

Decisions on land use and monitoring agrobiodiversity: The land sparing versus land sharing debate.

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The great debate: How do we conserve biodiversity and feed 9+ billion people?

Land sparing

Agricultural intensification on already-converted land to spare forests and other “intact” habitats

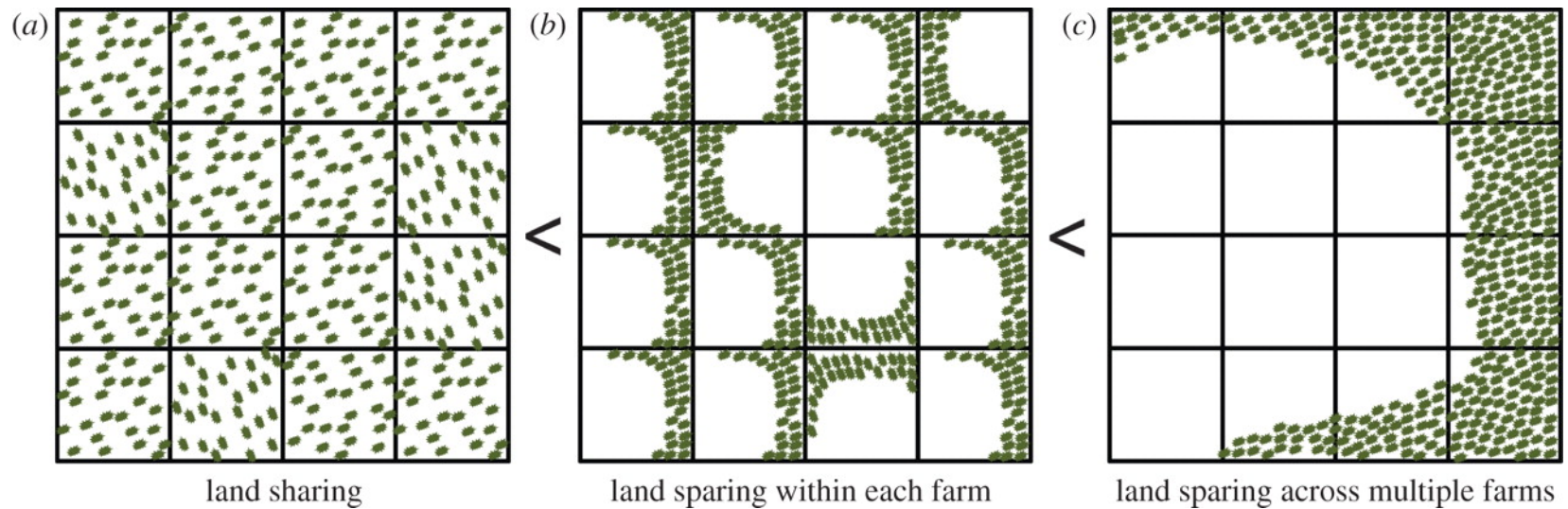
Land sharing

Agroecology or wildlife-friendly farming to conserve or increase biodiversity in agricultural landscapes



<http://www.worldwildlife.org/pages/whole-planet-full-plate-finding-ways-to-feed-the-world-sustainably>

Are the models more than an academic abstraction which does not adequately reflect the complexity of conservation and land use change?



From Balmford A et al. Proc. R. Soc. B
doi:10.1098/rspb.2012.0515

On the food production side:

- Food production will need to increase from 60-100% by 2050. This will need to be done through productivity increases.
- Tropical forests were the primary sources of new agricultural lands during the 1980s and 1990s. In Indonesia and Malaysia, 55 to 60% of the oil palm expansion was at the expense of forests;
- Up to 200m ha of forest may have been saved between 1965 and 2004 by Green Revolution technologies (or, perhaps, 18-27 m ha?).

We live in the anthropocene

Anthropogenic Biomes of the World

Urban & dense settlements

- 11 Urban
- 12 Dense settlements

Villages

- 21 Rice villages
- 22 Irrigated villages
- 23 Cropped & pastoral villages
- 24 Pastoral villages
- 25 Rainfed villages
- 26 Rainfed mosaic* villages

Croplands

- 31 Residential irrigated cropland
- 32 Residential rainfed mosaic
- 33 Populated irrigated cropland
- 34 Populated rainfed cropland
- 35 Remote croplands

