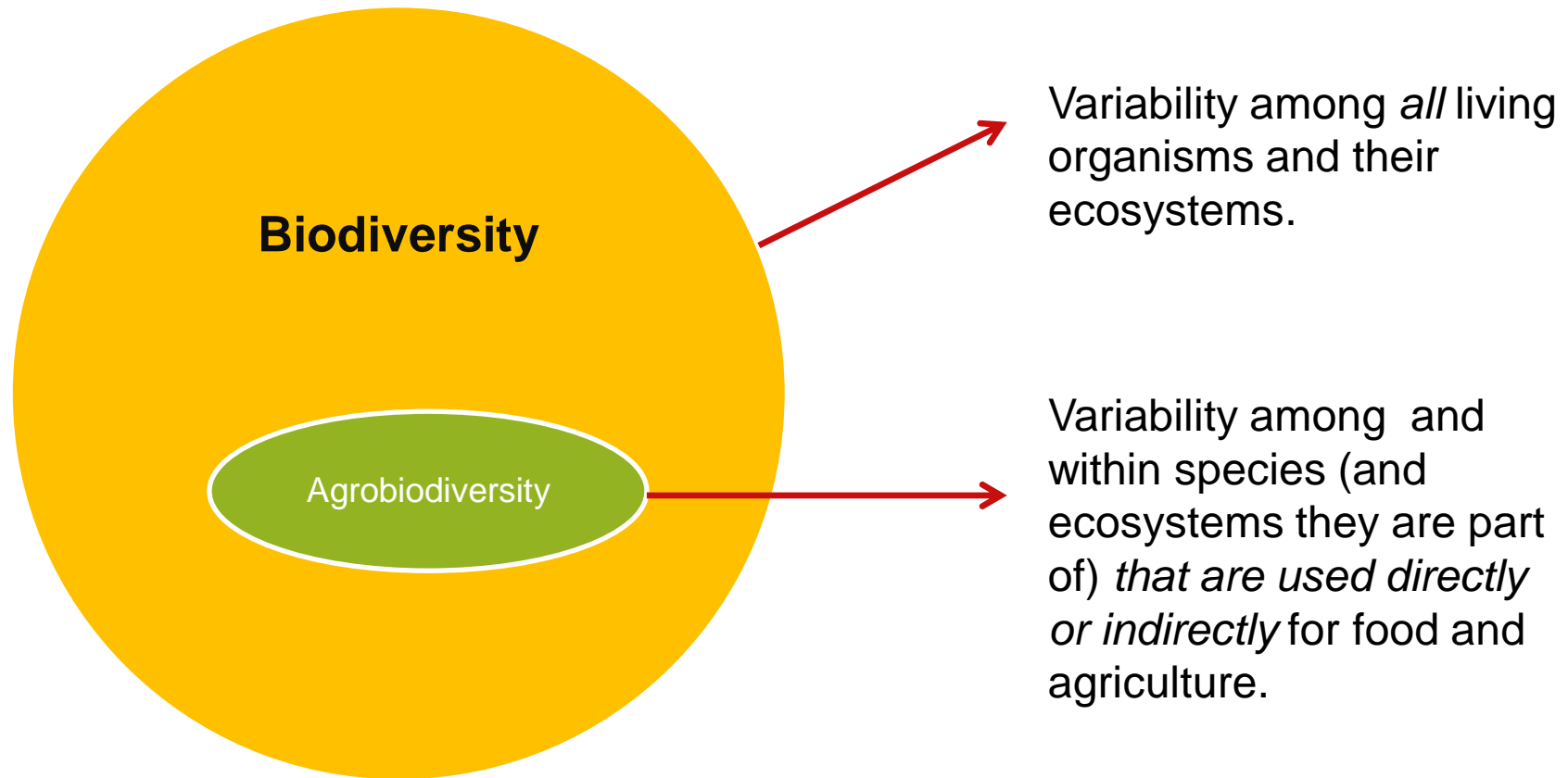


**Diversity fosters  
resilience; more  
diversity leads to  
more resilience**





## Biodiversity and