Water in agriculture-forest frontiers

SESAM Seminar

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Overview:

1. Agriculture-forest frontier

2. Trends in agriculture-forest frontiers

3. Reverting the trends

4. Pendulum analytical framework

Based on: Seijger et al. in Ambio

Water and forest in the spotlight (IUFRO, Bonn Challenge, Ellison et al.), but is it only about water-forest-people?

Amazon rainforest, Brazil

Riverine forest, Karlsruhe Germany

And is there a nexus, or is it about exploration-exploitation of forest and water resources?

- Conflicting goals: rapid economic growth vs. biodiversity and long-term sustainability
- Conflicting actor groups: powerful (industry, agriculture) vs. less powerful (water sector) vs. vulnerable groups (forest flora&fauna, local communities)
- Exploitation of the past is influencing and constraining exploitation and restoration of today

Agriculture-forest frontier

.. Is defined as „a dynamic physical and non-physical border area between agricultural and forest lands, which changes over time due to human interventions and biophysical processes“.

- exploration and exploitation of agriculture-forest landscapes
- the conflicts that emerge over benefits of natural resources like water
- complex interplay of policies, water and land use

2. Trends in agriculture-forest frontiers

Examples of shifting water benefits in agriculture-forest frontiers:

Cuenca del Morro, central Argentina

Napa Valley, California

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Cuenca del Morro, central Argentina

- Water absorbing forests and grasslands largely replaced by maize and soy beans
- Argentina has ambition to be soya bean powerhouse
- 2.4 million hectacres native forest lost in last 10 years
- From deep rooted forest (yearround) to short-rooted soy bean (few months)

→ Groundwater aquifer began to rise

https://www.youtube.com/watch?v=MGZUuNLbvuA&feature=youtu.be&t=3

Napa Valley, California

- 95% of Napa‘s oak woodland were felled already
- Management plans to further decrease mixed woodland area
- Private land, private interests prevail

→ Water benefits at risk due to wineland expansion

→ Advocacy to protect woodland+water

→ Initiative to protect watersheds and oakland failed

Napa's Measure C Is Dead; the War Over Hillside Vineyards Has Just Begun

The ballot initiative that would have protected watersheds by sharply restricting vineyard plantings lost by a slim margin

What do the examples show us on governing water in agriculture-forest frontiers?

- Major land use conversions affect water resources in water quality and quantity
- Benefits of water are not “lost” but redistributed to other beneficiaries
- Beyond forests and water, important to look at: policies in agriculture-forest-water, land use, historical developments, legislation, public and private ownership, how power is exercised, conflicts, formal and informal rules.

3. Reverting trends in agriculture-forest frontiers

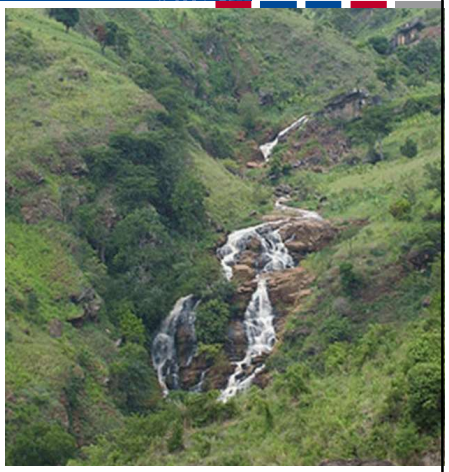
Examples to swing the agriculture-forest frontier into a different direction

Usambara Mountains, Tanzania

- Tropical forest declines with 43% during 1965-1991
- Forest is cleared for agriculture and settlements.
- High population pressure, policies to feed and accomodate people.
- Clean and stable water supply increasingly under pressure

→Communities planted over 5 million trees in international reforestation schemes.

→ Targeted planting on mountain ridges to increase water infiltration



Riverine forests, Upper Rhine Valley, Germany

- Straightening of the river Rhine also lowered groundwater levels (~5-15 meters)
- Riverine forests dried out and were brought under cultivation
- Of original riverine forest only 6% is left
- Intensive agriculture has polluted groundwater across the valley (>50 mg-L)
- Nowadays, efforts to expand the area of riverine forest are constrained by low water levels, polluted waters, strong agricultural sector.

