Diversifying Cropping Systems
Multifunctional Agriculture 1- Agroforestry

Agroforestry in Landscape Planning

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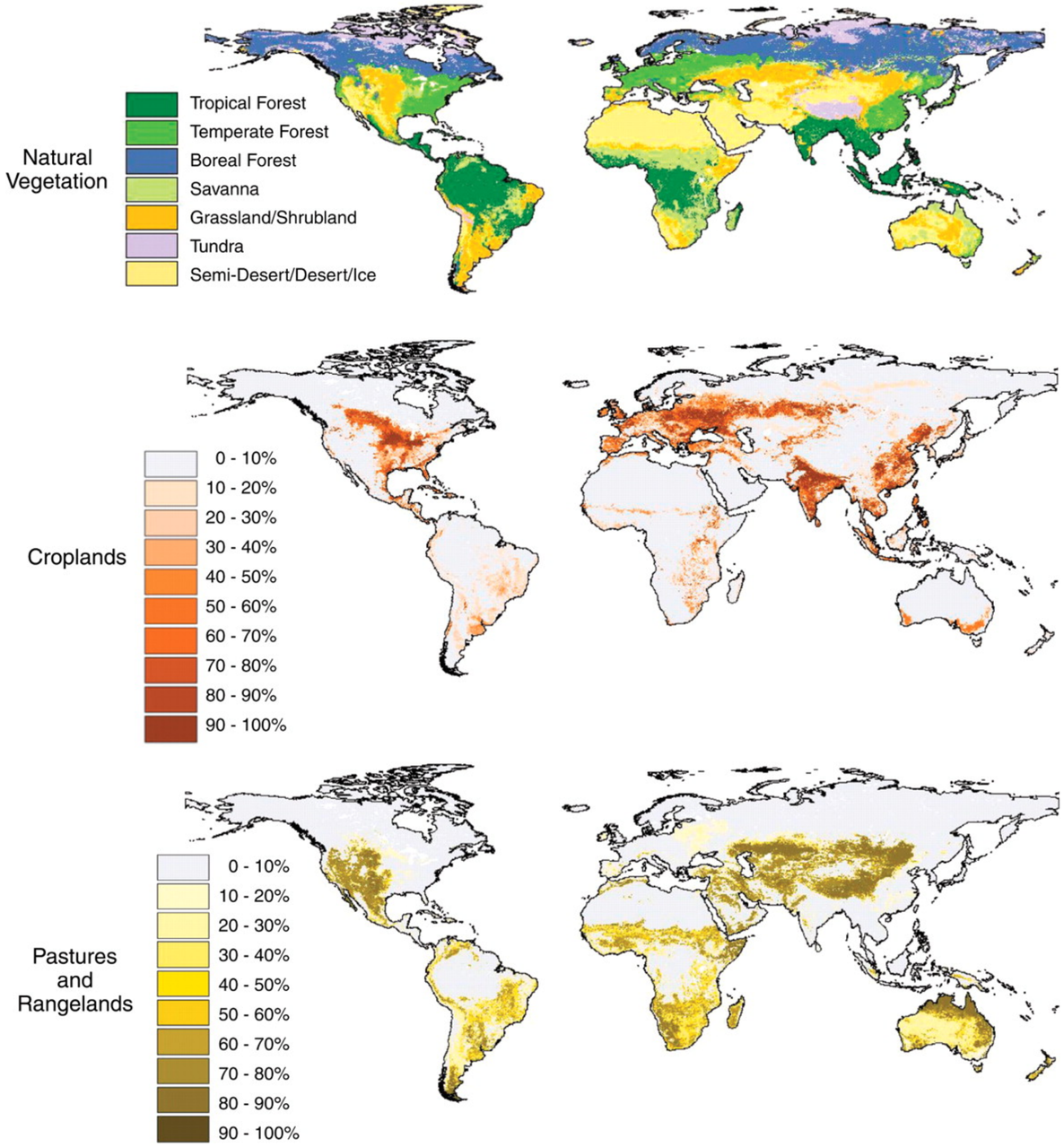
Tropical ecosystems play a major role in the well-being of the population and in the global climate system

Agroecosystems cover 38% of the world's land surface

Red color on the map represents the proportion of territory occupied by crops

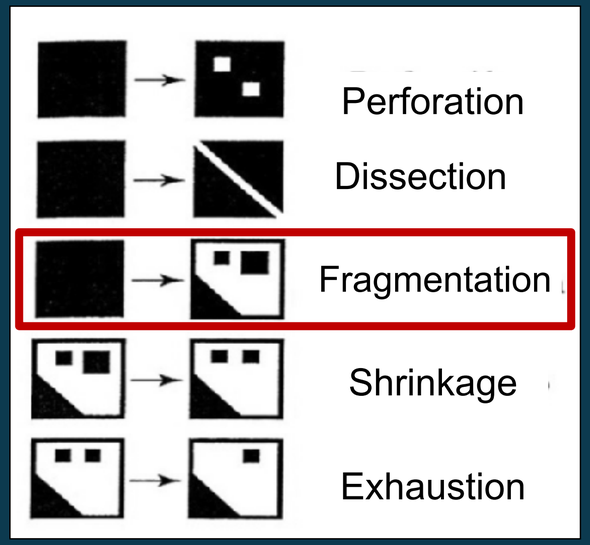
Yellow color on the map represents the proportion of territory occupied by pastures



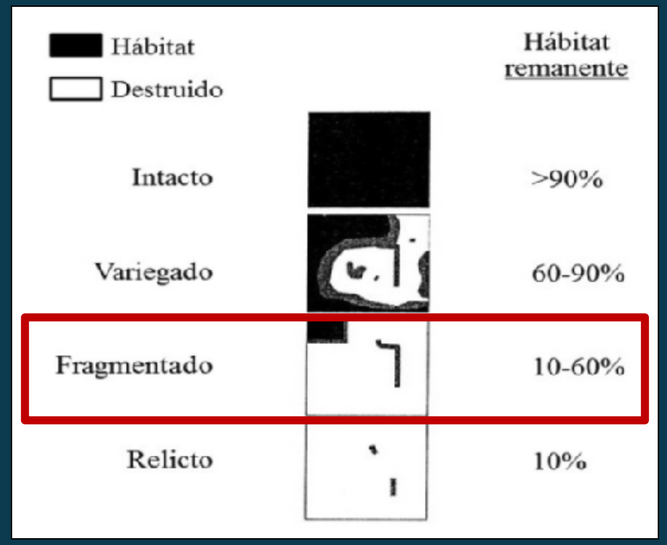
Jonathan A. Foley et al. Science 2005;309:570-574