agricultural biodiversity



**ABD is a *vital subset* of the global biodiversity!**

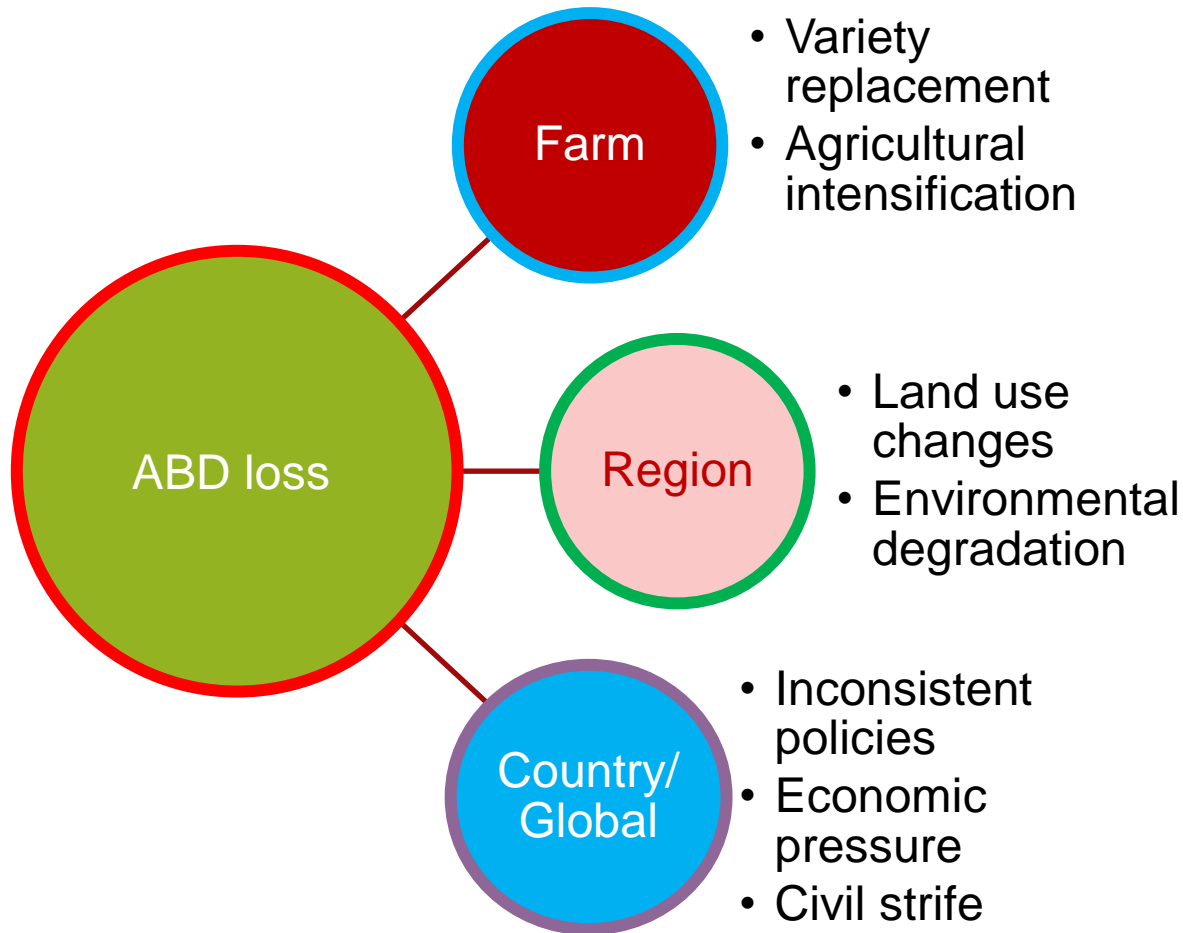
Sources: UN (1992); FAO (2004)