Rangelands

- 41 Residential rangelands
- 42 Populated rangelands
- 43 Remote rangelands

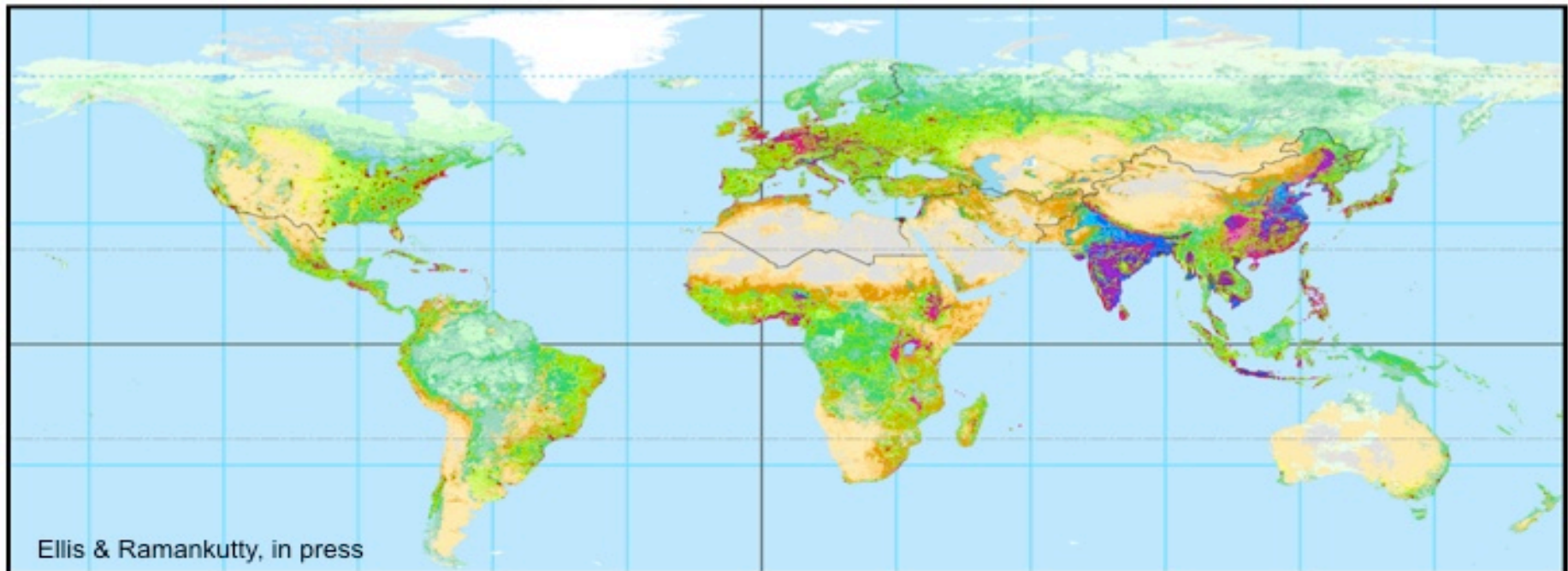
Forested

- 51 Populated forests
- 52 Remote forests

Wildlands

- 61 Wild forests
- 62 Sparse trees
- 63 Barren

**Mosaic*: >25% tree cover mixed with > 25% pasture and/or cropland



Is all intensification equal in its effects on land use?

Table 1.

Changes in the global food equation between 1965 and 2004 (3-y rolling averages, all data from FAOSTAT)

Parameter	1964–1966 (3-y average)	2003–2005 (3-y average)	% increase
Demand side			
Population (billions)	3.33	6.43	93
Food per capita (kg per capita per y)	311	344	10.6
Supply side			
Area harvested (million ha of cereals)	669	680	1.6
Cereals yield (Mt per ha per y)	1.53	3.25	112