Landscape modifications:

- Forest loss
- Fragmentation: dynamic process of landscape alteration



Process of fragmentation (Forman 1995b



States of landscape change (Hobbs y Hopkins 1990)

- Natural habitat
- Isolation
- Edge length
- Human use of matrices

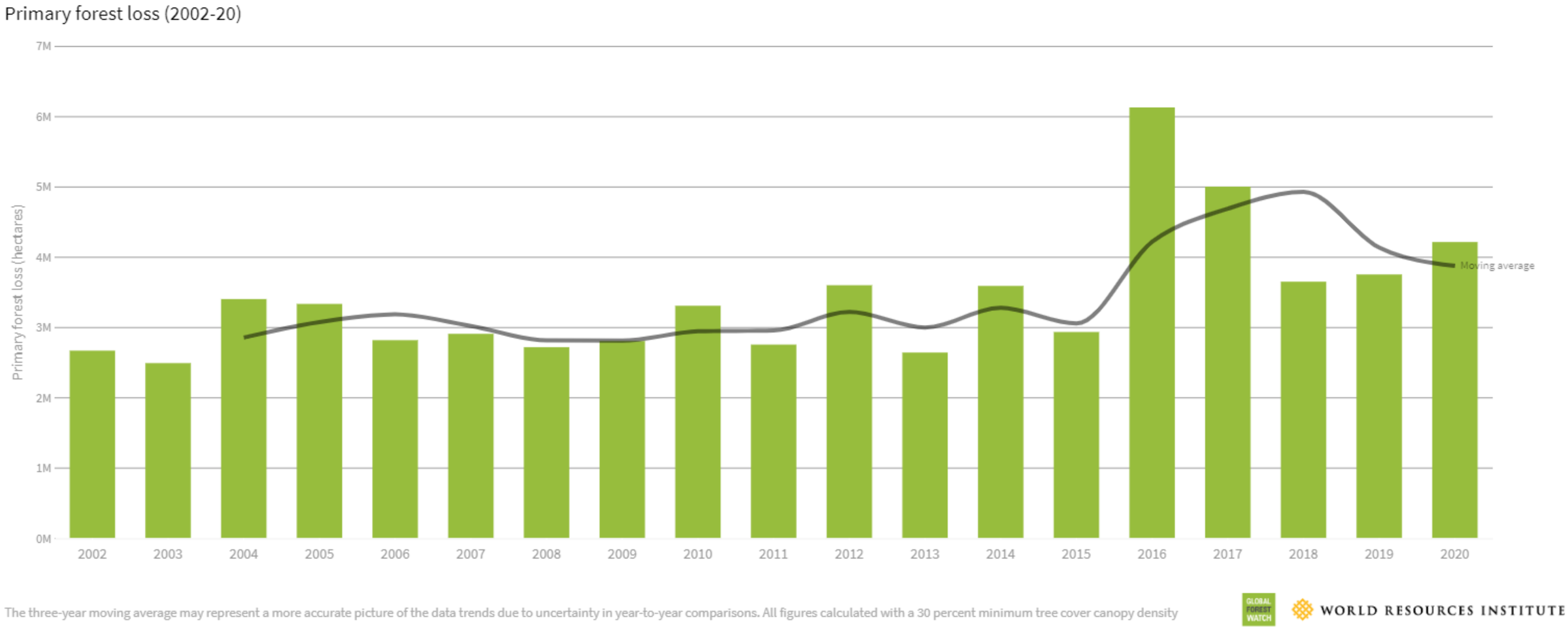
SPACE PATTERNS AT LANDSCAPE LEVEL:

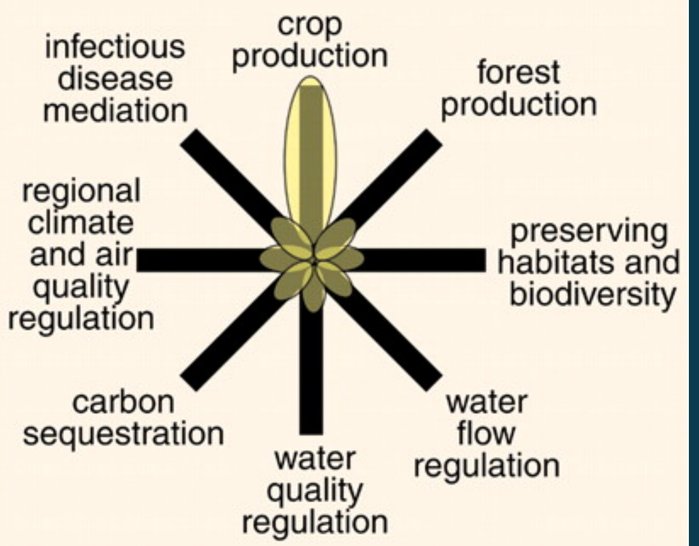
(Turner 2001)

- COMPOSITION
- CONFIGURATION
  - Area
  - Core
  - Shape
  - Edge
  - Proximity

(McGarigal 2002, Bennett 2004)

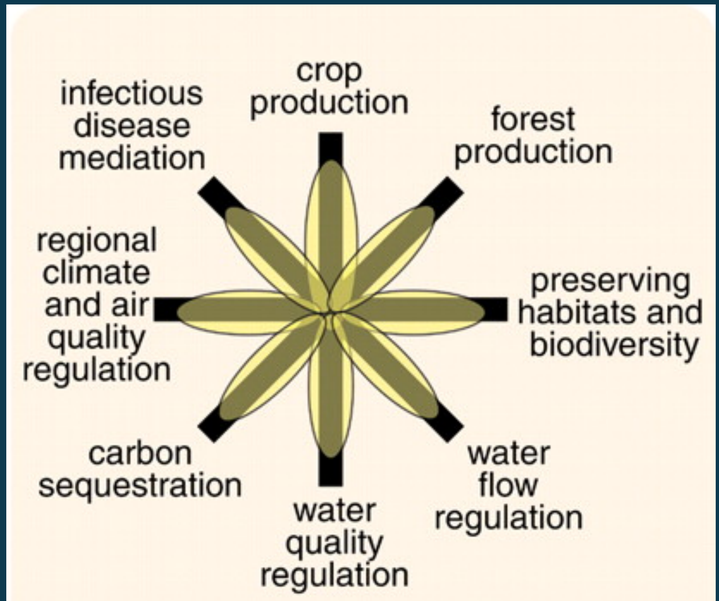
The tropics have lost 12.2 million hectares of forest cover in 2020 (University of Maryland Global Forest Watch)





