Complex Ecosystem Service Supply and Delivery in a Mountain Mosaic Landscape in Chiapas, Mexico

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Background

- Frontier rural community in "La Sepultura" Biosphere Reserve
- Montane pine-oak forests – a tropical mosaic landscape
- Challenges: eradicate rural poverty and vulnerability, counteract agricultural impact causing forest fragmentation and degradation

Conservation-development actors

protect forests,
value biodiversity &
hydrological services

Peasant farmers

co-produce with nature
an array of benefits in their farms,
instrumental values

promote:

- ❖ Sustainable intensification of agriculture → land use zoning
- ❖ (In)direct forest conservation strategies & sustainable forest management projects: e.g. promote pine resin production

- Ecosystem service (ES) and social-ecological approaches are proposed as a way to manage protected areas and their surrounding landscapes (Palomo, I. *et al*. (2014) *BioScience* **64**(3),181-191).

Objective

1. Characterise land use types in the landscape
2. Identify locally relevant ES and assess their supply across the landscape
3. Analyse a case of ES supply and delivery: focus on pine resin production

Results

Land use types

Riparian areas
Valleys bottoms & hollows
9% of area
Medium-High land use intensity

Agricultural land
Valleys & foothills
16% of area
High land use intensity

Open forests
Foothills & hillsides
42% of area
Medium land use intensity

Closed forests
Hillsides & mountain ridges
33% of area
Low land use intensity

Figure 1. Land use types, based on farmer's view of the landscape, were characterised in a systematic horizontal point sampling (sampling area = 123 ha).

Ecosystem service supply

We measured and estimated mean values of 18 selected ecosystem properties to quantify ecosystem service supply across the landscape.

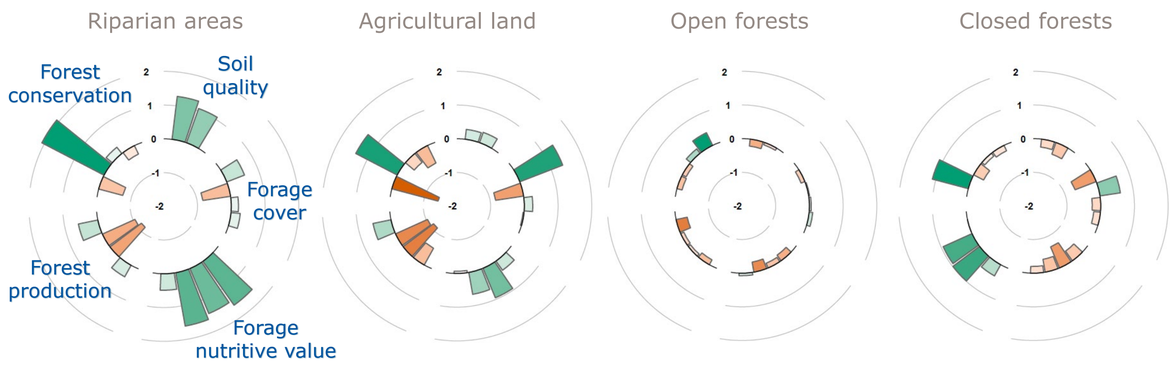

Figure 2. Ecosystem service supply for different land use types. Supply measures (bars, here not individually identified) are grouped into benefit categories (labelled in blue). Values of supply measures are centred and standardized: green fill for values > μ, red fill for values < μ.

Pine resin supply-delivery

Average resin production in a hectare of closed forests is ≈390 kg per year. Yet there is a mismatch between resin supply and delivery, i.e. a resin yield gap, which we here analyse.

Figure 3. Framework on mediating mechanisms and factors in pine resin delivery (based on Fedele, G., Locatelli, B., Djoudi, H. (2017) *Ecosystem Services* **28**, 43-54).

Conclusions

- The community's multifunctional landscape is arranged into diverse land use types, each supplying different sets of ES.
- Delivery of ES and associated benefits to farmers however, are not fully realized, e.g. in pine resin co-production, as they're affected by multiple mechanisms and factors.

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