Global food losses from field to fork

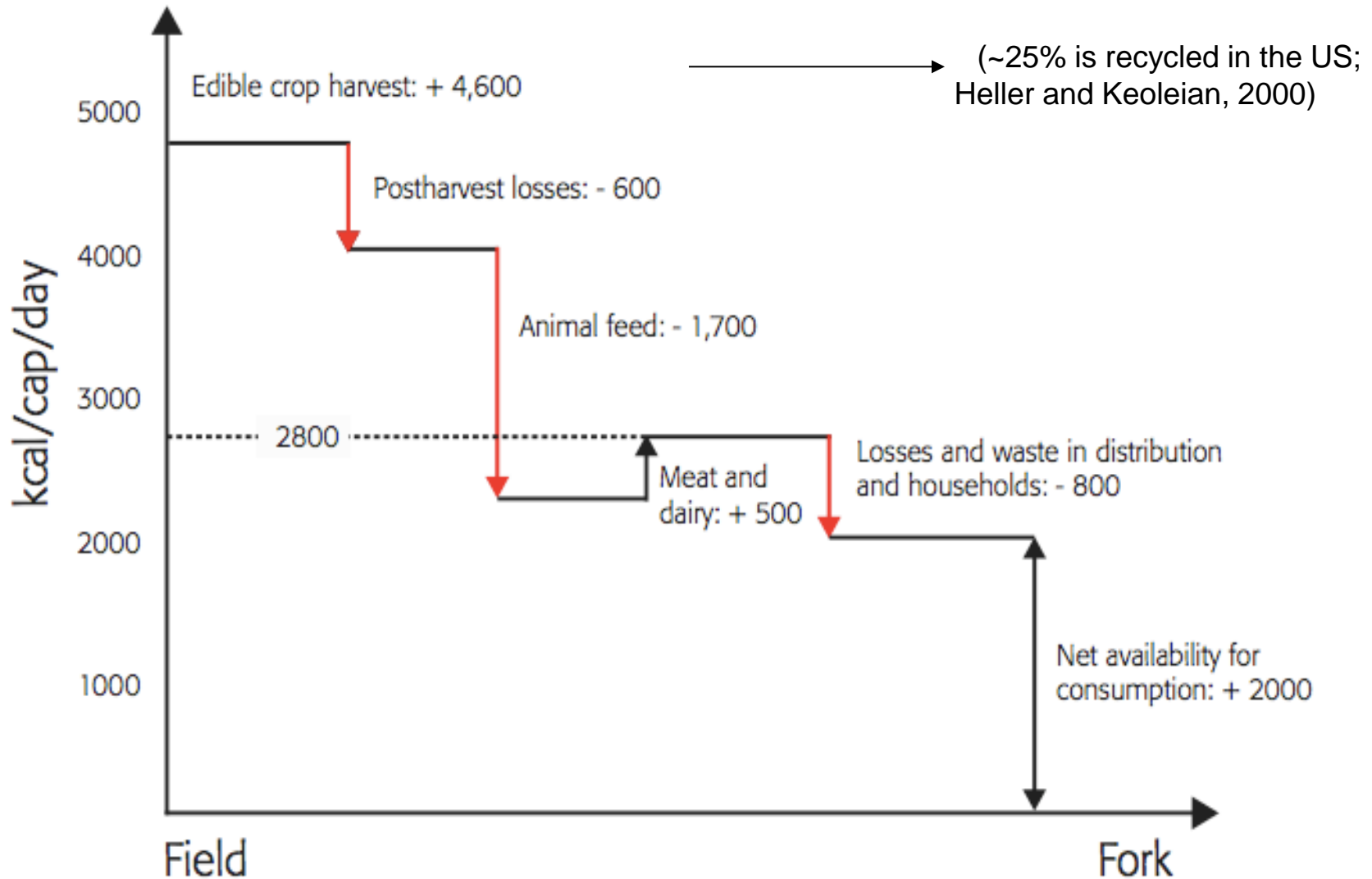


Figure 1. A schematical summary of the amount of food produced, globally, at field level and estimates of the losses, conversions and wastage in the food chain. Source: Smil (2000). Illustration: Britt-Louise Andersson, SIWI.

On the conservation side:

What should be the focus of conservation efforts?

- Species
- Phyletic distance
- Populations
- Ecosystems
- Evolution

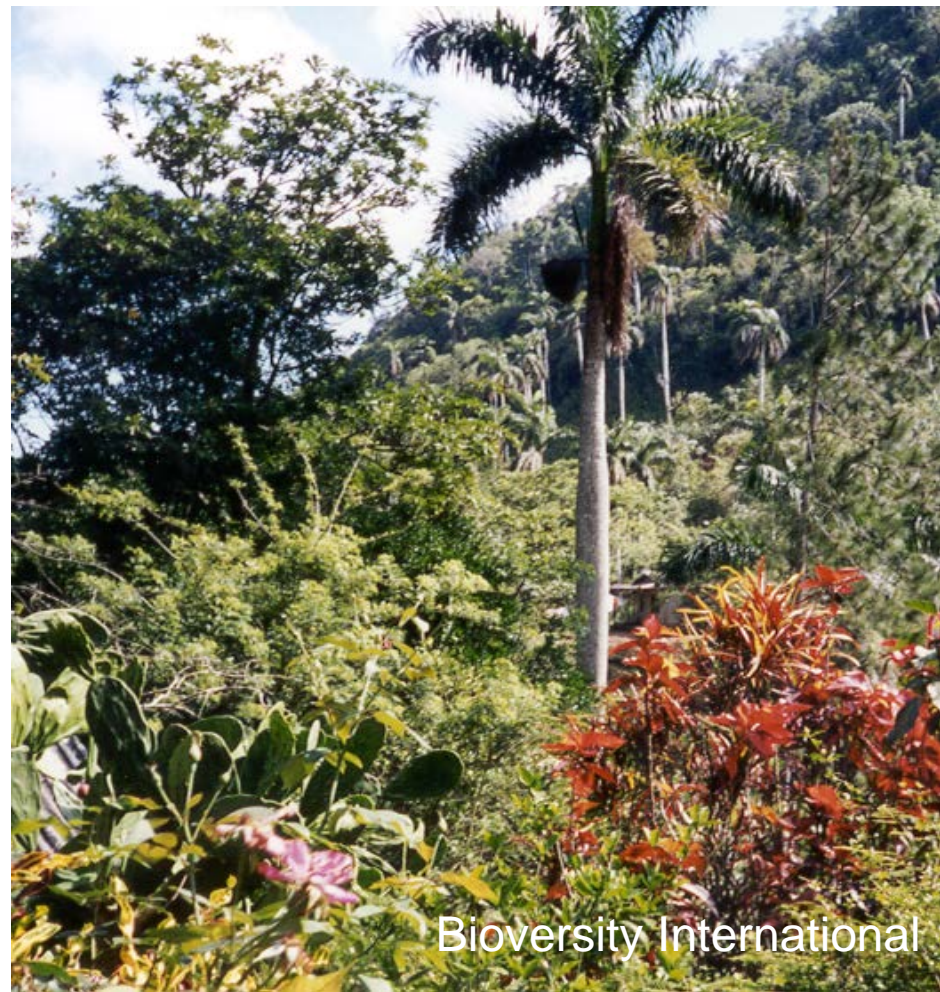
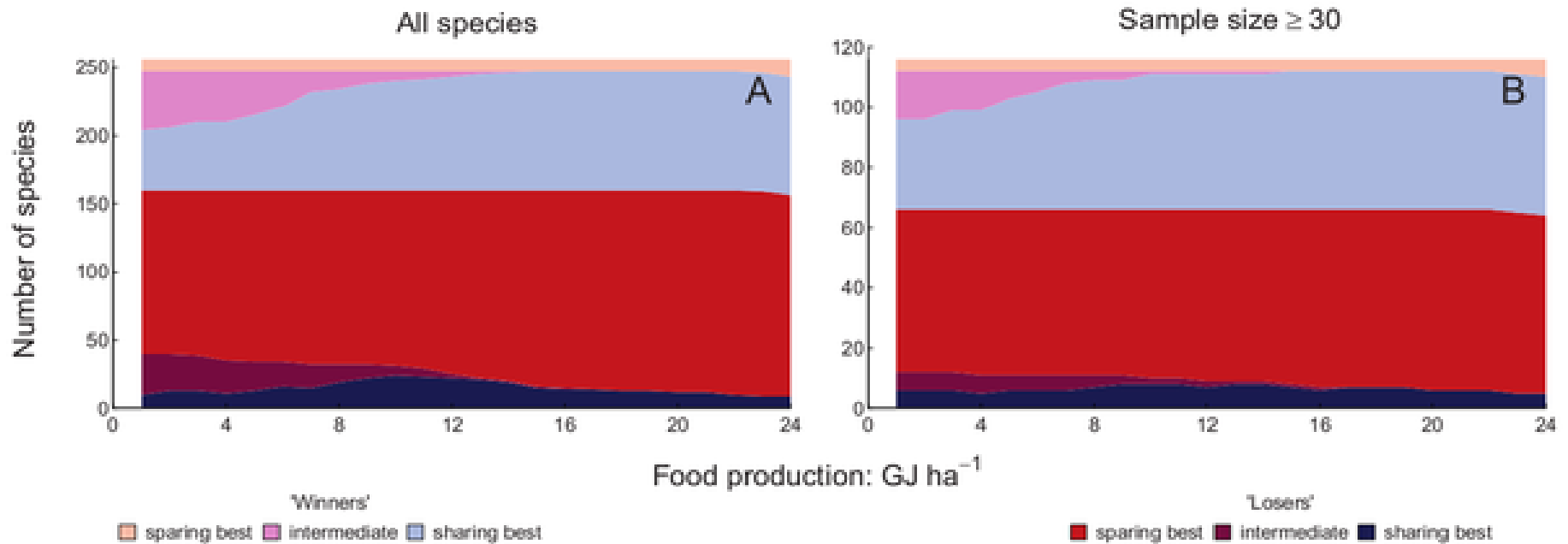