intensive cropland

We



cropland with restored ecosystem services

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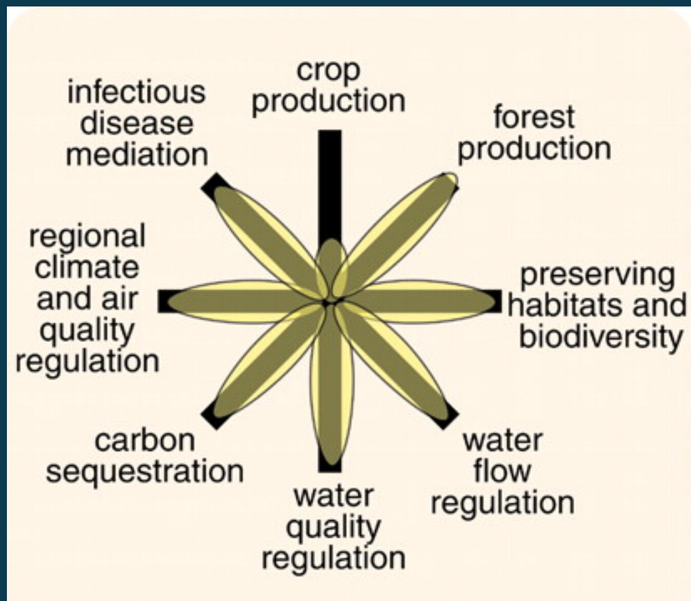
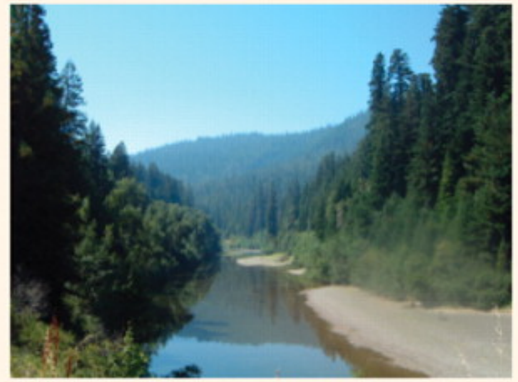




natural ecosystem

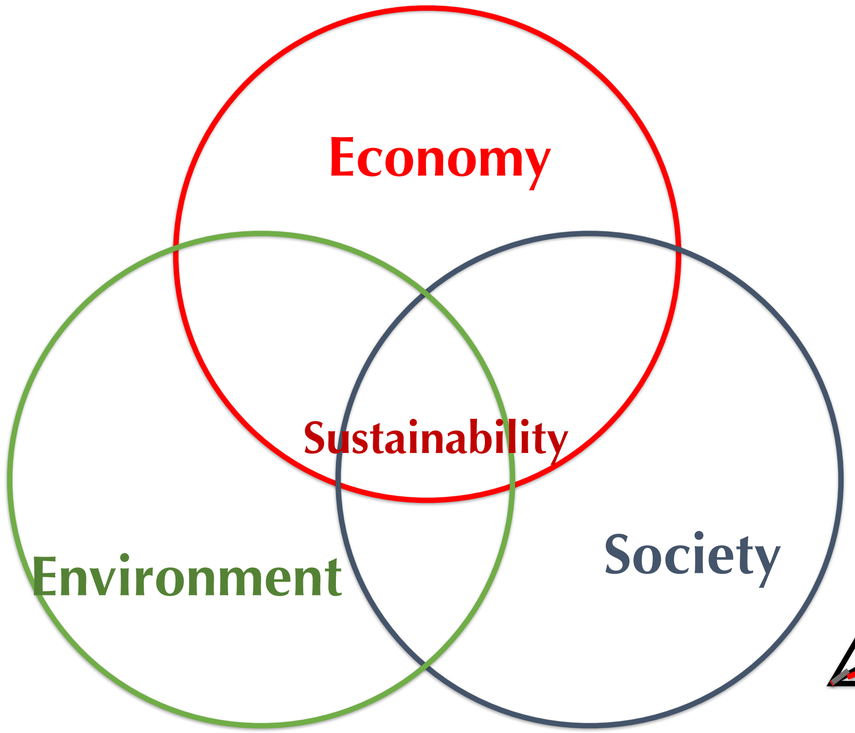
Jonathan A. Foley et al. 2005. Science.

We are on an unsustainable trajectory, which compromises the availability of resources for the next generations, including ecosystem services and and food sovereignty.

