

# Bridging Managed and Natural Landscapes

The role of traditional (agri)culture in maintaining the diversity and resilience of natural ecosystems

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**Nature conservation is still largely practiced by excluding human communities from ecosystems, their presence often considered intrinsically harmful.**

**Yet humans have played a role in the evolution of many, if not all, 'wild' ecosystems. These systems must rather be seen as social-ecological, deriving part of their diversity and resilience from their link to social processes.**

**Here, we outline the mechanisms through which farming communities anchor biodiversity and strengthen the resilience of ecosystems and propose indicators to help understand these interactions and integrate them into Protected Area Management practices.**

**Introduction** Despite a shift to community-based conservation practices, much of nature protection is still focused on physically separating humans from their environments. This ignores the role that agricultural communities have played in shaping these environments through a long and complex process of co-evolution.

More than 1.1 billion people, mostly agriculture dependent, now live within the World's 25 biodiversity hotspot areas. Most protected areas are embedded within agricultural landscapes, or vice versa. The conservation of these areas will depend on our ability to harness the beneficial influences that diverse, smallholder agrarian communities can have on the diversity and resilience of natural ecosystems.

**The aim** of this poster is to propose a *conservation approach that maximizes the ecological and social synergies that exist between managed and natural landscapes*, and that:

- (i) takes full account of the social and cultural dimensions of ecosystem functioning, and
- (ii) strengthens the participation and decision-making power of communities in land use and management.

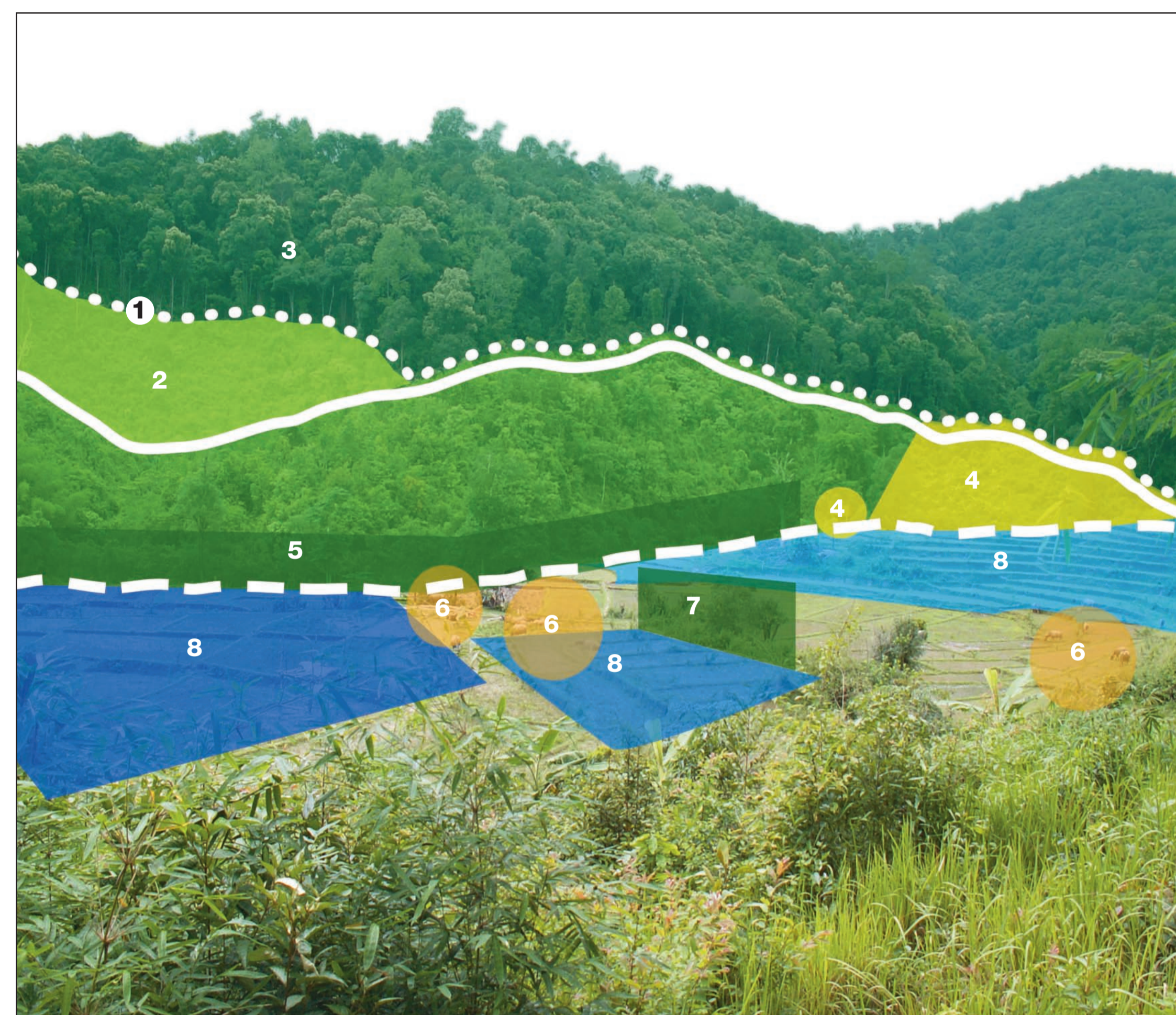
We propose *social-ecological indicators* that:

- (iii) can be used by agrarian communities to endogenously 'monitor' the state of their surrounding ecosystem and their interaction with that ecosystem;
- (iv) complement more traditional scientific measures of ecosystem health

**Rotational farming**, or swidden agriculture is often misunderstood to be a destructive farming technique. This farm in the north of Thailand shows the ingenuity of this system. Highly knowledge intensive, it is well-adapted to local ecosystem and climate and provides numerous environmental services.



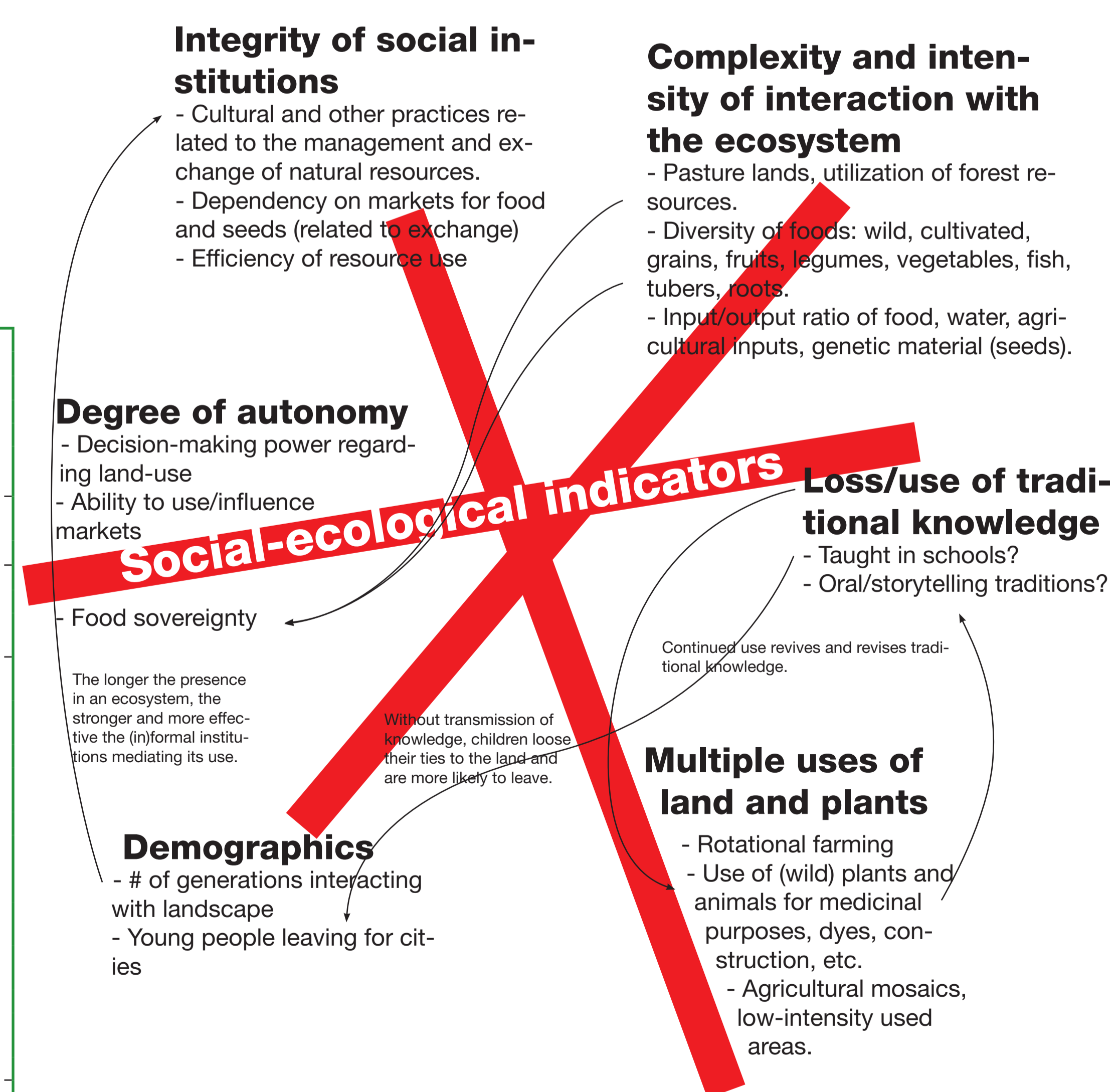
Photograph: P. Bordoni Editing P. Tazza



- 1 **Forest line firebreak** - the strip of land formed by cleared forest creates a firebreak while at the same time providing a pathway for wildlife. The resulting transition zone between forest and cultivated land provides niche habitats high in biodiversity.
- 2 **Fallow land** in the third year of recovery. Rotation allows the soil to recover nutrients without interrupting food production. They act as pasture for livestock whose manure further enriches the soil.
- 3 **Natural conservation forest** acts as the primary reservoir of resources - a source of water for the paddy fields, habitat for plant and animal species. Hunting and gathering are allowed but farming is forbidden in this section.
- 4 **Home garden** - beside the home, mainly traditional subsistence crops (vegetables, fruit etc.) as well as a few banana trees are cultivated. A nursery contains rice before it is transplanted into the main paddy field.
- 5 **Trees along stream bed** and between fallow fields and rice paddies. They provide shade which prevents the stream from drying out, and their roots keep soil together, preventing erosion.
- 6 **Livestock** is allowed to graze in the paddy field only after harvest and until the rice is planted. After that the animals go to the forest or to the 1-7 year old fallow area, where they help in the process of nutrient recovery.
- 7 **Wind breaks** - trees planted in a row protect paddies from the wind and prevent soil erosion.
- 8 **Rice fields** - paddy rice is grown in the terraced and lowland fields while drought tolerant upland rice, is planted in the swidden area. This diversity provides choice in case of climatic variability and provides food for an extended period because of different harvesting times.

**The mechanisms** that govern human-environment interactions are central to understanding the resilience of social-ecological systems. Often they are complex, owing to the long co-evolution of agrarian communities with their surroundings. The expression of cultural, social and agricultural values and practices at the landscape levels is most pronounced at the interface between managed and natural areas. Examples are:

Sacred trees are protected and allowed to flourish in areas altered/exploited by human communities (Unruh 1994, <i>J. of Biogeography</i> 21:3)	<b>Cultural values</b>
<b>Sacred sites</b> in Tibet have use restrictions, favouring vegetation density and establishment of old-growth forests (Salick et al 2007, <i>Biodiversity and Conservation</i> 16:3)	
Agrobiodiversity and its distribution in manioc is largely a result of cultural preferences and social networks extending 100s of km's (Emperaire & Peroni 2007, <i>Human Ecology</i> 35:6)	
Cultural diversity as expressed through linguistic differences determine crop preference and creates agrobiodiversity (Perales et al 2005, <i>PNAS</i> 102:3)	
<b>Cultural practices are important for maintaining the diversity of crop germplasm.</b> In situ conservation of pgr maintains evolutionary flexibility (Pusadee et al 2008, <i>PNAS</i> 106:33)	
In Borana (Ethiopia) <b>symbolism</b> , the Sycamore tree represents the Borana elders. It cannot be cut and so creates a microenvironment facilitating the growth of other plants (Bassi & Tache 2008 in <i>Values of Protected Landscapes and Seascapes</i> 1)	
Tajik and Afghan Paminis have knowledge of 40+ medicinal plants growing in the wild. This knowledge is indicative of active use, which in turns ensures conservation (Kassam 2009, <i>Hum Ecol</i> , forthcoming)	<b>Traditional knowledge</b>
(Forcibly) changed land use practices in SE-Asia retain ecosystem services because of farmers' deployment of traditional knowledge (Perkasem et al 2009)	<b>Social institutions</b>
Borana <b>indigenous governance</b> determines access to grazing areas and wells. Disruption of this governance system created severe environmental degradation (Bassi & Tache 2008)	
Social institutions associated with different groups of grasslands in the Mkambati area, S-Africa, shape complex grassland landscape (Kupe & Scoones 1999, <i>Human Ecology</i> 27)	
Decisions that shape biodiversity are made at various institutional levels, from native hunting knowledge to the government administration of contemporary society (Walls et al 1999, <i>Biodiversity</i> 8:1)	
<b>Savannah forest in Guinea is established rather than destroyed by local communities</b> , whose agriculture creates favourable soil conditions, moderates wildfires, etc. (Fairhead & Leach 1996, <a href="http://www.india-seminar.com/2000/486/486%20fairhead%20leach.htm">http://www.india-seminar.com/2000/486/486%20fairhead%20leach.htm</a> )	<b>Agricultural practices,</b>
Continuous (re)domestication for morphological and quality traits retains genetic and functional diversity of (semi-)domesticated plants (gourd in W-Africa, apricot in Tajikistan) (Bioversity International)	
<b>Mycorrhizal fungi</b> associated with root of the <b>Pada tree (N-Thailand)</b> planted in <b>swidden field</b> enables nutrient accumulation and recycling (Yimyam et al 2008, <i>Biodiversity</i> 9:1-2)	<b>land management,</b>
<b>Agrobiodiversity maintained on farms provides ecosystem services</b> (pollination, pest/disease resistance, ensuring continuous biomass) (Hajjar et al 2007, <i>Agriculture, Ecosystems &amp; Environment</i> 123:4)	
Indigenous fallow management of secondary forest stands in the Amazon speeds forest regeneration and maintains high level of biodiversity (Toledo & Salick 2006, <i>Biotropica</i> 38:2)	<b>and use</b>
Paminis (Tajikistan/Afghanistan) were confined to and created ecosystem niches on the bottoms of valleys and on alluvial fans, maintaining very diverse agricultural systems (Vavilov 1939) 1997, <i>Five Continents</i> )	<b>Livestock grazing</b>
The geographical spread of 39 high-value tree species is facilitated through traditional land management practices (shifting/fallow, pastoralism, sacred sites, consumption) (Unruh 1994)	
Many sources suggest that pre-hispanic occupation of Amazonian sites has affected the composition and diversity of its ecosystem (Rival 2006 <i>J of the Royal Anthropological Institute</i> 12:s1; Whitmore & Turner 1992, <i>Annals of the Association of American Geographers</i> 82:3; Bush & Silman 2007, <i>Frontiers in Ecology and the Environment</i> 5:9)	
Pre-columbian amazonian communities (1) enriched soil (2) physically modified the landscape and (3) created ecosystem niches that helped to express plant genetic plasticity (Balée 2000, <i>La Recherche</i> 333)	
<b>Maasai land management practices provide ecological corridors</b> between ecosystems, ensure ecosystem health (Brockington 2002, <i>Fortress Conservation</i> ; Dowie 2009, <i>Orion</i> )	
Farmers and gatherers using the wild walnut forests of Kyrgyzstan and Kazakhstan <b>prevents a user vacuum</b> - other, more destructive 'users' coming in to harvest timber (Bioversity International)	
Traditional communities living in highly biodiverse ecotones maintain balance of use between systems and prevent shift to single use (Bioversity International)	
Describes how the dispersal of weedy plants is facilitated by cattle in the cordillera of Merida, Venezuela (Molinillo & Brenner 1993, <i>Journal of Range Management</i> 46:6)	
Shows how moderate grazing is not sufficient and more intensive use is required to maintain landscape patches and prevent dominant species from taking over ecosystem (Bartolomé et al 2000, <i>Agriculture, Ecosystems &amp; Environment</i> 77:3)	



**Conventional indicators** of ecosystem health (species richness, nutrient and water recycling, soil productivity, etc.) are too limited. They are often

costly to measure and only rarely provide historical depth. Most importantly, they overlook an entire system of knowledge which, though difficult to measure, is eminently practical, exquisitely attuned to local ecology and embodies a complex of (socio-cultural) interactions relevant to ecosystem functioning and resilience.

The indicators proposed here are tentative. They relate to each other in many different ways and capture most of the human-environment interactions described before. What they tell us, in brief, is this: that **the health of human communities, and the nature and depth of their connection to the land, are vital to understanding and conserving the health and resilience of the ecosystems we seek to protect.**