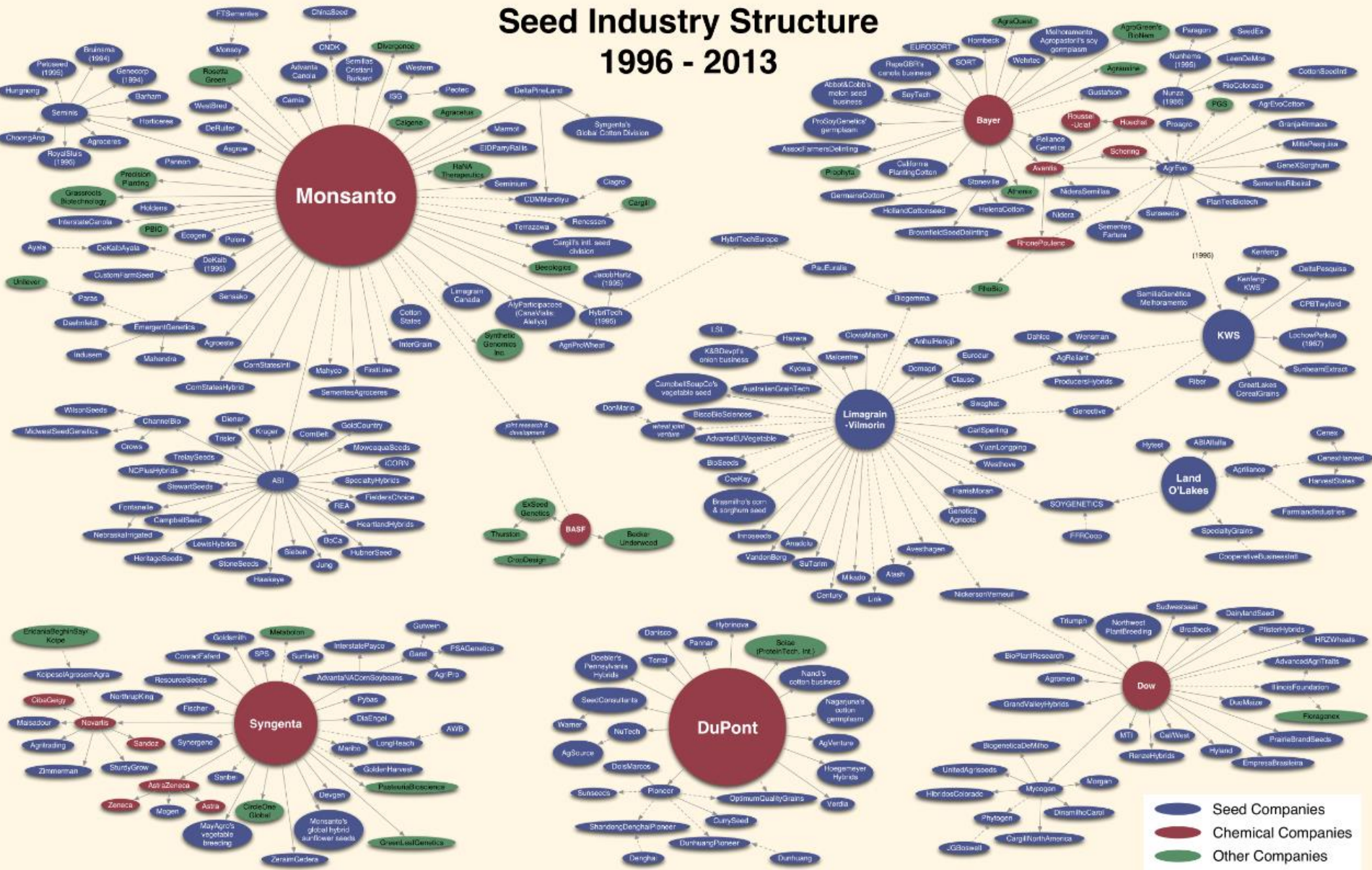
# Agrobiodiversity Loss



## Main drivers for ABD loss:



# Seed Industry Structure 1996 - 2013



- Seed Companies
- Chemical Companies
- Other Companies
- Full Ownership
- - - Partial Ownership

● Size proportional to global seed market share

Phil Howard, Associate Professor, Michigan State University  
<http://www.msu.edu/~howardp>



## Crop species concentration ABD is underutilized...

Only 4 species account for 60% of energy in human diets

~103 species account for 90% of energy in human diets

~150 species are commercially grown

~7000 edible plant species were used in history

Source: Padulosi et al. (2013)



## The use of local varieties

### Advantages

...are adapted to agro-ecological and production conditions such as:

- Hot/cold climate (e.g. heat tolerance of seedlings)
- Low soil fertility (e.g. low P)
- Variable rainfall conditions (e.g. drought, temporary flooding)
- Pest/disease pressure