Figure 3. Winners and losers with food energy production targets by sample size.



Hulme MF, Vickery JA, Green RE, Phalan B, et al. (2013) Conserving the Birds of Uganda's Banana-Coffee Arc: Land Sparing and Land Sharing Compared. PLoS ONE 8(2): e54597. doi:10.1371/journal.pone.0054597
<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0054597>



PAR and the sparing/sharing debate: the agrobiodiversity dimension



What does crop genetic diversity contribute?

- Ecosystem services
- Domestication
- Diet and nutrition
- Stability and risk avoidance

- Complementarity
- Adaptation
- Option value
- Portfolio effect
- Resilience



Supporting Agrobiodiversity Maintenance and Use in the Context of Land Management Decisions



Supporting agrobiodiversity maintenance and use in the context of land management decisions

Develop a framework that will provide a methodology for:

- Integrating different agrobiodiversity measures
- Assessing and analysing the consequences of different land use systems for agrobiodiversity, ecosystem services and resilience.
- Be relevant at community and landscape scales

Partners in developing the framework

- Bolivia - Gaia Pacha
- Cuba – INIFAT
- India – NESFAS
- Iran - CENESTA
- Nepal – LIBIRD
- Sri Lanka – Green Movement
- Thailand - PASD
- Zimbabwe - CENESTA

Land use map of Khuntae village, Thailand

Total area: 15,337 Rai

Farming: 11.2%

Use Forest: 47%

Conservation 38.2%

Govt Project: 2.4%

Settlements: 1.2%

[total forest area: 85.2%]