Sustainability is not an option, it is a necessity

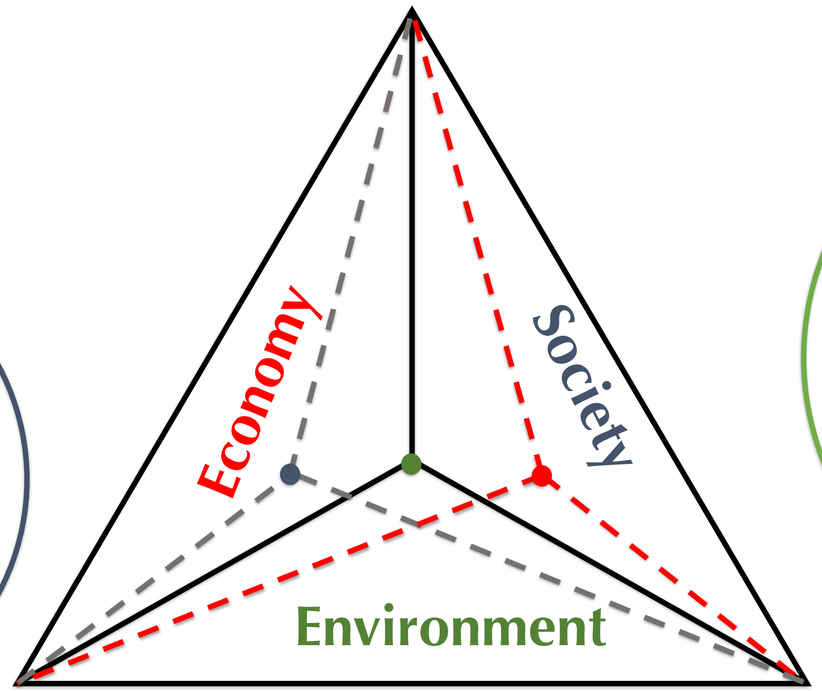
Definitions of Sustainability

Three baselines



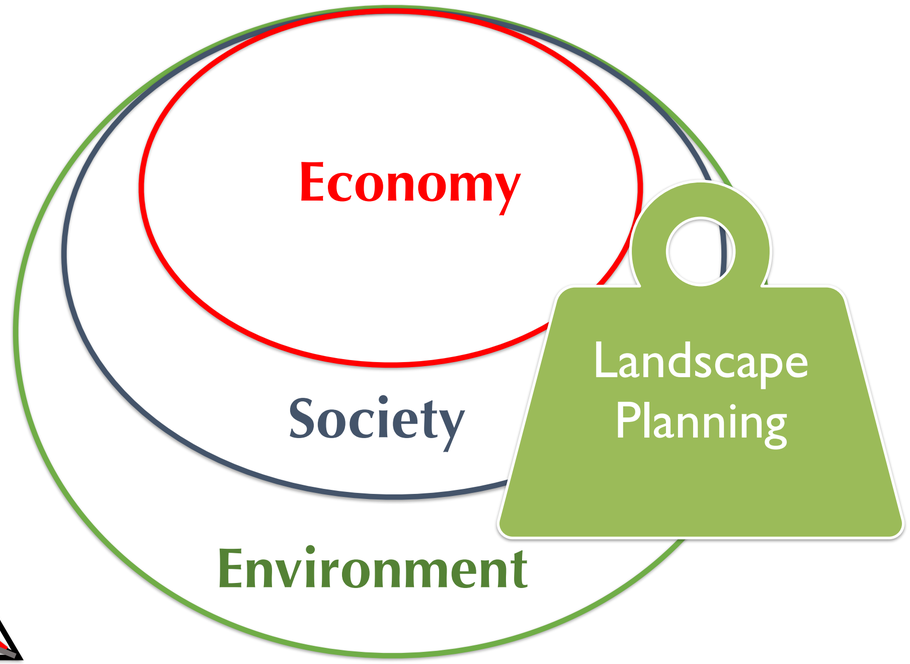
The three baselines describe that sustainability is achieved when sustainability is achieved in each pillar: economic, social and environmental.

Weak sustainability



Weak sustainability allows substituting one capital for another (environmental, economic and social) as long as total capital does not decrease.

Strong sustainability



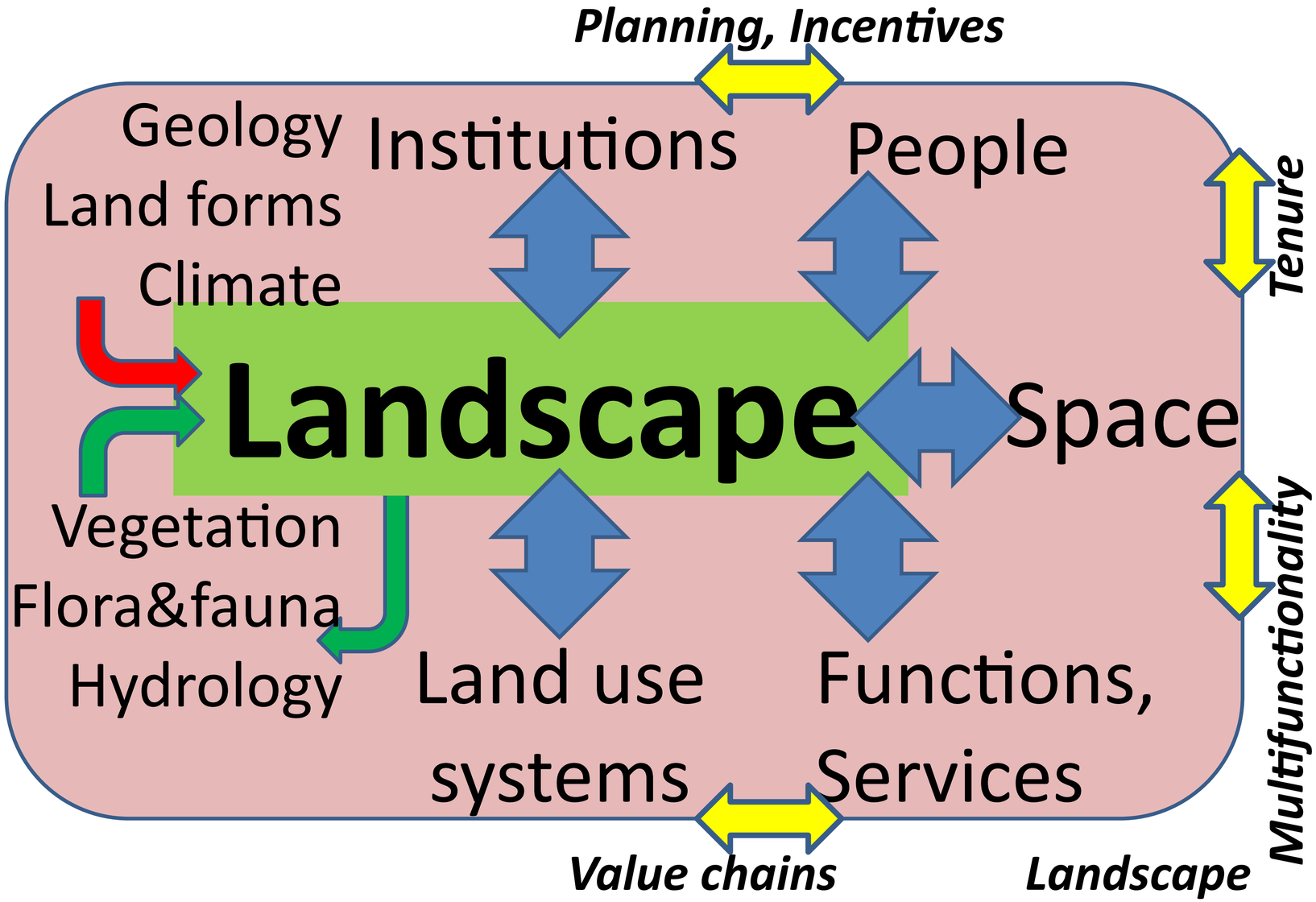
Strong sustainability assumes that the economy is in the social domain, and both are dependent on the environment. It establishes that human and nature capitals are complementary.

