a 'Biodiversity Platform' during a workshop of over 30 scientists from various disciplines (ecological and social sciences, focus on environmental services, livelihoods and governance) interested in development and conservation. The Platform aims to identify principles and practices that promote conservation, sustainable use and equitable sharing of biodiversity goods and services in landscape mosaics. Participants debated the scientific (research gaps) and development (impact pathways) aspects of conservation and production in mosaic landscapes. Participatory action research in multiple sites was accepted as the general approach but the risk of reduced scientific quality was also highlighted. Ideally, the initiative will allow the collection of a large number of site experiences and collaboration between research institutions over time to advance knowledge on fragmented landscape mosaics. Empirical evidence demonstrates that forest fragments and intermediate-intensity land uses such as agroforestry systems provide important biodiversity conservation services that complement those of dedicated reserves (Forman 1995; Lindenmayer and Franklin 2002). The platform will thus focus on intermediate intensity land uses: remnant, managed and secondary forests, agroforests and plantations in selected landscapes. A combined approach of hypothesis-driven and participatory action research is proposed to both provide international public goods and support negotiations for improved and adaptive landscape management.

15.5.3.1 Hypotheses, Common Analytical Framework and Flexibility

To allow cross-landscape comparisons and to deliver internationally applicable results, four main assumptions were defined: (1) external conservation values and local values of biodiversity goods and services of natural and semi-natural fragments vary non-linearly in time depending on the landscape patterns and overall intensity of use (possible trajectories are suggested for various landscape types), (2) timely empowerment of local populations through integration of scientific and local knowledge will mitigate biodiversity loss and maintain or increase livelihood security, (3) reward mechanisms will only work where external value exceeds local values of land use systems and local regulations based on local environmental services can constrain individual decisions, if external commitment is serious and follows up on promises made, and (4) overall landscape sustainability is enhanced if public policies are informed by and allow for customary or local rules and practices. These assumptions provide a preliminary common thematic framework for participating scientists from different disciplines and sites. For each, a 'thematic' group of researchers will gather information and experience. Some of the assumptions (2, 4) do not allow direct testing but the thematic groups will gather information that tends to confirm or cast doubt on the assumption and will form common, narrower research questions.

15.5.3.2 Assessment of Landscape- and Local Level Facts and Values

Based on the hypotheses, spatial analyses and a set of common aggregated data will be standardized across the Platform's landscapes (see matrices and methods developed by other site networks in Ostrom 1995; Tomich et al. 1998; Colfer 2005). A scientific

analysis of landscape modifications over time and of the driving forces of changes will drive discussion about general threats to biodiversity and their causes according to different stakeholders. Such a reconnaissance phase can give a good overview of the understanding and perception of general trends, build confidence with partners and provide hints to stratify landscapes and select plots for further local surveys. Local livelihood perspectives are intentionally emphasized in the approach but perspectives of external stakeholders in biodiversity are also taken into account. Livelihood needs will be surveyed and locally appropriate mechanisms that may lead to adaptive and collaborative landscape management identified. Three foci (local people, external stakeholders and scientists) will guide field biodiversity surveys. Biodiversity products are found important by the *local population* (e.g. timber, non timber forest products, and game), species or habitats have special existence values for *conservationists* and finally, data such as tree diversity and their linkages to dispersal mode and life history will interest *scientists* for cross-site standardized comparisons.

15.5.3.3 Facilitation of Collective Planning

Based on this multidisciplinary landscape analysis, tools will be developed for collective planning through an open discussion of future management scenarios. To be able to project various landscape developments, CIFOR and ICRAF have developed and currently use participatory scenario modeling (Wollenberg et al. 2000; Vanclay et al. 2003; Purnomo et al. 2004). This allows planning and discussion of management options with the community and other stakeholders. Dynamic spatial models and qualitative soft and hard systems approaches along with multi-agent modeling provide a framework. This will allow for participatory analysis of stakeholders' (or agents') interactions and facilitates problem solving and decision making (Purnomo and Guizol 2006). Once the various stakeholders' perceptions and options are known, negotiation support tools, sometimes with games, may facilitate the search for compromises between groups, and when needed, the discussion of incentives (van Noordwijk 2001; Hartanto 2003).

