Working Paper

Eco-Certification: Can It Deliver Conservation and Development in the Tropics?

Mica Bennett

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Working Paper nr 65

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Abstract

This paper investigates the potential for eco-certification to improve livelihoods and conserve biodiversity in tropical countries, using the example of a traditional rubber agroforestry practice in Indonesia. Eco-certification has the potential to allow farmers to generate revenue streams by marketing environmental benefits of their practices. However, in the years since eco-certification first began in 1993 to 2005 fewer than 1.5 percent of tropical forests had become eco-certified, compared to slightly over 31 percent of temperate forests.

Nonetheless, eco-certification has promise for delivering conservation and development to the tropics, but it comes with much fine print to observe if it is to do so. This paper makes recommendation regarding the fine print including changes to current eco-certification practices that could make it a more effective option for the tropics.

Findings

- Eco-certification cannot deliver sustainable conservation if it does not also deliver sustainable development. Failure of price premiums to materialize for eco-certified wood has strongly contributed to the low rates of eco-certification in the tropics.
- Choice of certification schemes should match local circumstances. Among the various certification types (for example, organic and fair-trade) eco-certification offers the strongest conservation protections, making it highly suited for situations with threatened biodiversity. Crops already traded internationally make the best choice for internationally-based eco-certification.
- Ways need to be found to reduce transaction costs and maximize conservation outcomes. The use of contracts that separate biodiversity from raw material value chains is a potential solution.
- The eco-certification space needs a "boundary spanning" to organization to forge a learning system for transferring know-how to action. This learning system must engage currently missing research expertise in business analysis and marketing to tackle issues coming from the fiercely competitive retail of markets within developed countries.
- Eco-certification is new with a still evolving market. Its success or failure to conserve environmental services depends on being able to motivate consumers to pay for the certified environmental services so that producers can earn decent returns for providing global value.

Keywords

Eco-Certification, Indonesia, Rubber, Tropics, Conservation, Development, Payments for Environmental Services

Acknowledgements

I wish to thank Meine van Noordwijk for the encouragement and much precious time and insight in critiquing and developing the ideas on eco-certification. Thanks go also to Laxman Joshi for additional guidance; to Chandra Panjiwibowo, project manager for RUPES Bungo for answering so many questions, as well as to ICRAF field staff in Maura Bungo – Ratna Akiefnawati, Jasnari, Damsir, Henry, and Janudianto; and thoughtful comments by Endri Martini. Finally, this paper would not have become a reality without production expertise from Tikah Atikah and Josef Arinto, marshalling through the process by Aunul Fauzi, editing suggestions from Pat Minor and Linda Vittitow and editing for the duration by Kathleen Walsh.

Contents

Acronyms

FSC Forest Stewardship Council

INGO International Non-Governmental Organization

NGO Non-Governmental Organization

NTFP Non-timber forest product

Introduction

Eco-certification's promise: Market power can focus global collective action on conserving biodiversity habitats

This paper evolved from evaluating the potential of eco-certification of jungle rubber as a mechanism for conserving biodiversity habitats and furthering economic development in rubber-growing areas on the Indonesian island of Sumatra. Jungle rubber is a traditional fallows practice that starts with slashing and burning land, followed by planting of rubber trees. Farmers then allow natural vegetation to reclaim the space around the trees. The farmers selectively nurture other economically valuable plants to create a mix of food and fibre producing trees. In time, this "jungle rubber" develops a complex, multi-strata canopy that resembles natural secondary forest and shares up to 70% percent of the species found in primary natural forest. It provides food and fibre for farm households and raw rubber necessary to meet world demand for car, truck and aircraft tires as well as thousands of other products.

Box 1 – People, poverty and species in Indonesia

The island of Sumatra, Indonesia, is recognized as a biodiversity hot spot both for the irreplaceability of its species and the high degree of threat to them. (Myers 2000) In Indonesia as in many other places in the developing world, there is little choice but for people and species to share the same land that is the source of their livelihoods. Sundaland, which includes Sumatra and Indonesia's Java island is one of only 3 regions on earth to be in the top 10 for 5 factors used to define biodiversity hot spots.(Myers 2000) However, Indonesia also ranks as the world's 4th most populous country while ranking only 16th in land area. Nearly 50 percent of Indonesians earn less than $2 per day and 72 percent of these poor work in agriculture. Agricultural productivity has declined an average 1 percent annually since the 1990s. The rate of economic growth for the rural poor has been one tenth the rate for the urban poor. (World Bank 2006)

This form of agroforestry offers a particularly rich countryside matrix. Countryside matrices are the ecosystems not significantly built upon but still imprinted with human use, such as agricultural plots and managed forests. The term comes from island biogeography which has characterized human-influenced landscapes as barren oceans surrounding islands of biodiverse, natural habitat. In the last 10 years, as the areas with no human imprint have dwindled, researchers have suggested that the countryside matrix is not barren but instead may offer an important resource for conserving biodiversity. (Rosenzweig 2003; Mayfield 2005; Harvey. 2006)

While vibrant, diverse countryside matrix offers hope for conserving biodiversity, in many places it is undergoing species simplification with land-use systems sliding down a transition curve depicted in Figure 1 from extensive, biodiverse systems to intensive, less biodiverse systems. For example, Landsat images of Sumatra's Jambi Province show that in 1973, 92.4 percent of land had forest or jungle rubber cover while only 2.3 percent of land cover came from oil palm and rubber monocultures. However, by 2002, forest and jungle rubber accounted for only 40.6 percent of the land cover while oil palm and rubber monocultures accounted for 41.4 percent. Farmers have converted the forest and jungle rubber to monocultures because the intensive cultivation yields more income. (Budidarsono). However, monocultures harbour only a handful of species compared to the hundreds of trees, mammals and reptiles that jungle rubber, and particularly forest, sustain as illustrated in Figure 1.