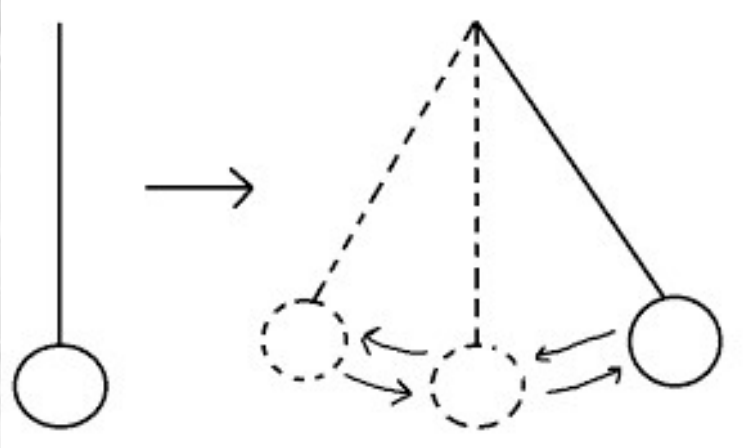

LEBENDIGE
RHEINAUEN
bei Karlsruhe

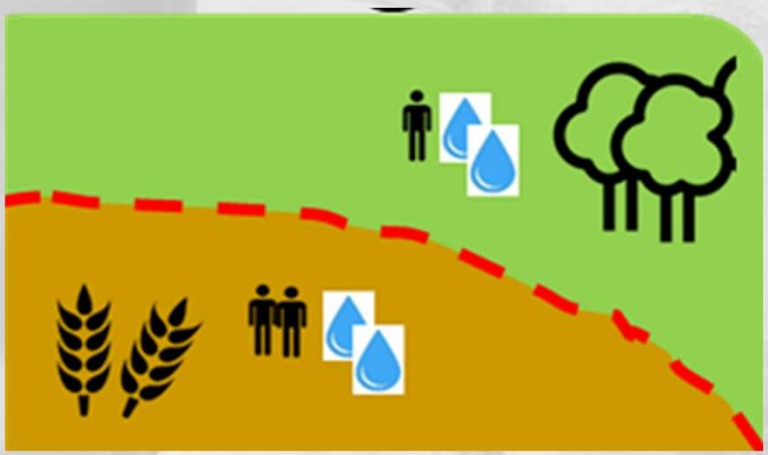
What do the examples show us on reverting frontier land and water?

- Land use is highly dynamic, changes over time in the frontier
- We are increasingly confronted with human pollution/depletion of water resources. → people pro-actively intervene in the frontier, efforts to revert trends
- Response time of water important (and unknown) factor in how fast restoration can succeed
- Strong policies / governance needed to revert trends, protect forest and water resources over many decades

Missing:
Analytical frameworks to study these social-ecological dynamics around water in agriculture-forest landscapes