Wu Jianguo 2013

Maslow's Hierarchy of Human Needs

Wu Jianguo 2013

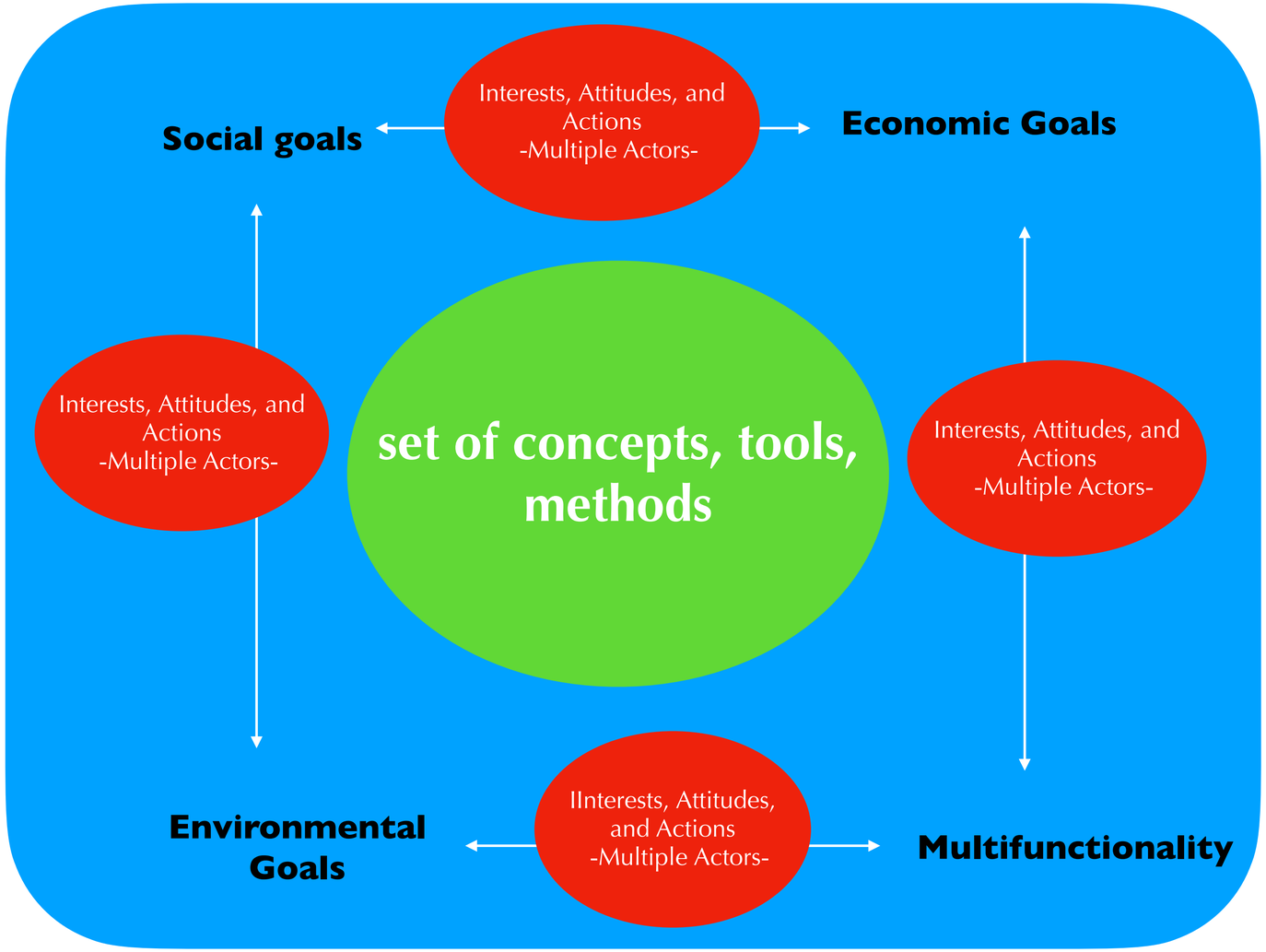
Why Agroforestry in Landscape Planning



Minang et al. 2015

Ten principles for landscape approach adopted by the CBD

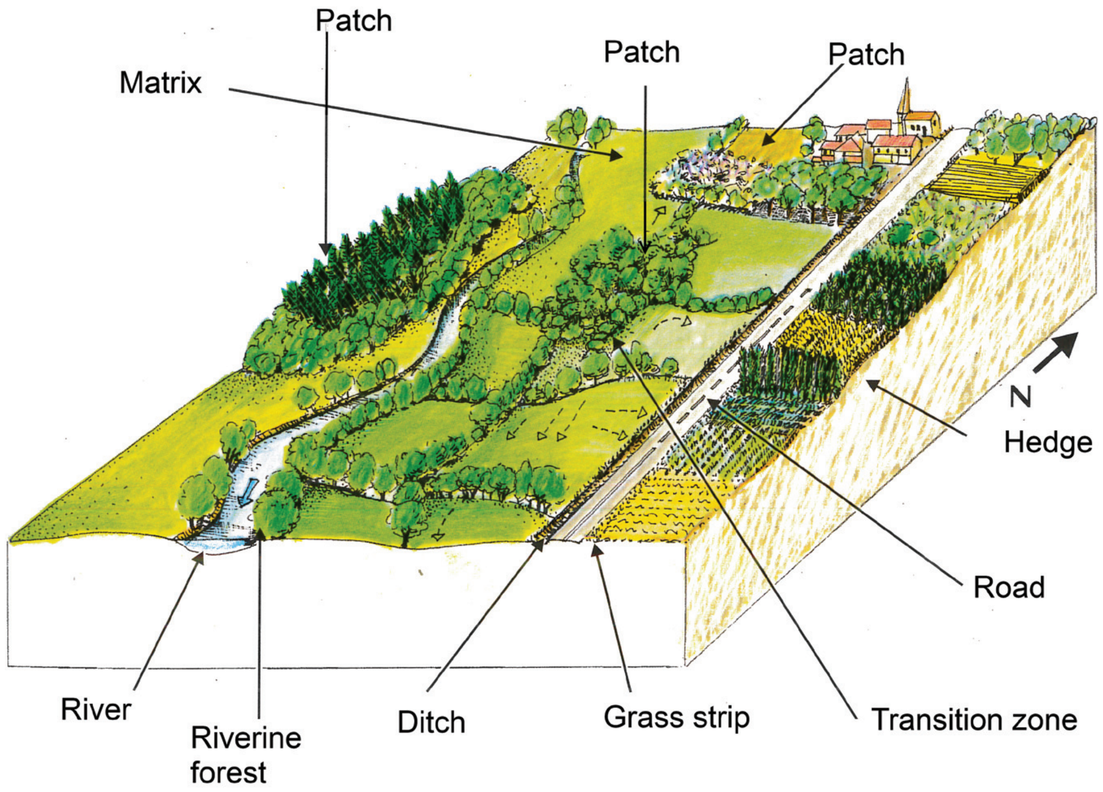
1. Continued learning and adaptation
2. Common concern entry point, multiple scales
3. multiple scales
4. multifunctionality
5. multiple stakeholders
6. negotiated and transparent change logic
7. clarification of rights and responsibilities
8. participatory and user friendly monitoring
9. resilience
10. strengthened stakeholder capacity