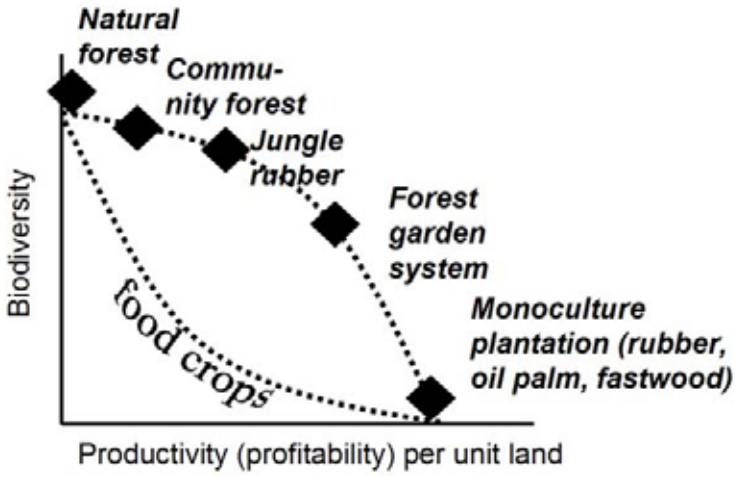


Figure 1. Sliding down the transitional agricultural system trade-off curve. Jungle rubber in Indonesia is following the trajectory from extensive systems that support high levels of biodiversity to very low biodiversity systems that offer more crop productivity. (van Noordwijk 1997)

Box 2 – Jungle rubber: countryside matrix that provides livelihoods keeps the global economy rolling and harbours threatened species

Natural rubber is a vital resource for the world's economy. Planes, cars and trucks would find the going extremely bumpy without rubber. And without it, more than 5,000 other needed products might disappear.

Natural rubber is also a renewable resource, unlike synthetic rubber which is made from petroleum products. However, some rubber growing practices contribute much more to the world's resource base than others. Jungle rubber – a traditional Indonesian rubber growing practice where farmers let natural forest species claim the land in between rubber trees – harbors hundreds of species. The result is a mix of species like secondary forest, but with a higher proportion of economically valuable trees.

Jungle rubber is a good example of country-side matrix that provides a range of environmental services, while also providing livelihoods. Currently it covers an estimated 1-2 million hectares of Indonesia, mostly on the islands of Sumatra and Kalimantan – both islands of megabiodiversity. An estimated 7 million people directly or indirectly earn their livelihood from jungle rubber. Indonesia is the second biggest rubber producer in the world after Thailand and 70 percent of its rubber comes from jungle rubber systems.

Jungle rubber represents a second-best biodiversity option. While it harbours impressive numbers of faunal and floral species, it does not shelter many charismatic species. Nonetheless, species such as the endangered Sumatran tiger and *Rafflesia arnoldi*, the world's biggest flower, do use jungle rubber for movement and dispersal. In many places in Sumatra, jungle rubber connects national parks and protected areas, hence functioning as important corridors that allow movement of wild animals and dispersal of plant species.

In general, farmers also regard jungle rubber as a second best management system, after the more intensive monoculture plantations they would plant if they had the resources to do so. However, working with researchers looking to develop payments for environmental services, some jungle rubber farmers in Bungo have agreed to look for mechanisms that could give them a fair return for providing environmental services to make up for foregoing the opportunity to improve their livelihoods with more intensive rubber cultivation.

This transition comes at a loss. Figure 2 shows the trade-offs among land-uses for ecosystem services. The first "flower" shows the case for the top of the transition trade-off curve where extensively managed systems provide lower crop yields, but delivers greater levels of other services. The second flower equates to the bottom of transition curve with high crop production but low levels of other services. Finally, the last flower shows land-uses that provide a full range of services.

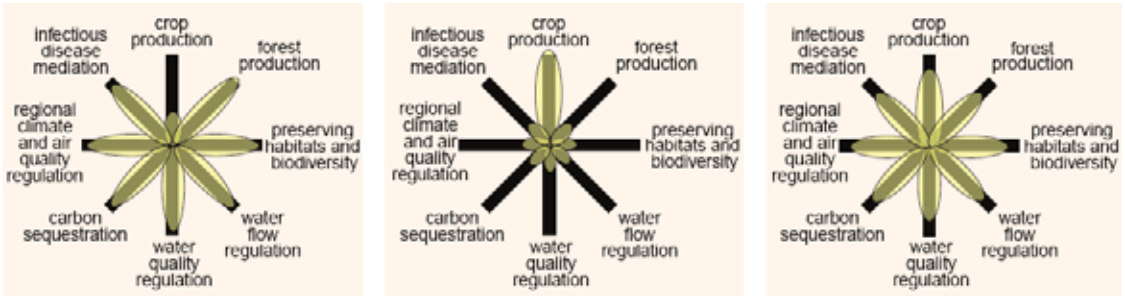


Figure 2. Conceptual framework for comparing land-use and trade-offs of ecosystem services. The provisioning of multiple ecosystem services under different land-use regimes can be illustrated with these simple "flower" diagrams, in which the condition of each ecosystem services is indicated along each axis (in this qualitative illustration, the axes are not labelled or normalized with common units.) For purposes of illustration, three hypothetical landscapes [are compared]: a natural ecosystem (left), an intensively managed cropland (middle), and a cropland with restored ecosystem services (right). The natural ecosystems are able to support many ecosystem services at high levels, but not food production. The intensively managed cropland, however, is able to produce food in abundance (at least in the short run), at the cost of diminishing other ecosystem services. However, a middle ground – cropland that is explicitly managed to maintain other ecosystem services – may be able to support a broader service portfolio. *Taken from Foley, 2005.*

In Jambi Province, land-uses are sliding toward the second diagram because until recently, farmers only received income from the crop production, driving them toward land-use choices that under-produced socially desirable levels of other services. As Daily notes, with its collective ability to affect the fate of most species, the global community faces the challenge of figuring out whether the countryside matrix will support biodiversity in the long-term or just slow extinction progressions; determining how people can and will affect the distribution of species through their moulding of the matrix; and determining what practical measures can maintain the capacity of these landscapes to harbour species. (Daily 2001)

Dollars in service of the environment: Communicating demand for baskets of environmental services

Using payments for environmental services (PES) as a mechanism to shape the future of land-use in favour of maintaining these services has received enthusiastic embrace from many quarters. PES introduces market forces that proponents suggest offers win-win potential to promote the delivery of socially desirable levels of environmental services (Mayrand 2005); increase financing for conservation in an era of declining government and other funds; provide an avenue for the growing number of businesses interested in environmental quality to contribute to its conservation (Scherr 2007); and improve livelihoods for the poor. (Wunder 2006) In addition, PES fits with current pressures to move away from mandates to voluntary programs, which proponents see as serving multiple interests of government, industry and nonprofits by reducing administrative burdens, providing flexibility in how to implement

environmental improvements and allowing work toward superior environmental performance. (Steelman 2006)

Eco-certification has inherent logic as a PES mechanism of choice in any setting where:

- People generate livelihoods by using land for which they have legal or customary rights to produce raw material or food demanded by an external market.
- Arrest of a system sliding down the trade-off curve in Figure 1 from more extensive to more productive systems could produce biodiversity benefits.
- Producers need to earn a return for maintaining biodiversity services in order to afford to do so.

What is eco-certification?