4. Analytical „Pendulum“ framework to study soc.-ecological interplay in agriculture-forest frontiers



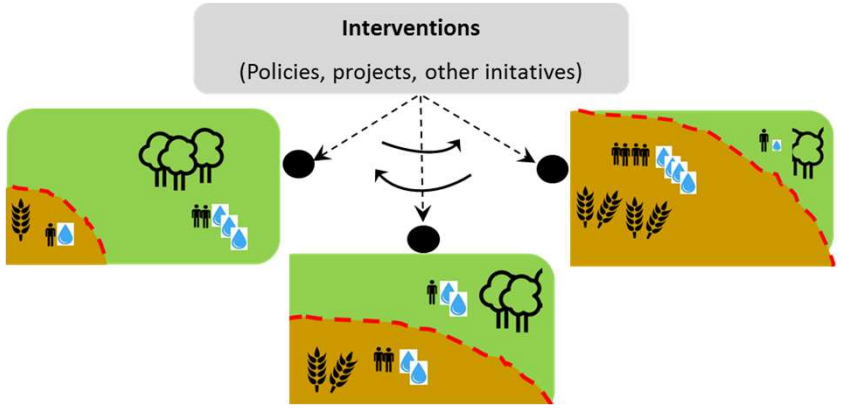


A framework to study water resources in agriculture-forest frontiers

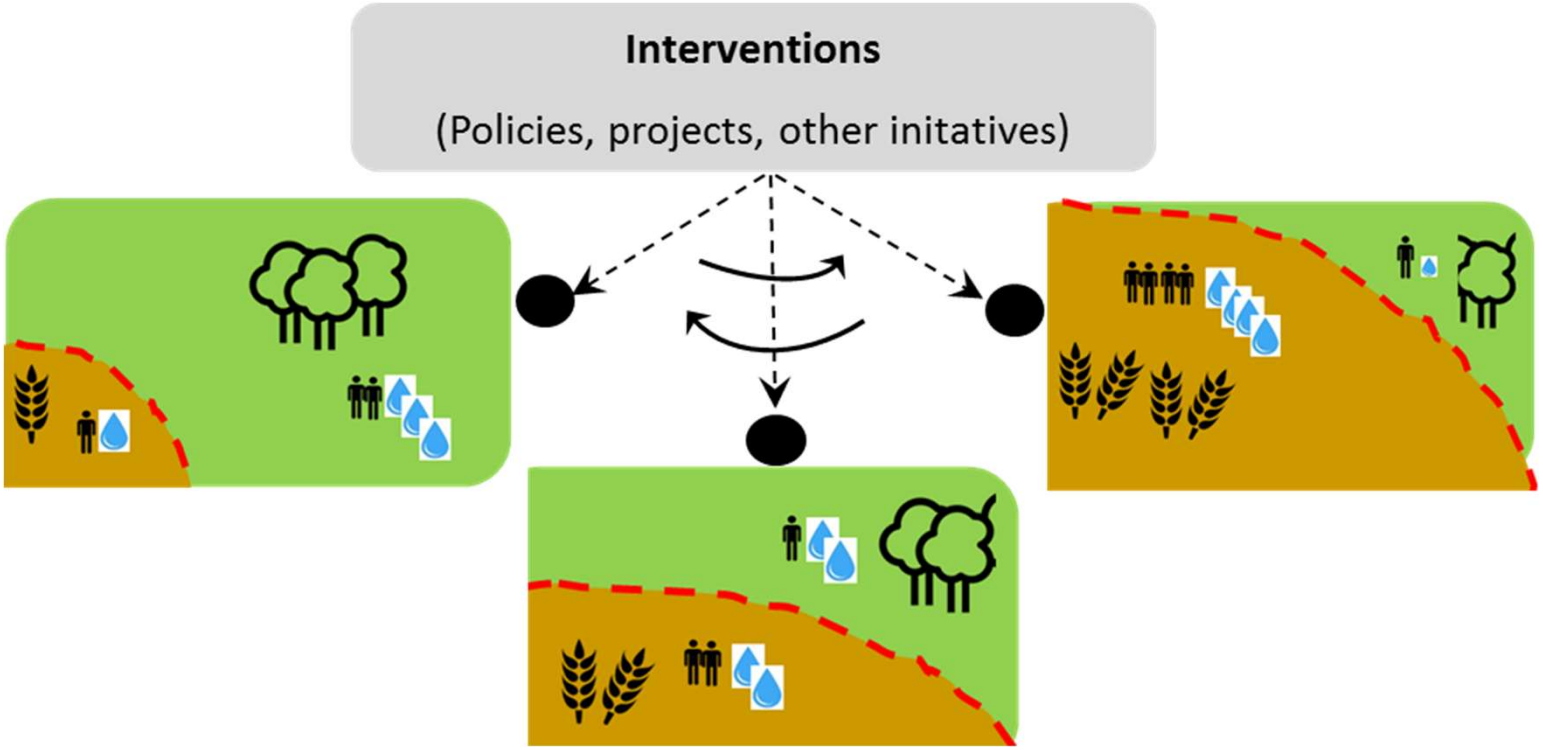
That takes into account:

- Dynamic frontier land-use change over time
- Exploration and exploitation of land and water resources (contested)
- Peoples interventions in frontier land-use (policies, projects, other initiatives)
- Impact of these interventions on
  - water resources
  - livelihoods
  - biodiversity

Soc.-ecol. interplay



Pendulum framework to study processes over time in agriculture-forest frontier



Pendulum Framework: A back-and-forth-movement of actor interventions and outcomes in the agriculture-forest frontier

Expected insights

- Multi-level linkages of policy formulation and implementation between sectors (agriculture, environment, water)
- Attempts to restore land and water resoures, and extent that multiple actor interventions and their implementation across levels is observed in land-water resources and management.

→ Practical recommendations: how to change management and policies for frontier waters through land management, water governance, policy coherence

Key points of my presentation

To understand the complex interplay of water and forests we need to move beyond a biophysical understanding. I advocate an expanded interdisciplinary research approach with four aspects:

1. Frontiers conceptualisation instead of nexus
2. Inclusion of agriculture as key factor in understanding and redistributing water benefits
3. Link water resources to sectoral policies (and other interventions e.g. deforestation or reforestation projects)
4. Study frontiers in “Global North” and “Global South”

Questions for discussion with SESAM

- What is a better conceptual lense: frontier or nexus?
- How do you include conflict and policies in relation to water resources, in your research?
- Can you observe a pendular move (so from explore to exploit and revert/restore) in forest and water resources? Or is it mostly deforestation and some cosmetic reforestation?