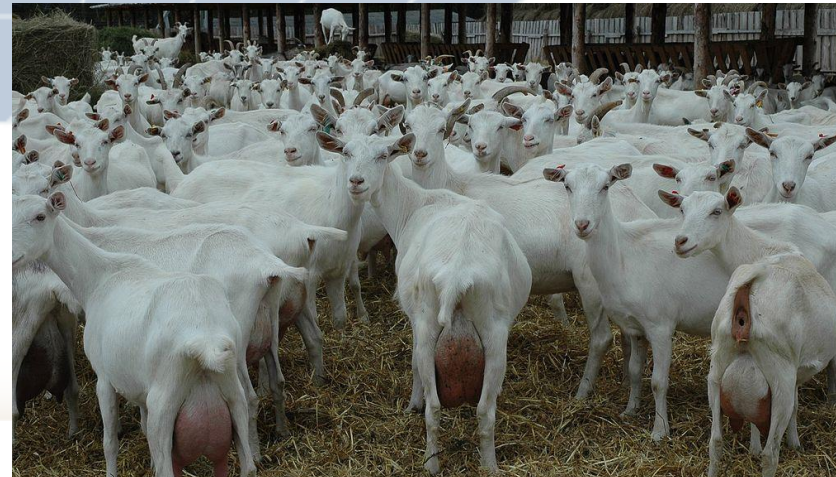
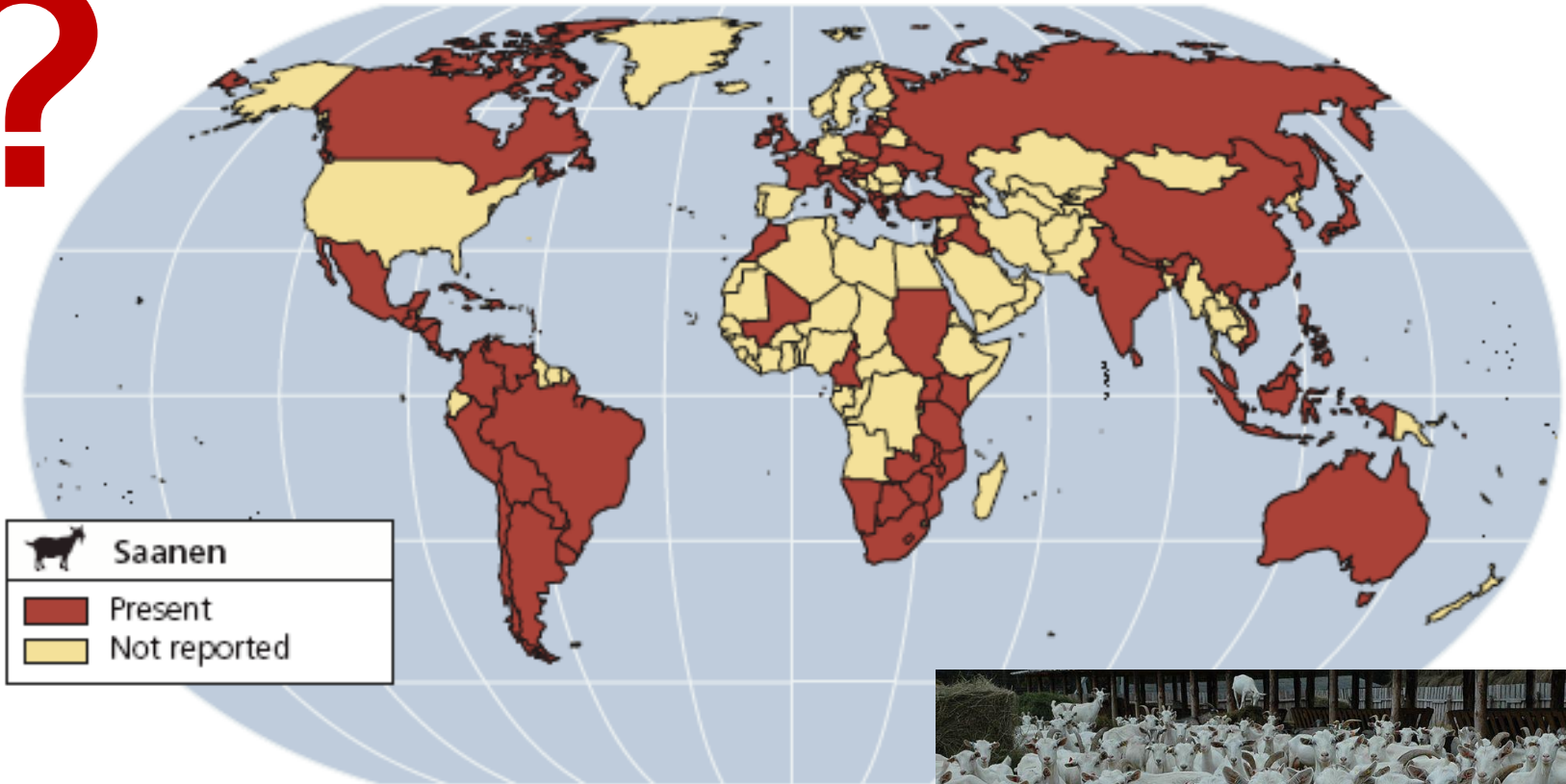
### Disadvantages