Certification schemes guarantee that production practices used to generate a product meet a set of standards chosen to yield expected results. (Bass 1997). For example, certified organic products conform to production standards to protect the health of the consumer and the sustainability of farming systems. Certified cruelty-free products conform to standards to protect animals from product testing. Eco-certification targets the raw materials from crops produced in biodiverse, transitioning systems and verifies that producers have used management practices that conserve environmental services. By doing so, eco-certification attempts to keep systems in transitions from arriving at the lowest biodiversity land-uses.

Ensuring compliance with standards can be the sole goal for those looking to eco-certification to perform a quasi-regulatory role that limits access to markets by uncertified products generated through methods that harm biodiversity. However, this paper considers eco-certification as the entire chain of activities needed to bring market forces to bear for increasing financing for conservation and to enable price signalling that can contribute to supply meeting socially preferable levels of demand. In theory, eco-certification can do these last two things by commoditizing environmental services -- separating them from the raw material or food crop produced and making the services a “commodity” consumers can explicitly choose to purchase. Consumers that value the associated environmental product should reflect that value in willingness to pay an additional amount over and above what they would pay for the raw material alone. Figure 3 depicts the components of an eco-certification scheme needed for getting products to market so that consumers can distinguish truly certified products from free-riders that make false claims about production methods.

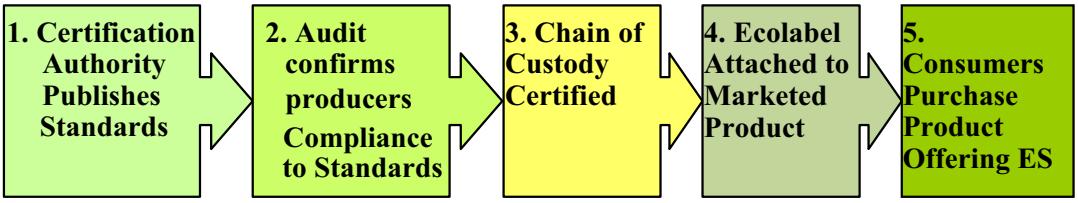


Figure 3 Components of an eco-certification scheme that can protect consumers and producers from free-riders. Components 1 and 2 technically make up the certification portion of eco-certification. Components 3 and 4 ensure that raw materials marketed as eco-certified were truly produced according to standards. With these components, consumers buying eco-labelled products receive a guarantee that their purchases truly are eco-friendly. Also, producers who invest in eco-friendly production methods will not see unscrupulous agents rob them of the benefits of eco-certifying without bearing its costs.

In 1993, a group of environmental organizations, private foundations and other allies formed the Forest Stewardship Council (FSC) to develop eco-certification of forest products. The FSC does not directly certify products but rather developed and manages a process for setting forest management principles and accrediting other organizations as actual certifiers of forest product operations. Responding to FSC success, forest industry and forest owner association have since formed competing certification schemes. As of 2003, more than 50 certification schemes have appeared around the world. By 2005, eco-certification schemes had certified approximately 33 percent of temperate forests, but only about 1.5 percent of tropical forests – an ironic result since eco-certification came about as an effort to protect tropical forests. Research to date finds as key culprits the lack of price premium for producers coupled with high cost in the tropics for changing management practices to meet eco-certification standards and for going through the certification process. (Gullison 2003; Cashore 2006)

The different eco-certification schemes each target different sets of forest management outcomes. Eco-certification schemes with low standards can compromise conservation effects. Other schemes appear motived by an intent to limit access to markets to certain groups. This raises concerns that eco-certification creates barriers for poor, small producers that cannot absorb the cost of meeting the standards. However, eco-certification aimed at turning environmental services produced by conservation-oriented management practices into marketable products offers the potential for delivering sustainable conservation *and* development for poor producers in the tropics. Delivering on this promise means that eco-certification must offer a practical mechanism for small holders.

This paper is a kind of "thought experiment" synthesizing the realities of trying to make eco-certification work in places like Jambi with findings reported in the literature on eco-certification to produce a generalized discussion for how to address barriers that keep it from fully making good on its promise to deliver both conservation and development in the tropics.

- Part 1 looks at eco-certification's conceptual promise and the "fine print" that practitioners need to consider if it is to deliver conservation and development in the tropics. Fine print includes:
  - Sustainable conservation requires development of improved livelihoods.
  - The need to match certification attributes to conservation needs, crops, market development and market integration of producers.
- Part 2 discusses reasons for why eco-certification has not yet delivered on its promise. This discussion defines a value chain and focuses on issues of connections and dynamics between all the intermediaries in the value chain. It does not explore changes that would need to occur within jungle rubber producing communities to attain eco-certification.
- The first section discusses the failure of eco-certification in practice to look like conceptual models that show it increasing funds for conservation. It suggests that to address this issue, the eco-certification knowledge system must facilitate an understanding of competitive analysis and strategy for global scale conduct of business.
- The next section discusses the multiple failures to meet promises arising from allowing the biodiversity value chain to follow the raw material value chain. It proposes that shortening the biodiversity value chain through the use of contracts between biodiversity producers and biodiversity intermediaries could make the mechanism more sustainable by ensuring price premiums reach producers. This, in turn, would allow biodiversity land-uses to out-compete other land-uses; facilitate paying producers for environmental service outcomes rather than quantities of raw material produced; and reduce costs through an "accounting" chain of custody.
- The conclusion identifies the need for a boundary-spanning organization to ensure the production and dissemination of learning that can challenge the status quo if necessary to ensurep eco-certification can sustainably deliver conservation and development in the tropics.

Chapter 1: The eco-certification promise – fine print and all

Both conceptual and empirical evidence suggest that eco-certification has potential to deliver on its promises to conserve environmental services and contribute to improving livelihoods for poor landholders in the tropics. It provides a way for markets to facilitate collective action on the part of both eco-motivated consumers and small holders:

- The eco-certified label allows the consumers who value environmental services to make a collective expression of demand that rises to a threshold level that groups of farmer, processors and others can cost effectively meet.
- Small holder communities can then collectively act to meet the expression of demand by delivering the services the eco-label defines, creating enough supply that distribution channels can cost effectively deliver to consumers.

Also, eco-certification works through the market and therefore possesses its characteristics of efficiency, effectiveness and adaptability. In addition it also has features that empirical analysis shows are associated with ecological and environmental success. And, in temperate areas, eco-certification has succeeded in getting significant tracts of forests under better management.