Ritual forest

Rotational fields

Community conserved forest

Traditional forbidden forest

Use forest

Spring area

Government reforestation

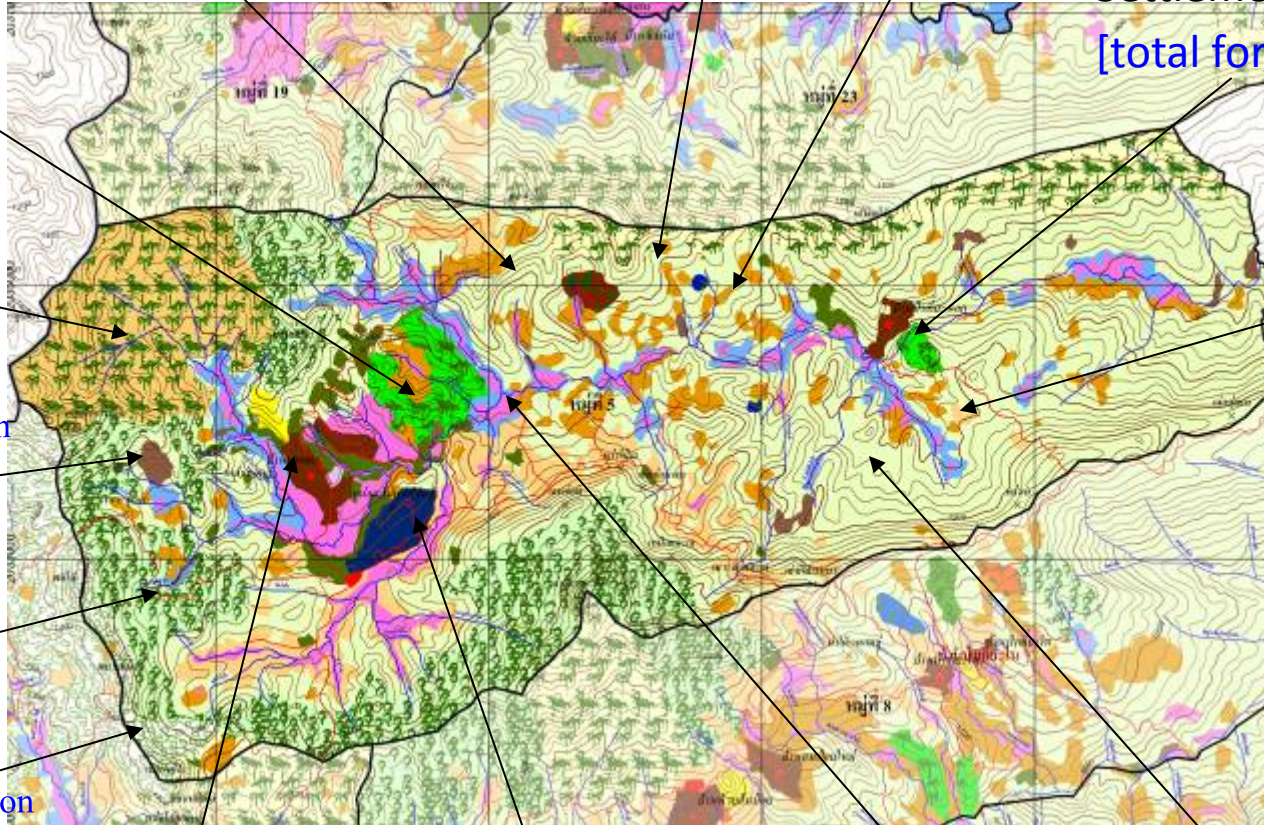
Paddy

Grazing area

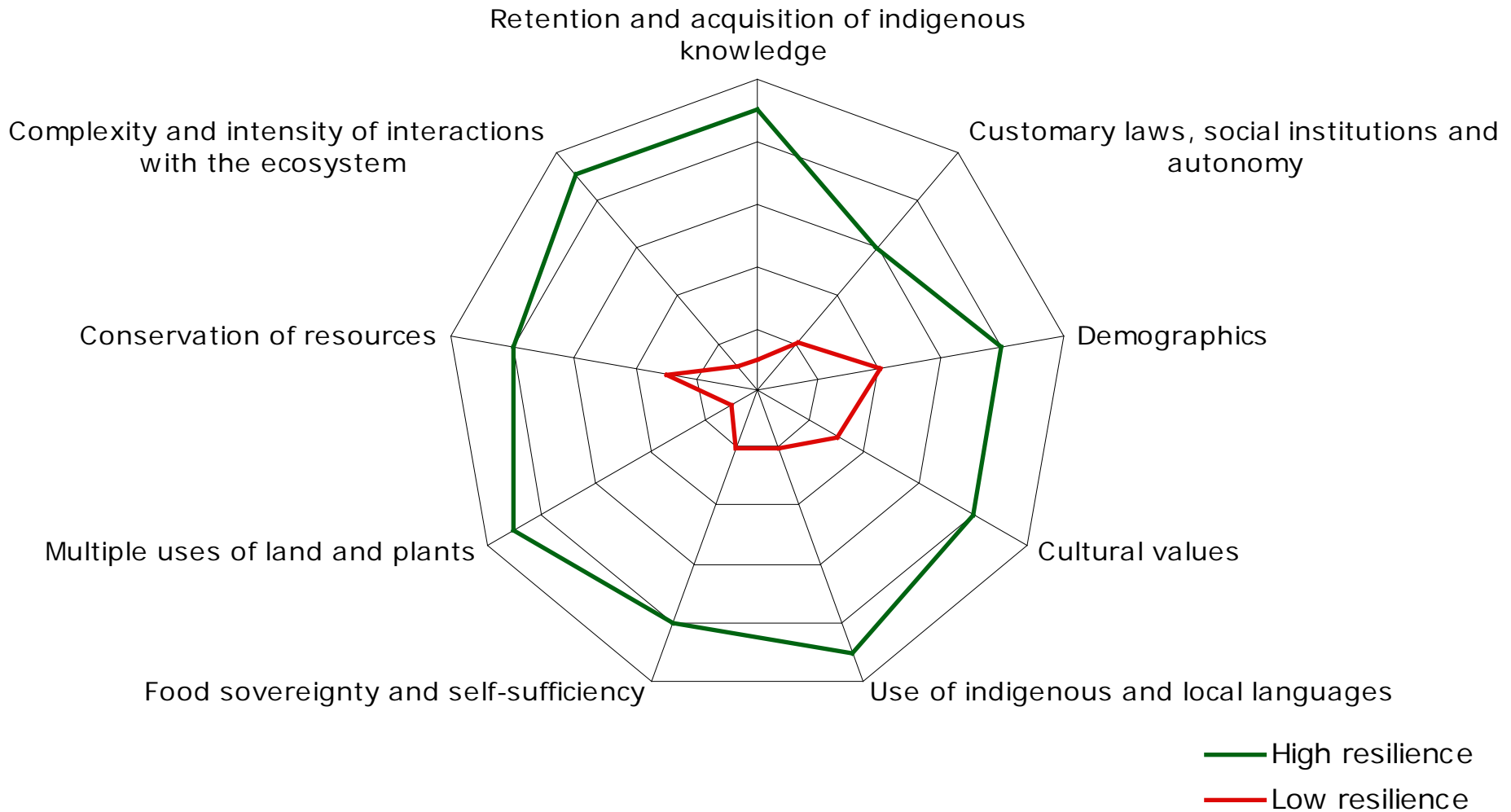
Settlement

Queen project

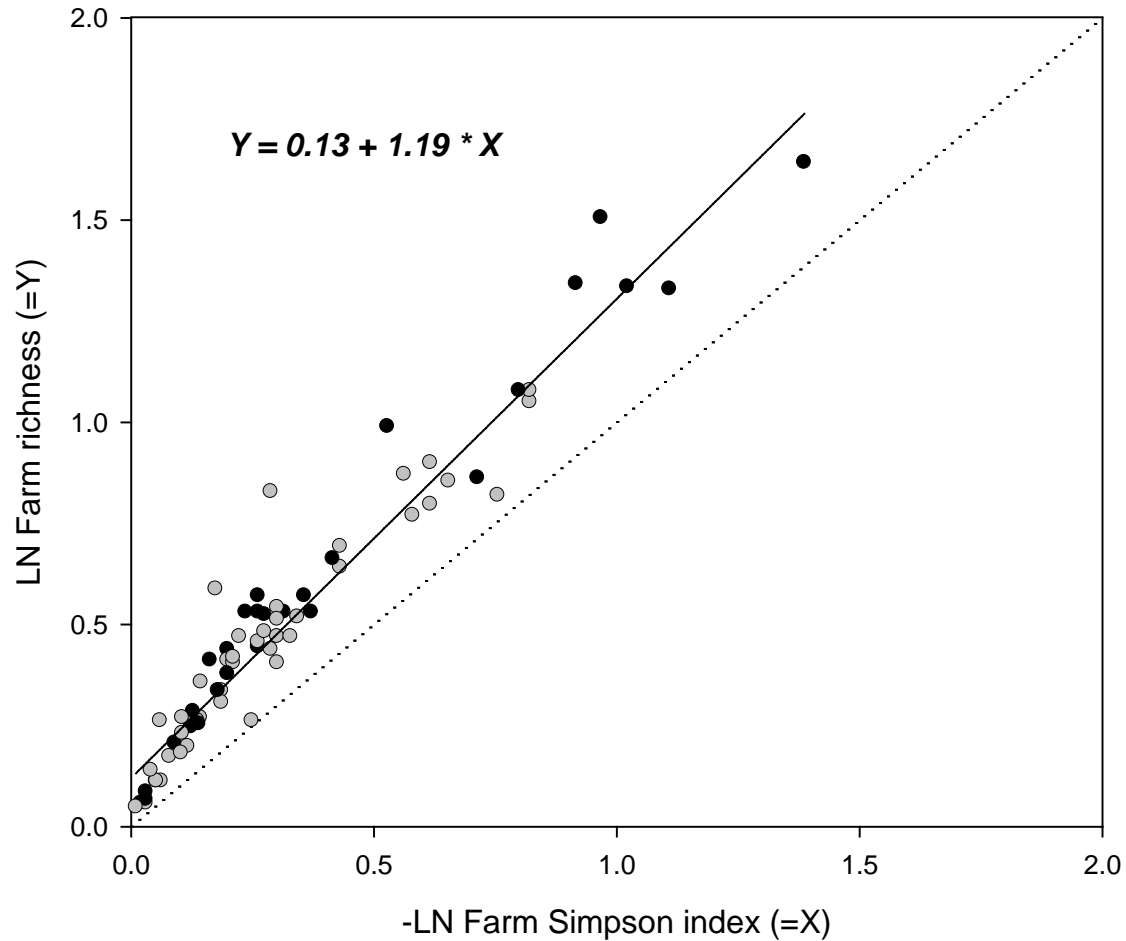
Source, IKAP, Thailand



Indicators to measure the resilience of social-ecological systems

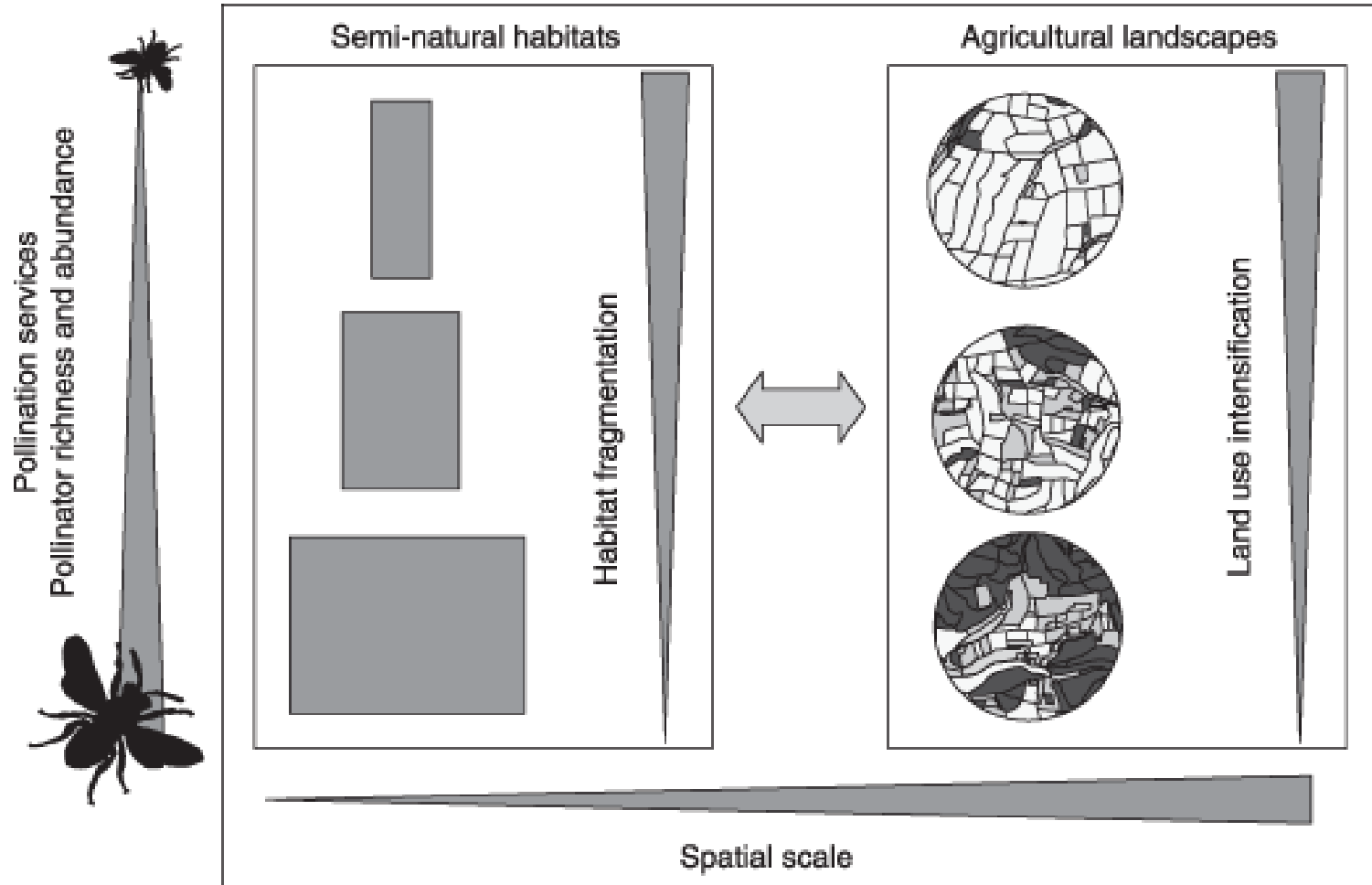


Relationship between farm evenness and farm richness both on a log scale