- Lower yields and slow growth
- Little selection and breeding
- Little knowledge and research

Source: Haussmann et al., 2013



# Livestock genetic concentration



FAO 2007. The State of the World's animal genetic resources for food and agriculture.



## Changes in livestock diversity

- Domestication began over 12,000 years ago  
-> livestock diversity results from human intervention.
- Only about **40 of the 50,000** known mammalian and avian species were selected as useful by different human cultures and domesticated.
- **14 species account for most of global livestock production, the so-called 'big five'** show particularly large numbers.
- In contrast to plant genetic resources for food and agriculture, animal genetic resources for food and agriculture comprise **less species, have lower reproduction rates, and longer generation intervals.**





## The use of local breeds

### Strengths in

- Familiar with local conditions (feed, climate, high elevations..)
- High resistance and tolerance to specific diseases
- High tolerance of climatic extremes (heat, cold)
- Less fertility problems and longer life expectancy
- Multi purpose animals
- Cheap local breedings animals

### Deficiencies in

- Lower yields and slow growth
- Low final size
- Little selection and breeding
- Almost no records
- Little knowledge and research



## Changes in livestock production systems

### Low input – low output farming

- Remote areas
- Less fertile environment
- Small to medium farms
- Local and crossbreeds
- Lower feed demand
- Robust animals
- Niche production
- Missing breeding strategies

### High input - high output farming

- Close to urban areas
- High quality products
- Medium to large scale farms
- High yielding exotic breeds
- High feed demand
- Fragile animals
- Modern reproduction techniques
- Singular breeding criteria



## Changes in livestock production systems

Local Breed: Kedah Kelantan



Imported high yield breed



# Forest



100%

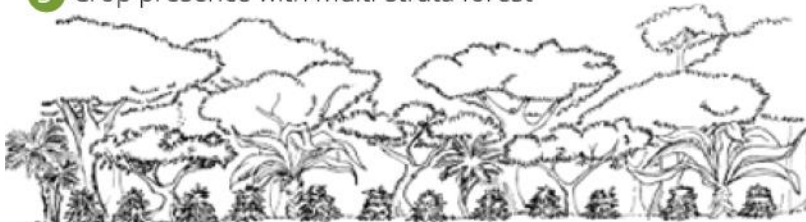
Abundance of original species

0%

6 Fully functional natural forest



5 Crop presence with multi-strata forest



4 4-10 species cultivated (some trees)



3 2-3 species cultivated (sparse trees)



2 Commercial monocrop

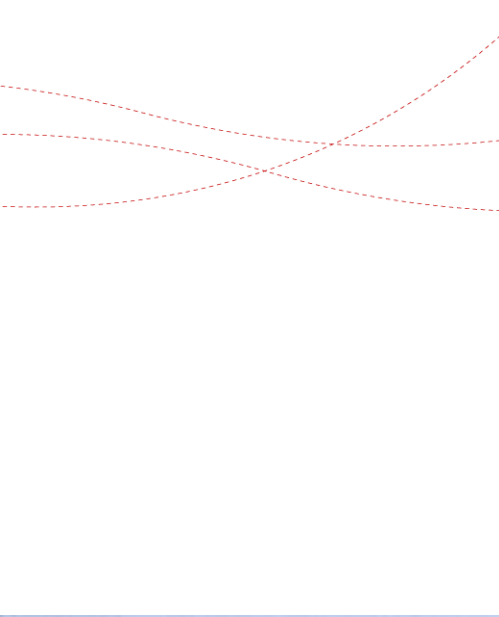


1 Cleared land or pasture



## Land use changes

Source: Perfecto et al 2009



Source: [www.mongabay.com](http://www.mongabay.com)