Minang et al. 2015

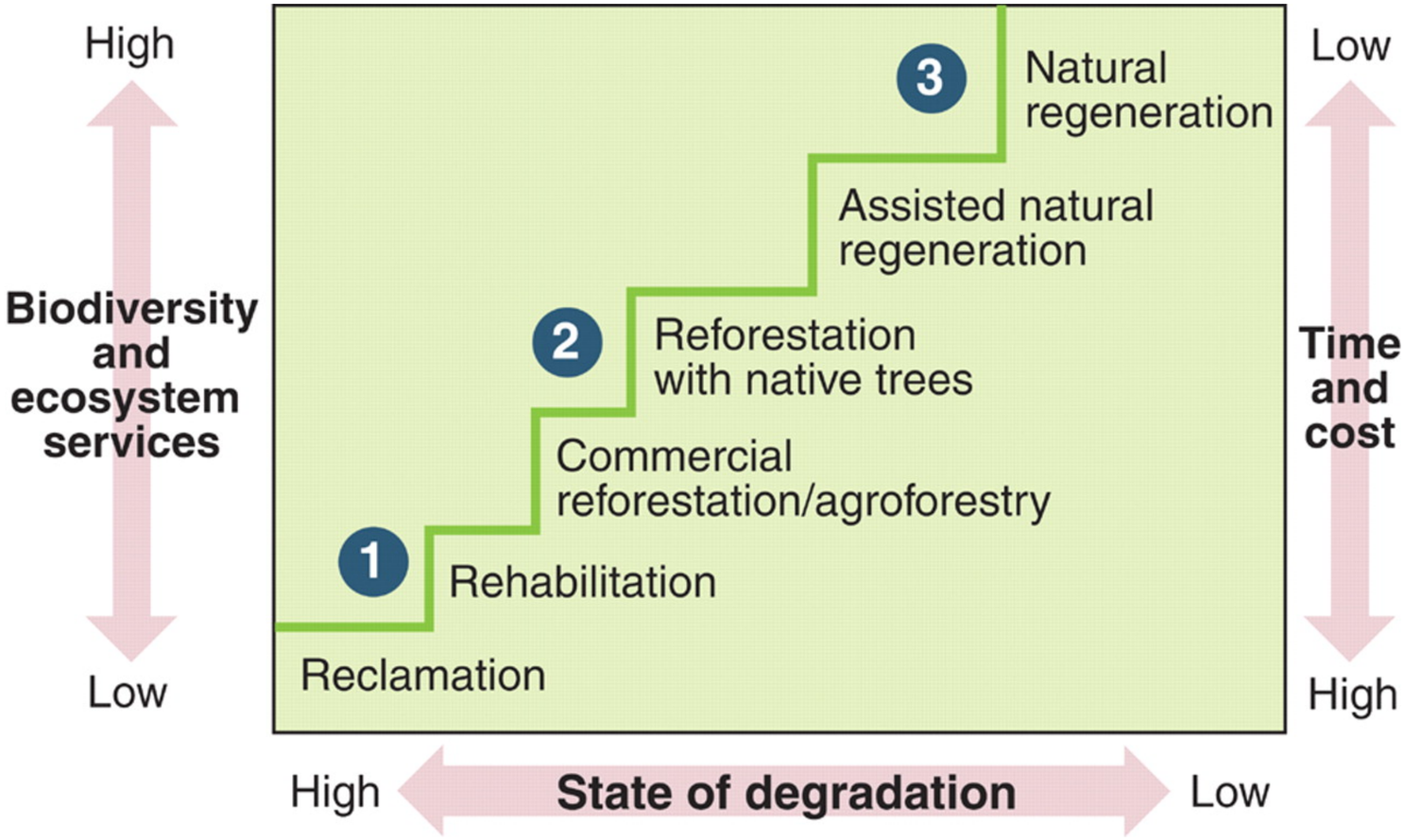
Where do the landscapes go? Integrating the requirements for the landscape approach

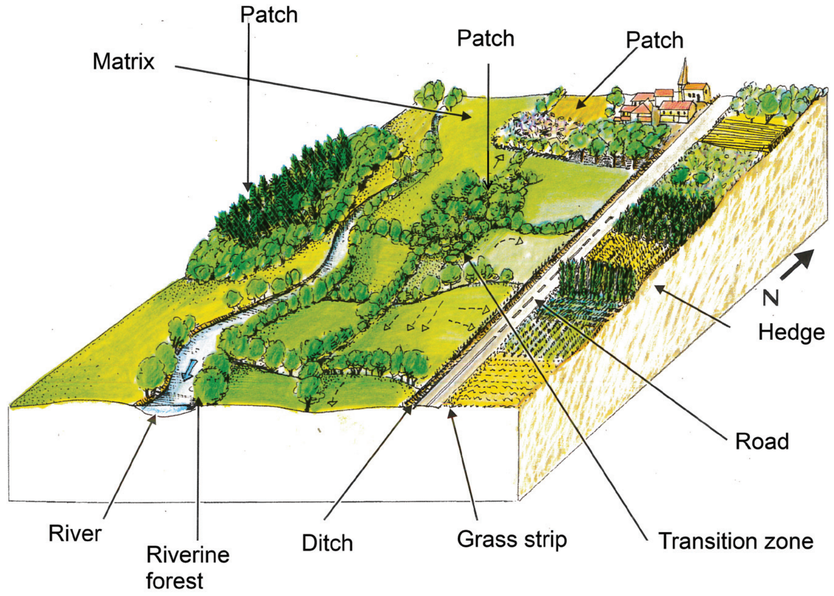
- Thinking at the landscape scale does not simply mean thinking of larger areas, but mainly thinking in terms of heterogeneity.
- For a heterogeneous landscape to function, there must be links and interactions between the landscape units, leading to functional heterogeneity.
- Different land uses mean different functions, leading to the concept of landscape multifunctionality or multipurpose landscapes.
- Multifunctional mosaic landscapes offer a better synergy between climate change mitigation and climate change adaptation than homogeneous land areas.