Black = main staple; Grey = non-main staple; 2x2 contingency c (p=0.03)





Pollinator diversity, pollination services and landscape change



Below ground soil biodiversity



Iran – pastoral transhumance



Thailand: Karen rotational cultivation



1 The village of *Huay Hin Lad Nai* lies in a hilly area surrounded by a mosaic of forest, rotational fields, agroforestry gardens and rice fields.

Land use mosaic of *Huay Hin Lad Nai*

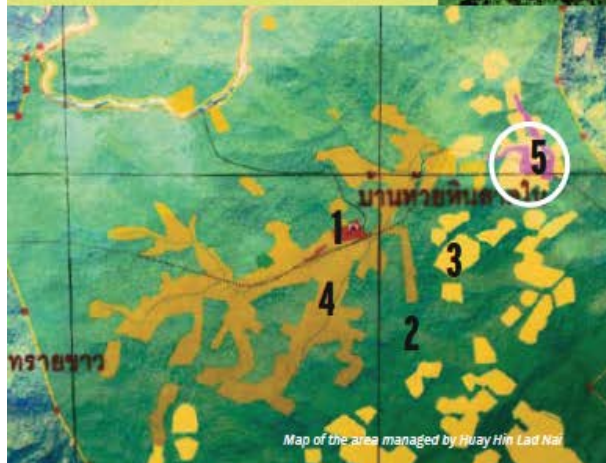
2 Community forest covers approximately 90% of the land. It includes sacred hilltops, conservation zones and areas for collecting non-timber forest products like honey, mushrooms and wild vegetables.

3 Rotational fields are circulated between land parcels on the slopes. The rotational cycle consists of 1-2 years of cultivation and 6-10 years of fallow. After the harvest, the fields are grazed and then left to fallow for the soil and vegetation to regenerate.