However, eco-certification comes with fine print that practitioners pursuing it must observe to get the promised results. In the tropics, conservation of biodiversity services cannot be sustained unless eco-certification also develops livelihoods. Those moving forward with certification projects need to match the market and conservation strengths of the various types of certification (organic, fair-trade, eco) to the specific project locale. Those opting for eco-certification should select the schemes that best match market, crop and conservation factors. The following review of the fine print provides guidance for those considering eco-certification projects on making these matches and designing the projects to further learning about improving eco-certification potential.

Why even consider eco-certification? Conceptual and empirical evidence of promise

Using market collective action to increase supply and demand for biodiversity services

Individual consumers face the obstacle of information asymmetry when they want to communicate to producers their desire to purchase products that conserve rather than reduce biodiversity. The asymmetry occurs because they do not know how each product in the market is produced. Even if they did, they would find it difficult to decide the relative effects

of various permutations in management practices on biodiversity. Eco-certification corrects this information asymmetry by – in its ideal form – showing that products with the label all conform to a set of practices agreed upon by a spectrum of affected parties to conserve environmental services claimed. As Figure 4 depicts, consumers can converge their purchase choices around the label, collectively spending dollars that pool into funding for land-uses that that conserve biodiversity.

At the production end, individual producers also face obstacles in bringing an environmental service to market. Generally, the raw materials and services that they produce go through several intermediaries that collect the critical mass needed to export, process, distribute and market a product that consumers will buy. When an eco-certification authority designates a set of standards that, in essence, creates a marketable service, producers acting individually have a way to communicate with consumers interested in purchasing their biodiversity services. In this way, the eco-certification scheme leads to the creation of a value chain that establishes a base for making investments to increase market awareness and identity for environmental products. Purchases of the products create a pool of funding that, when paid to producers makes biodiversity-friendly land-use choices competitive with hostile uses. In concept, it also develops livelihoods by allowing producers to earn returns for the resources they devote to products that offer benefits to people residing well-beyond the borders of producers' communities.

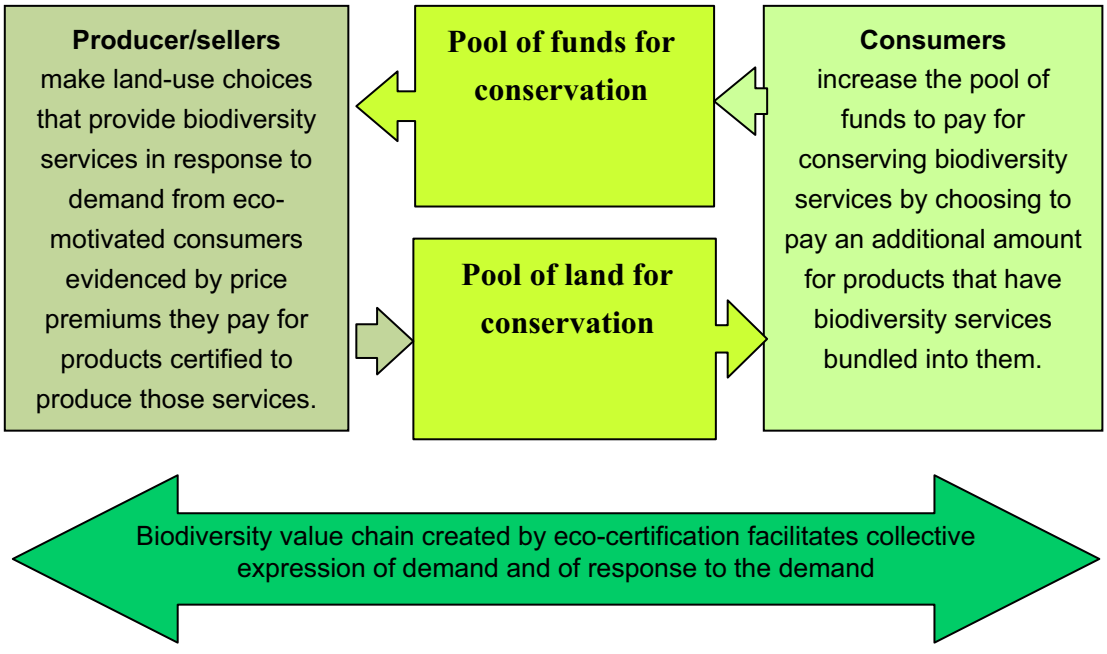


Figure 4. Eco-certification facilitates collective action that funds biodiversity conservation services.

Injection of market smarts

Eco-certification inherently possesses three attributes that could allow it to display the efficiency, adaptiveness, and effectiveness of the market (RUPES 2006-07):

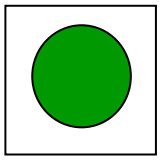
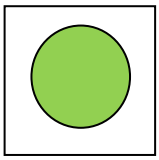
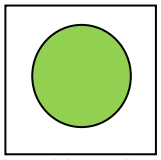
- Realistic – prices (or rewards) must be realistic in view of benefits and costs to produce the product. **If** they are not, either sellers or buyers or both will not participate in the eco-certification market.
- Conditional – rewards must be conditional on the level of environmental service provided. **If** producers do not meet standards their products will not receive any benefits of certification. **If** buyers purchase other than eco-certified products, they will not have a guarantee that they are receiving biodiversity services. (The non-excludable nature of biodiversity services introduces a weakness for conditionality that could undermine the effectiveness of eco-certification. Although a consumer will not have a guarantee of biodiversity services if they do not purchase eco-certified products, they may believe that they can still enjoy the benefits of global biodiversity services if others pay for them. This potential for free-riding could erode the amount of financing that eco-certification can generate for biodiversity so that it cannot not fund the socially optimal amount of biodiversity services).
- Voluntary – both buyers and sellers are free to buy or sell or not.

With these attributes, eco-certification seeks to inject forces that will conserve biodiversity services through market activity, thus matching socially desirable supply to actual supply.

Project factors associated with ecological and environmental success

Projects featuring small holders that eco-certify raw materials they grow or collect **can** inherently include attributes associated with ecological and economic success in integrated natural resource initiatives. Brooks et al (Brooks 2006) reviewed research reports on 28 conservation projects seeking both conservation and development outcomes. They found that projects had better chances of affecting economic, ecological, attitudinal or behavioural change when they included *use* by local people of the target area; helped *integrate* the target communities into *markets;* and featured *decentralized* control. Table 1 shows these factors and how eco-certification schemes do or can account for them. This information suggests that eco-certification should be in the "consideration set" for projects where people are using the target area for livelihoods; the raw materials generated already do or can integrate into markets; and project implementers intend to build greater producer capacities for this integration. It also suggests that as a best practice, eco-certification should be implemented community by community, with each community being able to tailor aspects to meet its needs.

Table 1. Eco-certification attributes connected with successful projects.