Minang et al. 2015

Agroforestry occupies an intermediate position on the forest restoration ladder





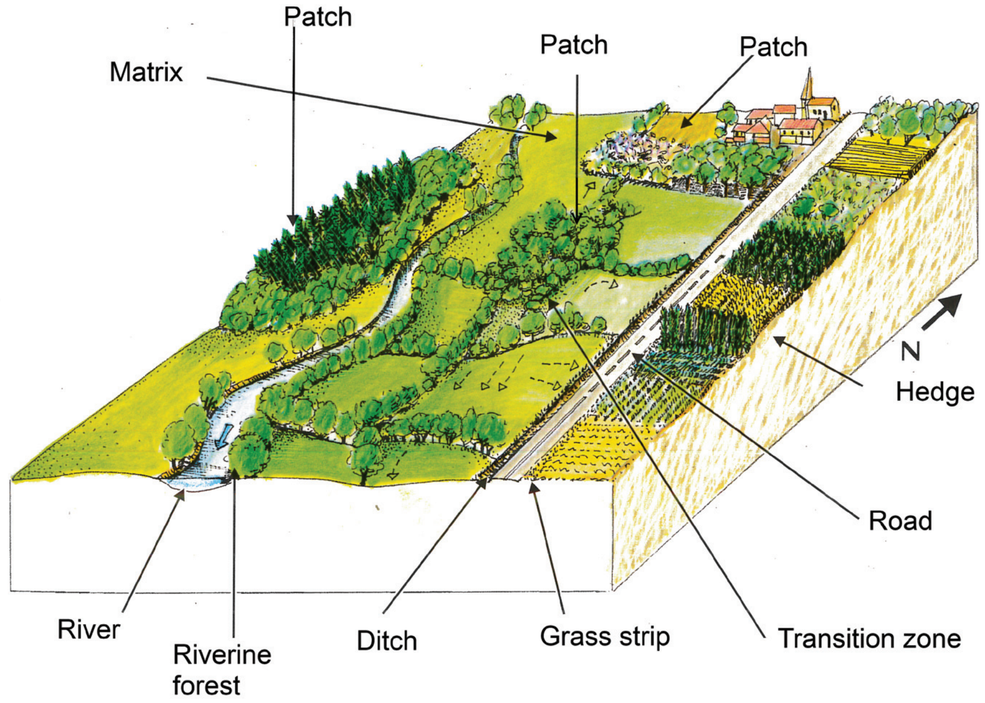
- The results of particular restoration approaches are:

1. restoration of soil fertility for agricultural or forestry use
2. For the production of timber and non-timber products
3. for the recovery of biodiversity and ecosystem services

Robin L. Chazdon Science 2008;320:1458-1460

Options around agriculture that allows landscape planning

1. Adopt agricultural practices based on biodiversity - for example - polyculture.
2. Learn from traditional agricultural practices - for example, the chakras.
3. Transform conventional agriculture into organic agriculture
4. ***Transform "simple" crops and pastures into agroforestry systems***



Rey Benayas y Bullock (2012)

Agroforestry in Landscape Planning

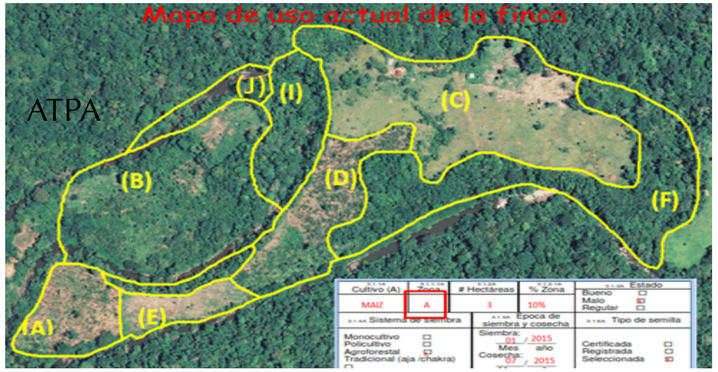
Chocó-Andean Bio-Corridor (CAB)

Photo Google

Protected forests that secure clean water and climate resilience for healthy communities and productive farms, with enterprises that provide employment opportunities for youth to stay in the community rather than migrate.

Agroforestry

Agenda for transforming production in the Amazon (ATPA)



Convert current agricultural production activities in the Amazon region to agroproduction systems that are sustainable from economic, social, cultural and environmental perspectives. It aims to generate incentives to reduce deforestation and foster restoration.

Buck et al. 2020; Cobos et al. 2017; ATPA-Ministerio de Agricultura, Ganadería, Acuacultura y Pesca.

Agroforestry in Landscape Planning

Chocó-Andean Bio-Corridor

Strategy

Polycultures provide income and connect ecosystem components

Contributions to scaling agroforestry

Agroforestry builds connectivity in a highly fragmented landscape while generating income for farmers and local communities

Agenda for transforming production in the Amazon

Strategy

Silvo-pasture, shade cacao and coffee, native fruits, fungi, fibers, oils provide income for producers and protect ecosystems services

Contributions to scaling agroforestry

Technical assistance service are revised to promote diverse practices that appeal to different farmers

Buck et al. 2020; Cobos et al. 2017; ATPA-Ministerio de Agricultura, Ganadería, Acuacultura y Pesca

Agroforestry in Landscape Planning

Chocó-Andean Bio-Corridor

Strategy

Polycultures provide income and connect ecosystem components → Agroforestry

Contributions to scaling agroforestry

Agroforestry builds connectivity in a highly fragmented landscape while generating income for farmers and local communities → Agroforestry

- Agroforestry systems are designed to meet both conservations landscape and development landscape.
- As small holder farmers are the predominant land users, restoring ecological connectivity requires multi-funcional agroforestry systems.
- The planning prioritize watershed protection, wildlife habitat and ecosystems service.
- The planning in sustainable-use zones include forest management, reforestation, mixed agroforestry, silvo-pasture, tourism.