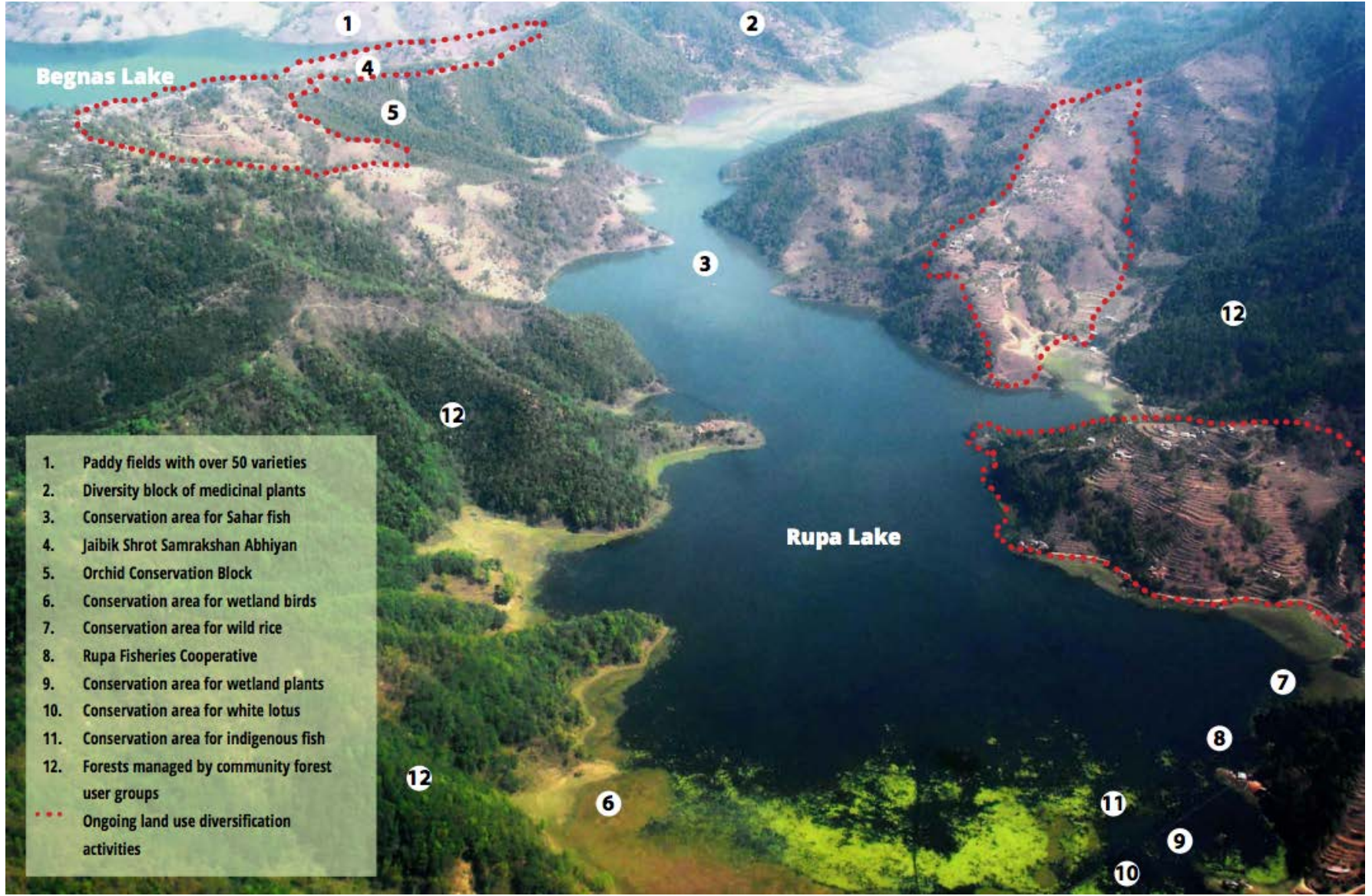
4 Agroforestry products include tea, rattan, bamboo, fruit and nut trees, which are planted among native trees. Small agroforestry gardens are occasionally created on cleared land.

5 Permanent fields located on soft slopes or flat areas close to water sources are used for paddy rice cultivation.

6 Rice diversity includes six local varieties. Paddy varieties are cultivated in permanent fields; while upland rice varieties are grown in rotating fields intercropped with vegetables and pulses.



Community-based Biodiversity Management in Rupa watershed, Nepal



- 1. Paddy fields with over 50 varieties
- 2. Diversity block of medicinal plants
- 3. Conservation area for Sahar fish
- 4. Jaibik Shrot Samrakshan Abhiyan
- 5. Orchid Conservation Block
- 6. Conservation area for wetland birds
- 7. Conservation area for wild rice
- 8. Rupa Fisheries Cooperative
- 9. Conservation area for wetland plants
- 10. Conservation area for white lotus
- 11. Conservation area for indigenous fish
- 12. Forests managed by community forest user groups
- Ongoing land use diversification activities

Some Concluding thoughts

- What should be monitored? Identifying objectives and context is important.
- Who does the monitoring and how?
- What scale is most informative?
- How will the results be used?



Source: B. Sthapit