15.5.3.4 Early Participation and Monitoring

The potential for successfully implementing the project will obviously depend on the uptake of ideas by local, regional and national institutions involved in land use planning and management. To ensure this, the potential users should be identified early and involved in both study design and implementation. As part of this joint initiative, the institutional design and the link to ongoing development or conservation initiatives will be carefully analyzed. Partnerships are sought with stakeholders who may be posing biodiversity threats as well as those who currently offer benefits to conservation.

In order to analyze the efficiency of the approach as well as its effects, a systematic monitoring of the landscape mosaics project, implementation and outcomes will be set up from the beginning. In the short term, this should allow discussion of transaction costs linked to complex partnerships and transdisciplinary settings of the project. In

the long term, it should allow discussion about real-life outcomes and facilitate regular monitoring of landscape management activities performed by local populations.

Summarized, the proposed steps to be taken by the Platform for its transdisciplinary research are:

- Creation of institutional partnerships, identification and involvement of output users
- Landscape definition and spatial analysis of land use changes and their drivers
- Collection of data of local and external biodiversity relevance and biodiversity indicators linked to understanding the degradation processes of habitats
- Scenario development and possible use of models simulating stakeholders' decisions
- Support to negotiations through partnerships and promotion of long-term collaborations
- Regular monitoring and evaluation of progress and outcomes for adaptive management

15.6 Conclusion

Natural and social processes change rapidly in tropical contexts and the sometimes implicit assumption that ecosystem responses to human use are linear has been revised (Folke et al. 2002). Social and political dynamics, tenure uncertainties and financial constraints on land management make the field application of conservation and landscape ecology theories, at best, uncertain (Wu and Hobbs 2002; Sayer and Campbell 2003). In real life, planning and implementation, practicality, flexibility and potential for adaptation may be more important factors to sustainably integrated conservation and development than achieving optimal landscape ecology (e.g., see Margules and Pressey 2000; Brown et al. 2006; Rouget et al. 2006). Yet, in terms of biodiversity conservation, research in tropical forest landscapes has tremendous gaps to address in order to better understand the potential of managed semi-natural landscape patches and of sustainable use of wild species in landscape mosaics. The real issues are how to prioritize research and how to conduct it. A possible standpoint is to analyze what issues currently influence the potential of research and development outcomes. In developing contexts, outcomes will be greatly dependent on:

- The communication channels and boundary organizations that will enable and facilitate fair exchanges between local and administrative, market or conservation actors,
- The understanding of the different development and conservation trajectories in order to project realistic scenarios,
- The availability of understandable criteria and indicators related to prioritized conservation objectives,
- The agreements, commitments and incentives that can be decided among key stakeholders and that can be realistically enforced and monitored and

- The local rights and capacities to manage natural resources as well as the possibilities of involving other stakeholders fairly through community-based or co-management schemes to implement, monitor and adapt the agreements.

Biodiversity conservation must be promoted according to the development contexts and research must be able to provide 'bundled' and understandable recommendations to reach key actors such as decision-makers, extension services and local managers. Success factors will rely on the capacity to interest people, induce action in the short term and launch long-term adaptive collaborative mechanisms. Be it for poverty alleviation or for biodiversity conservation, rural people must generally be better supported to improve or change management practices. The way to achieve more support is still greatly debated, especially on the topic of payments for environmental services. Generally, if landscape ecology research is designed according to the local contexts (including livelihood needs, stakeholders' perceptions at various levels and institutional systems), its findings have good chances to be considered relevant and the potential to encourage new commitments and supporters.