Conservation and development projects that have the following characteristics:	**Are associated with –**	**Does eco-certification offer the characteristic associated with the positive outcome?**
High levels of ***use*** of the conservation area	– good *economic* outcomes. [1]	 Yes – eco-certification links *using* targeted lands for income production to practices that produce *biodiversity services*.[2]
Components to increase integration of producers into markets	– positive *attitudes* about conservation. [3]	 Yes – eco-certification success depends on *environmental services* becoming integrated into the market as well as the raw materials produced. Eco-certification projects should take on the job of assisting producers develop capacity to integrate biodiversity services into receptive markets.[4]
Decentralized structures	– *behavioral, ecological* and *economic* success because projects can address site specific factors.[5]	 Potentially yes – If payments are tied to indicators of ecological success, then producers would apply their first-hand knowledge of local conditions to adopt the best practices to achieve goals for the indicators. Most eco-certification schemes do not currently work this way.

[1] In case studies, projects with good economic outcomes engaged producers in addressing environmental service issues better than projects without economic benefit. However, while a high level of use contributes to better environmental service engagement, it is not sufficient. Strong institutions for regulating sustainable management; education; technological and marketing support; and internal capacity all assist. Getz, W., et.al (1999). "Sustaining natural and human capital - villagers and scientists." Science **283**: 1855-1856, Salafsky, N., and E. Wollenberg (2000). "Linking livelihoods and conservation: A conceptual framework and scale for assessing the integration of human needs and biodiversity." World Development **28**(8): 1421-1438, Brooks, J., et. al (2006). "Testing hypotheses for the success of different conservation strategies." Conservation Biology **20**(5): 1528-1538, Dolisca, F., et.al (2006). "Factors influencing farmer' participation in forestry management programs: A case study from Haiti." Forest Ecology and Management **236**: 324-331.

[2] Projects need to select eco-certification schemes with effective requirements for ensuring that 1) the eco-label truly differentiates the products from products that are not eco-friendly and 2) only appears on products with the defined biodiversity services.

[3] Attending to the attitudes of the local people actually managing land toward conservation of environmental services has been shown as a factor in ecological success. However, while market integration has potentially positive effects on ecological success, much more rigorous research is needed to draw firm conclusions. Jones, C., and RH Horwich (2005). "Constructive criticism of community-based conservation." Conservation Biology **19**(4): 990-991, Brooks, J., et. al (2006). "Testing hypotheses for the success of different conservation strategies." Conservation Biology **20**(5): 1528-1538, Chan, K. M., et al (2007). "When agendas collide: human welfare and biological conservation." Conservation Biology **21**(1): 59-68.

[4] Research in this area has focused on projects that diverted use from protected areas by providing assistance in integrating products into markets produced in other areas. Eco-certification similarly depends on assistance with market integration even though it is for products from the actual areas targeted for conserving biodiversity. As outlined above, the eco-certification scheme implemented must include effective biodiversity protections which act as the links between conservation and producing market products.

[5] Ecological, cultural and economic needs vary from site to site as does governance, partners and expectations. Therefore, decentralized management that allows adaptation to local conditions is necessary, but not sufficient. Strong local institutions and internal community capacity to manage and regulate on their own is also required. Wells, M., and TO McShane (2004). "Integrating protected area management with local needs and aspirations." Ambio **33**(8): 513-519, Brooks, J., et. al (2006). "Testing hypotheses for the success of different conservation strategies." Conservation Biology **20**(5): 1528-1538.

The fine print: What are the catches?

While more about 260 million hectares, representing more than 30 percent of North American and European forests have become certified, only about 22 million hectares representing less than 2 percent of tropical forests have become so. (Cashore 2006) Investigating eco-certification to determine how to make it work for jungle rubber areas in Jambi highlighted much "fine-print" for implementers to observe if their projects are to succeed in the tropics:

- To sustainably conserve biodiversity services, eco-certification projects must develop livelihoods;
- Implementer should choose the type of certification (organic, fair-trade and eco-) based on
  - which has the most appeal to consumers where the product will be marketed and
  - the conservation goals of the project area.
- The scheme implemented must have the flexibility to match local conditions; must exclude free-riders; and must minimize transactions costs.
- The scheme must also be compatible with crops and their markets.

Develop livelihoods to succeed at conservation

For the international conservation organizations that birthed eco-certification, it is first and foremost a tool for conservation. However, conservationist and development practitioners also recognized that eco-certification had at least conceptual potential to improve livelihoods of impoverished producers who could generate additional income by meeting global demand for environmental services. Although development came along as a second thought, it is important to realize that in the tropics, eco-certification's attraction is that it can serve both goals. In fact, the deck is stacked against achieving sustainable conservation without achieving sustainable livelihood improvements. Biodiversity-hostile land-uses will displace biodiversity-friendly ones unless small holders can to find a way to benefit so their families do not need to settle for poorer lives when they choose practices that maintain global environmental services. Figure 5 shows the connection between pro-poor development goals and conservation goals and how each one supports the other. However, producing better livelihoods through eco-certification is proving more elusive than ensuring that certification criteria are met. Although some tropical forests have become certified (Cashore 2006), and certification does result in better management, eco-certification has not yet consistently provided enhanced livelihoods.(Gullison 2003)