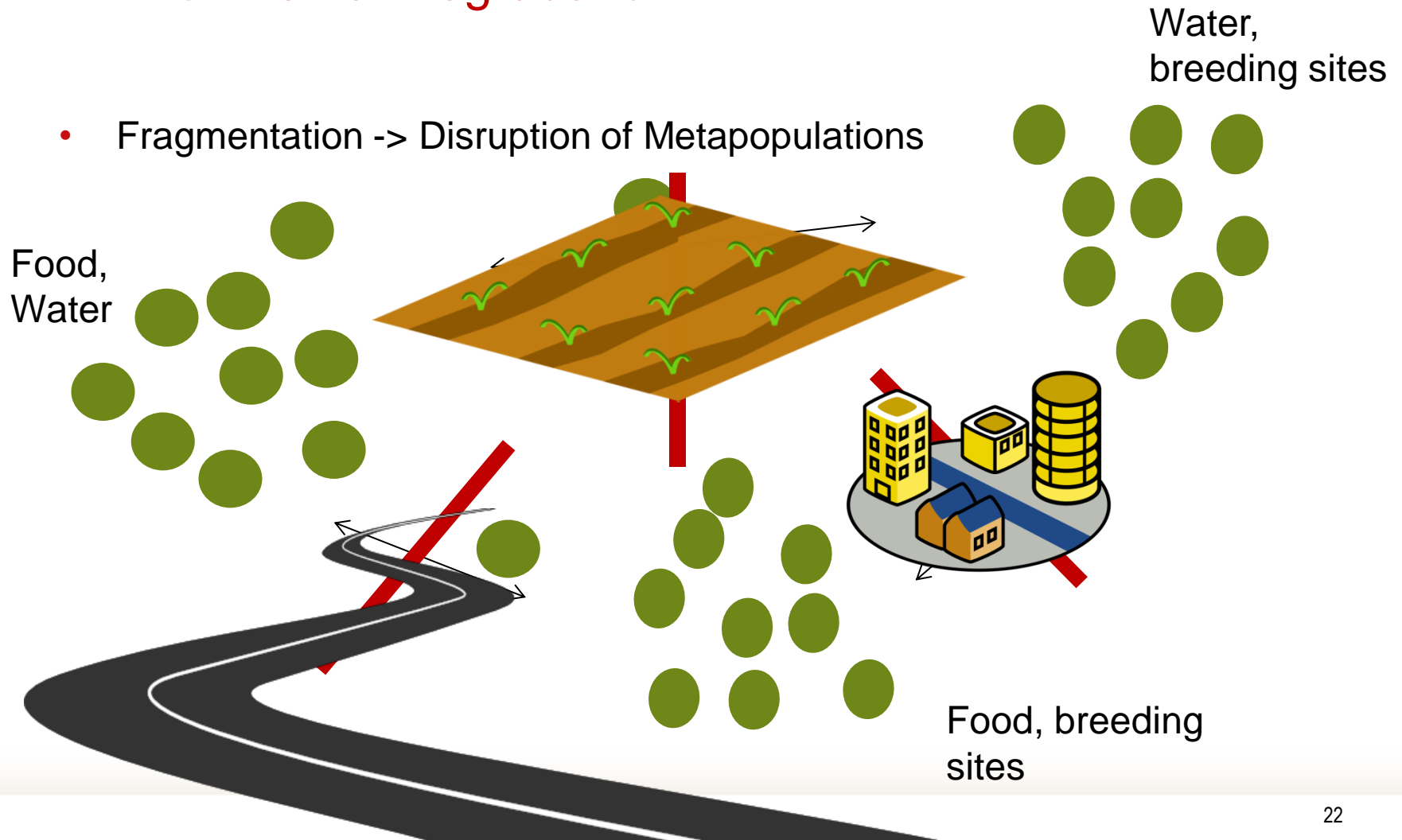
## Land use changes

Source: [agronigeria.com.ng](http://agronigeria.com.ng)



## Environmental Degradation

- Fragmentation -> Disruption of Metapopulations





# Thank you!

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On behalf of



Federal Ministry  
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