In tropical landscapes, linkages between disciplines and a research-development continuum must be ensured to effectively combat poverty and environmental degradation. Moreover, linkages between science and policy must be realized and new knowledge must presented in a way that will influence decision-makers. Cash et al. (2003) distinguish credibility, salience or legitimacy as principles to ensure impacts of research. Scientists can thus combine the search for local impacts (legitimacy and salience) with cross-site analyses (broadness of application and credibility) to extrapolate results. However, in the field, scientists face challenges in integrating disciplines and involving multiple actors with differing values. Typically, they cannot act alone; success requires clear and strong partnerships which may need facilitation by third parties. For long-term success of such complex research approaches, scientists must go beyond academic norms. Currently, incentives for transdisciplinarity are rare in a system which emphasizes scientific paper production. In the field, the goodwill and openness of many actors are needed for tangible improvements and acceptable compromises between conservation, private sector, Government and local interests. Nonetheless, the provision of biodiversity-relevant information and efficient planning tools to key players may help to facilitate communication and achieve better landscape-level outcomes in the tropics.

Appendix : List of Questions Used for the Semi-structured Interviews

Landscape Mosaics

1. What were the landscape elements where you worked?
2. What was the dominant land use – spatially, economically?
3. How much 'natural' vegetation remained? Where and why?
4. How connected was it?

5. How important do you think this connection was for organism movement and reproduction? (Or how limiting?)
6. How difficult was it to maintain connectivity within the production systems present?
7. In your opinion, in the landscapes where you worked would conservation be better facilitated by an integrated or separated landscape mosaic?
8. What was the history of land use in the area?
9. What was the apparent role of intermediate land uses (e.g. agroforests, managed forests) in conservation?
10. For what organisms? What were the limitations? Were the organisms entire needs fulfilled within the intermediate land uses? How dependent was the patch species composition (inc. Fauna) on nearby forest? How sustainable is the ecology of the systems? What options were present to increase the biodiversity value of the systems? Were these acted upon? Was it successful? What were the limitations on biodiversity improvement?

Methods

1. What are your experiences of using mixed (multidisciplinary) datasets?
2. How were different data types combined?
3. How did you come to terms with issues of scaling and mixed units?
4. Did your project involve action research (as opposed to pure research)? Research and development?

Rewards

1. What are your experiences of the use/attempted use of reward mechanisms for environmental services?
2. Did these include biodiversity as a consideration?
3. How was it measured?
4. What reward type was used?
5. How was adherence to the system monitored?
6. How successful do you consider the program?
7. What were the difficulties or limitations?
8. What advice would you offer?
9. Was biodiversity the only service involved or was it bundled with others? e.g. Water or carbon?
10. What potential and limitations do you see for binding of service rewards?

Livelihoods and ecological knowledge

1. What were the main sources of income and products?
2. Did the biodiversity products (non timber forest products, agroforestry products etc) produced act as a safety net?
3. Were people able to meet their own needs from local sources?

4. Was market access sufficient for people to benefit from selling their biodiversity products?
5. Was there potential to improve production processing and commercialisation of biodiversity products?
6. Have you recorded and analysed traditional ecological knowledge related to biodiversity products?
7. How? How did you use this knowledge? Was it compared with scientific knowledge? If so, were they consistent? –> Lessons learned (win-win or lose-less), recommendations?

Participation

1. How were local people involved in the research – as groups, individuals and community?
2. Had they (communities) been involved in resource negotiations with outside stakeholders? Were you involved in negotiations? Who else participated? What was the result of this?
3. Were the local community sufficiently empowered to negotiate?
4. How did you involve difficult players? At what stage?
5. What are the perceptions of local people towards conservation? Had they had previous experiences of dealing with conservation agencies?
6. Lessons learned about 'efficient' or 'difficult' partners? Recommendations?

Governance

1. Did the community have local rules for use of biological resources and sharing of benefits? (Access, management rights)
2. Were those effective?
3. In what parts of the landscape did they operate?
4. How were they enforced?
5. Were they consistent with rules of outside agencies?
6. Were they recognized by outside agencies?
7. If not, was there conflict over this?
8. What state agencies were involved in biodiversity use and conservation?
9. What other players?
10. What were the private and common resources?
11. What lessons regarding effective and ineffective governance can be learned from this landscape?
12. What recommendations?

Combining practice and scientific theories on conservation ecology

1. Did the project have strong basis in scientific theory?
2. What theories gave the basis for the hypotheses?
3. Did donors or funding agencies of the project demand both sound scientific basis on conservation part (basis in ecology) and clear development outcomes?

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