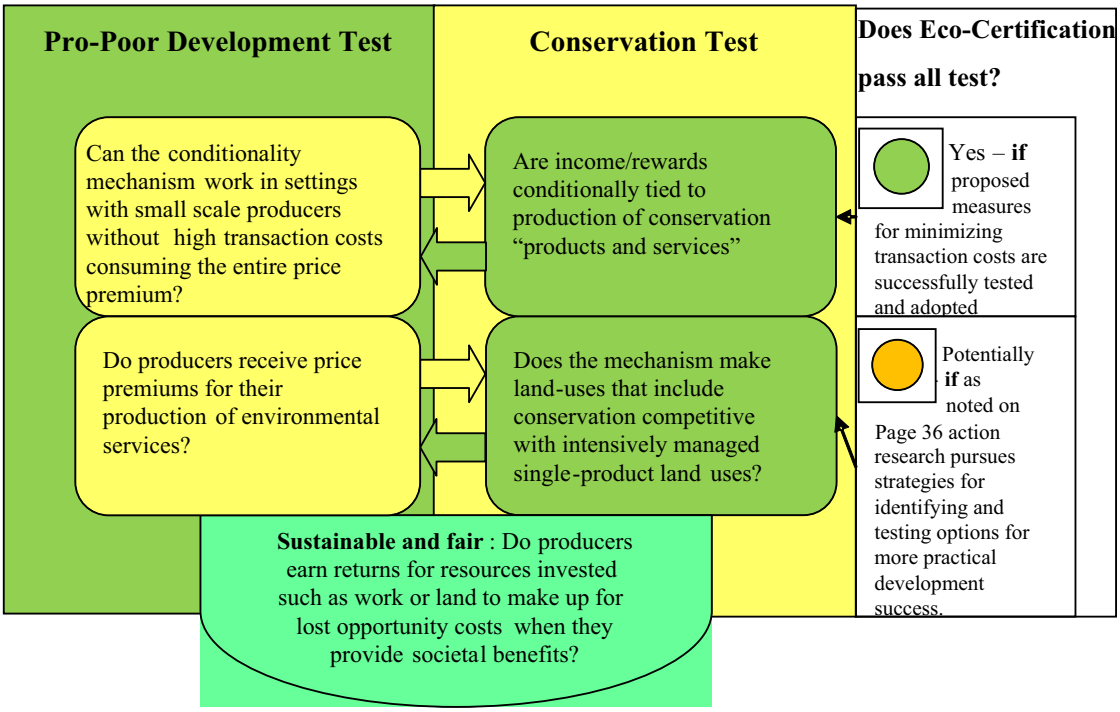


Figure 5. Sustainable eco-certification: Pro-poor is the flip side of pro conservation.

What kind of certification is best? Balancing market strength and conservation strength

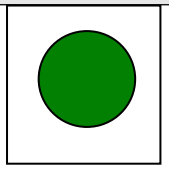
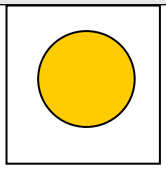
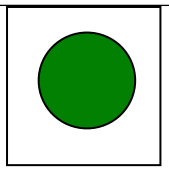
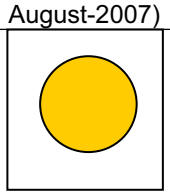
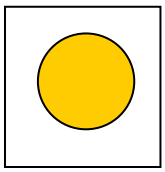
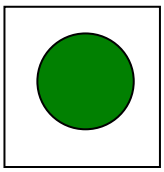
Looking to meet conservation and development goals in Sumatra, we tried to determine whether eco-certification would produce better results than two other types of widely used certification – organic and fair-trade. Table 2 shows how the literature indicates these certification types stack-up against each other on two key indicators: market/development strength and conservation strength. The "traffic lights" indicate the likelihood that the certification type will produce strong outcomes for that indicator.

As the table shows, no certification type is equally strong in both market/development and conservation effects. The single indicator is used for both market strength and development strenght to show the interplay between the two. If a certification type has high market strength, this will manifest as consumers willing to pay high premiums. As long as the premiums reach producers then the extra money will translate into improved livelihoods that signal development strength. Several studies with crops ingested or worn indicate that organic certification has a good track-record in increasing farmer net incomes through a combination of price premiums, increased productivity and, in some cases, lower costs. Fair-trade also yields price premiums that, while not as high as organic premiums, can extend to products not

worn or ingested. As reported earlier, eco-certification has not reliably generated price premiums for producers. (Taylor 2005)

On the conservation scale, the hierarchy of strength is somewhat reversed with some eco-certification schemes offering stronger protections for biodiversity and forests than either fair trade or organic certifications. For example, researchers have found that the FSC's certification program has resulted in improved practices for forest integrity. (Gullison 2003) The requirements of most organic schemes that follow the principles of the International Federation of Organic Agriculture Movements (IFOAM) will increase biodiversity over conventional monocultures; however, the schemes typically address practices in field agriculture, which generally is already highly intensive. (Hole 2005) The organic standards do not address best forest practices and would not necessarily translate well to forest management. (IFOAM accessed 20-August-2007) Many fair-trade schemes require producers to use eco-friendly production techniques. However, environmental requirements are not necessarily specifically aimed at forests and their levels of biodiversity (Hole 2005).

Table 2. The market and conservation effects of three certification schemes.

Certification Type	Market/Development Strength	Conservation Strength
Organic	 Organic certification has produced substantial price premiums. (Dimitri 2005)	 There are many organic certification schemes and they vary in requirements that support biodiversity. Schemes such as that of the International Federation of Organic Movements contain provisions that protect biodiversity and other environmental services but have no forest specific requirements. (IFOAM accessed 20-August-2007) Others do not. For example, the US government's National Organic Program does not include any requirements for preserving biodiversity or ecological functioning. (USDA accessed 20-August-2007)
Fair-trade	 Products sold under fair-trade labels have consistently produced price premiums, partly because the scheme requires that buyers increase the incomes of producers. (Raynolds 2007)	 The umbrella fair-trade group The Fairtrade Labelling Organization (FLO) publishes fairtrade standards that include environmental requirements. However, the requirements are very general and do not address biodiversity directly.(Fairtrade_Labelling_Organization)
Eco-certification	 Evidence to date is that eco-certification has not yielded price premiums for producers. (Gullison 2003)	 Many researchers conclude that FSC certification_regarded as the most environmentally sound by the major conservation organizations – has improved forest management. (Rametsteiner 2002; Gullison 2003; Newsom, Bahn et al. 2006) Still some research finds it has not improved forest management beyond legal requirements already in place (Nebel, Quevedo et al. 2005)

The rise of açai, a palm that produces a nutritious, flavourful fruit (see box) validates the notion of a hierarchy of preferred certifications. Initially promoted as a internationally marketable crop that could protect the Amazon forests and improve livelihoods of Amazon residents, açai shows the risks of international commercialization of locally important products. Growing international demand for the fruit has translated in to high prices that keep it out of reach of many local people who formerly relied on it for nutrition. Also, because of its increasing value, açai production has started down the curve from biodiverse to intensively produced. In some areas, acai "forests" have started to replace Amazon floodplain forest. This suggests that organic and fair trade certification has not had sufficient protections for achieving the biodiversity protection that conservationist sought in promoting açai. Projects

that sought eco-certification could have been researched to see if they would have produced better results. (Weinstein 2004)

Given the differing hierarchies for market/development and conservation strength, in any specific setting, the choice of certification type will depend on the project needs. Where project sites grow products ingested or worn and where environmental impacts are low, organic certification would probably best meet needs since organic certification most reliably generates price premiums. However, where environmental threats are high such as in coffee-growing areas in Sumatra with highly endangered species like tigers, elephants and rhinos, eco-certification will bring stronger conservation tools. Still, its persistent lack of price premium may weaken its effectiveness. Additional ways to tie conservation to development in such settings need to be tested. One testing candidate would be to secure the type certification that offers the highest price premiums, but to also incorporate side agreements with producers that agree to adopt conservation practices in return for assistance in securing the certification and integrating into markets, and technical assistance in agroforestry practices.