- To date an estimated **3600 ha of agroforestry** and community forestry have been established with native species to protected agricultural assets and the buffer zones and watershed reserves
- With the participation of 2000 farmers

Buck et al. 2020; Cobos et al. 2017; ATPA-Ministerio de Agricultura, Ganadería, Acuacultura y Pesca

Agroforestry in Landscape Planning

Agenda for transforming production in the Amazon (ATPA)

Strategy

Silvo-pasture, shade cacao and coffee, native fruits, fungi, fibers, oils provide income for producers and protect ecosystems services → Agroforestry

Contributions to scaling agroforestry

Technical assistance service are revised to promote diverse practices that appeal to different farmers → Agroforestry

- ATPA contributes to food and livelihood security, stabilization of the agricultural frontier, and climate change adaptation and mitigation.
- A key practice is incorporating cacao into the tradicional Chakra and Aja systems as an alternative to cacao monoculture to complement the main crop with fruits.
- Silvo-pastoral systems are promoted to transform relatively unproductive cattle operations into more productive mixed cattle-timber enterprise .

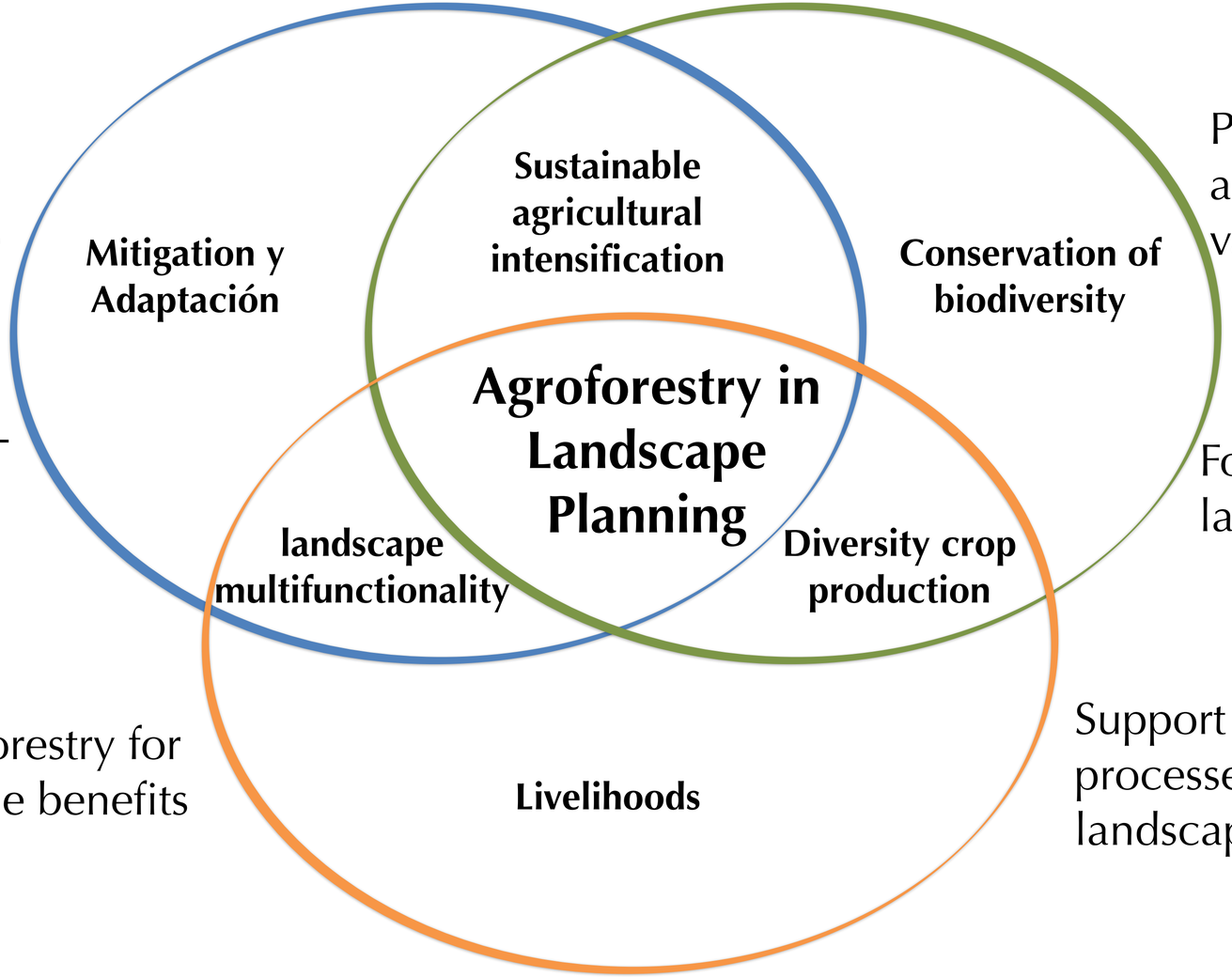
- Of its target to convert 300400 ha of grassland to five types of agroforestry systems, by mid-2019 the area under agroforestry was 174045 ha.
- By mid-2019, 9479 households had adopted integrated farm management plans.
- ATPA's efforts accounted for new product certifications and the development of 12 new value chains, signaling important momentum for markets that will incentivize agroforestry producers

Buck et al. 2020; Cobos et al. 2017; ATPA-Ministerio de Agricultura, Ganadería, Acuacultura y Pesca

Move towards an "agroforestry sustainability science

Understand local land-use trajectories and traditions

Upscale agroforestry for landscape-scale benefits



Promote synergies amongst the multiple values of agroforestry

Foster inclusive forms of landscape governance

Support innovation processes in agroforestry landscape

SUSTAINABLE DEVELOPMENT GOALS

Adapted from Plieninger et al. 2020; Minang et al. 2015; Rey Benayas y Bullock 2012

Some key questions

- How can conventional agroforestry extension methods and systems be modified to improve alignment with integrated **landscape planning**?

- How can the multitude of tools available for guiding landscape planning practice be **selected, combined, and designed** to foster the upscaling of agroforestry?

- How can **financing** to support integrated agroforestry landscape initiatives be **generated** on a sustainable basis?

Buck et al. 2020

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Muchas gracias!!!