Box 3 – Açai

Açai is the fruit of a palm that grows wild in floodplains of the Amazon basin. Local peoples reportedly have relished – even venerated – this nutritious fruit for centuries. Since the late 1980's conservation and development practitioners have tried to commercialize the fruit as a non-timber forest product that could increase local incomes and promote conservation of the Amazon's floodplain forests. Today, interest in acai has spread throughout much of Brazil's Amazon Basin and into Europe, Japan, and North America.

Web searches for acai have returned the following results:

Eco-certified acai	0
Fair trade certified acai	more than 80,000
Certified organic acai	more than 300,000

Assuming that acai dealers' preferences for certification types reflect the economic benefit that the particular certification scheme delivers, organic certification clearly provides the greatest advantage. (Organic certification is most likely the easiest certification to attain as there is little difference in management regimes between organic and conventional acai). On the other hand, eco-certifications appears to be perceived as having little value, even though acai production is promoted as conserving rainforests.

Intensification Occurring

Researchers now see that with increasing demand, acai production has started to travel the trade-off curve from more extensive, biodiversity conserving methods to more productive, less biodiverse systems. Former natural floodplain forests are becoming acai forests that resemble plantations. (Wienstein 2004) This demonstrates that commercialization alone without explicit standards for conservation can destroy the services it was to protect. Proactive eco-certification established simultaneously with efforts to promote acai production and increase demand might have avoided or minimized this effect.

In cases where a project selects eco-certification as the best mechanism given its local conditions, the project will still face choices about the best eco-certification scheme for its setting. Table 3 shows four types of eco-certification schemes and rates them on their strength in a range of parameters. This table serves two functions:

- It lists relevant features to consider in selecting eco-certification schemes that will best deliver conservation and development given local circumstances. Where critical habitat is a primary reason for a project, then third party certification from an authority with an inclusive, transparent process for setting standards would fulfil the needs, particularly for an internationally traded crop that could gain from leveraging an internationally recognized label.
- It gives information on where to focus efforts to make eco-certification schemes more sustainable by addressing the key obstacles to delivering both conservation and development. So, for example, while internationally based regulatory schemes are strong in several components, ways still need to be found to lower transaction costs and make them more flexible so they can match local conditions. Moreover, the fundamental need to make eco-certification of all types pay more to producers must also be addressed.

Analysis of the factors shown on the table reveals that schemes have constellations of strengths and weaknesses:

- *Regulatory schemes whether internationally or locally based* (see solidly green shaded area) offer the potential for ensuring that: development is tied to success in conservation of environmental services; and the standards setting process is inclusive setting which should lead to standards that deliver on the expectations of all interested parties. Also, the regulatory structure excludes potential free-riders who could benefit from making unverified claims about the environmental service benefits of the products.
- *Internationally-based regulatory schemes* like Forest Stewardship Council offer the best leverage for dollars spent on promotion. Because they cover many products from many countries and markets in many countries, any dollars spent to promote the standards they represent help promote a large volume of product and a large area of protected land. Locally based schemes will not have this leverage because the product volumes will not be as large as those of the international schemes. International reputational schemes have lower volumes because their promotion will likely only affect the narrower market segment commanded by their own brands, not the swath that a wide ranging forest product scheme can cover.
- *Local schemes, whether regulatory or reputational* (see yellow shaded area) can offer the most flexibility because their standards can be set for a narrower range of conditions tailored to their area. Local regulatory schemes can offer lower transaction costs because they do not have to pay for travel costs of international regulatory staff. However, local schemes will not have the volumes over which to leverage promotional expense that international schemes will.
- *Reputational schemes* (see bright green, cross-hatched area) offer higher flexibility to meet local conditions and more favorable costs, but are not as strong in other attributes.

Table 3. Comparison of eco-certification schemes by geographic extent and regulatory vs. reputational.

	Regulatory		Reputational	
Features	**Internationally based**	**Locally/Nationally based**	**Locally/Nationally based**	**Internationally based**
Example	Forest Stewardship Council	LEI – the Indonesian forest certification scheme	Associação dos Produtores de Artesanato e Seringa – Native rubber products in Brazil	Bird-friendly coffee
Strong institutions to be sure development is tied to conservation[6]	If a 3rd party audits compliance	If a 3rd party audits compliance	Range – but little certainty	Range – but little certainty
Inclusiveness in setting standards[7]	If a board with representation from all interested parties sets standards	If a board with representation from all interested parties sets standards	Low	Low
Free-rider exclusion[8]	Yes	Yes	Weak	Weak
Leverage of promotion expenses[9]	High	Low	Low	Medium
Flexibility in matching local conditions[10]	Low	High	High	High
Transaction costs for certification[11]	Unfavor-able	Most favorable	Most favorable	More favorable

[6] Reputational schemes do not rate as highly as regulatory schemes regarding conservation, because they do not need to have transparent processes in place to adopt their standards nor do they have third parties verify that their products, in fact, do comply with promised standards. Thus an entity could have developed a reputation for environmental concern through clever marketing, but fail to match their reputation with its actual, but unscrutinized, practice. Researchers have found that schemes with third-party monitoring to verify compliance with regulation perform better environmentally then those that self monitor or use industry groups or trade associations. Newsom, D., V. Bahn, et al. (2006). "Does forest certification matter? An analysis of operation-level changes required during the SmartWood certification process in the United States." Forest Policy and Economics **9**(3): 197-208, Steelman, T. A., J. Rivera (2006). "Voluntary environmental programs in the United States: Whose interests are served?" Organization Environment **19**: 505-528.

[7] Companies with strong market reputations can assert that they follow good practices without consulting other parties or ensuring that they use standards agreed upon by relevant parties, such as producers or environmental researchers. A regulatory scheme does not ensure this either, but a true, independent certifier would have little reason to introduce ineffective standards.

[8] A well-marketed company can simply claim the equivalent of "you've heard of us: trust us."

[9] Locally based schemes will be selling a smaller volume of product to spread promotion expenses over.

[10] If an entity is creating its own standards without an inclusive, transparent process, it can apply non-uniform standards as it chooses. While the flexibility may better match local conditions, there can be little transparency if the certifier does not transparently adopt standards.

In many cases, combinations of certifications might produce the best conservation results and widest market for the products. However, currently each certification type requires its own certification audit to verify that a site meets its production standards. Action research aimed at assisting certification authorities develop methods for a single audit for organic, fair-trade and eco-certification could lead to lowered transaction cost which would enhance certification's potential for achieving conservation and development objectives. (Shanley 2006)

Lessons from wood, coffee and fish: Eco-certification should match the character of the crop, its market and its market integration

Those contemplating eco-certification for settings with strong conservation and development needs may wonder if certification has more likelihood of meeting such needs with some crops (or products) than with others. Table 4 lists three products where eco-certification has made inroads in markets – coffee, wood and fish. The table rates each raw material on 23 descriptors within 5 categories identified through an analysis of NTFP commercialization. (Belcher 2005)

As the table shows, these products display more dissimilarity than similarity except in the category of markets and market integration. Within this category, wood, fish and coffee all:

- Have a long history of exploitation for international markets.
- Provide of a high percentage of household income for growers.
- Are internationally traded.
- Have a high trade value – greater than US $1 billion annually.
- Exhibit high-concentration in retail sectors.
- Have experienced heavy INGOs intervention in setting up certification schemes and marketing them.

This table suggests the strong possibility that certification of these products has grown not because they have had intrinsic characteristics that make certified versions of them more attractive for consumers than certified versions of other products, but because INGOs have targeted them. The market attributes these products share offer advantages to conservation INGOs wanting to get the biggest bang for their conservation dollar.

The initial frameworks for global programs to eco-certify wood, fish and coffee are all offspring of INGOs. The World Wide Wildlife Fund assisted in the start of both the Forest

[11] Internationally based schemes are more likely to send auditors and other certification staff from distant centralized locations than locally based schemes resulting in higher, and therefore unfavorable, transaction costs. International reputational schemes can have intermediate costs if they do not have detailed audit procedures.

Stewardship Council and the Marine Stewardship Council. (Marine_Stewardship_Council accessed 31-May-2008; Gereffi 2001) In the US, the Smithsonian Institute's Migratory Bird Center has provided a major force for certified bird-friendly coffee. Developing eco-certification schemes and building consumers awareness requires major spending. Targeting products whose production affects huge areas has the chance of affecting the largest areas per conservation dollar. Also, focusing on commodities with already well-developed international markets allows promotion dollars to go solely to raising awareness of conservation issues rather than on also trying to introduce unknown products. Finally, whether or not intentionally considered by the INGOs, promoting internationally rather than locally traded NTFPs for certification means not risking price increases for products that the poor rely on for nutrition, medicine or other needs..

The table does not include one market characteristic that may be a factor in the small percent of tropical forests that have obtained certification. Although the international market for wood is large, only about 6-8 percent of wood cut globally enters markets with large numbers of eco-motivated consumers. The rest goes to regional and local markets. This means the wood does not reach markets that will pay for biodiversity services, so eco-certification offers little benefit to producers. (Gullison 2003) This suggests that when considering eco-certification as part of a conservation and development project, researchers should look at the proportion of the global production that is exported to eco-motivated markets. For example, with 28 percent of natural rubber consumed by Europe and North America (International_Rubber_Study_Group 2007), jungle rubber may have more potential than wood to generate the price premiums needed for small holders to produce diversity conservation and thus to make certification attractive. Among other commodities, researchers may also want to analyze shea butter, Chinese truffles, and cocoa markets for their export patterns.

Table 4. Comparisons of characteristics of three widely certified products.

Category	Characteristic	Wood	Fish	Coffee
External factors				
	Development and conservation INGO intervention	High	High	High
Characteristics of markets and market integration				
	Local or Regional/International	International	International	International
	Percent exported to countries with large eco-motivated market segment	Low	Low	High
	Size of global market	> US $1 billion	> US $1 billion	> US $1billion
	Price of average unit of consumption	Relatively high	Low	Low
	Importance of finished market goods	Varied	Low	Low
	Retailing concentration	High	High	High
	Length of market exploitation	> century	> century	> century
	Percent of household income from production	High	High	High
Product and Production system				
	Labor intensity	Low	Low-high	Medium
	Technology intensity	Low	Low-High	Low
	Barriers to production entry	Low	Low-high	Low
	Stable/perishable	Stable	Perishable	Stable
	Percent of total production area targeted	All	All	
	Geographic distribution	World wide	World wide	Tropics
Socio-economic characteristics				
	Land tenure	Widely varied	NA	Widely varied
	Degree of contribution to household income	Widely varied	Widely varied	Primarily high
	Consumption locally important	Yes	Yes	No
Processing industry characteristics				
	Barriers to entry	Moderate	Varied	Low
	Proportion of value of commodity to value of finished product	Low-high	High	High
	Processing/importing concentration			High
	Value chain complexity	High		Low
	Degree of transformation	Medium - high	Low - medium	Low

Source of categories: (Belcher 2005)

Crop choices to avoid eco-certification downsides

Shanley et al looked at dozens of case studies of eco-certification efforts for NTFPs. Their results confirm that "for a narrow range of internationally-traded, high-value species, [eco-certification] can offer producers, companies and consumers a tool to sell and purchase products that are sustainable and equitable." However, their analysis points to the difficulties in developing workable criteria for the enormous variation in degree of domestication, ecology, cultivation, and social and market structures found in NTFPs. They find that eco-certifying NTFPs that are important to everyday lives of poor, forest dependent peoples can

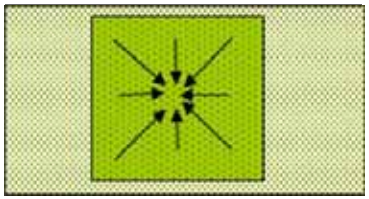
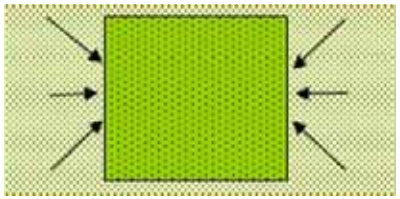
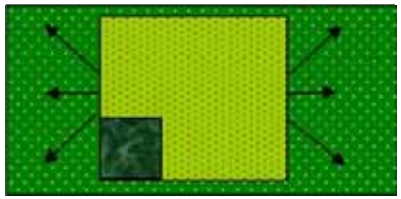
lead to price hikes the people cannot afford. Also, eco-certification can lead to over-exploitation that, depending on the specific ecology of the plant, can threaten its long-term survival. (Shanley 2006) In addition, Kusters find that increasing commercialization of FTFPs not already integrated into international or regional markets often does not benefit livelihoods of forest-dependent peoples and frequently does lead to intensification that simplifies biodiversity. (Kusters 2006).

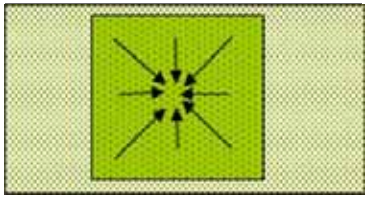
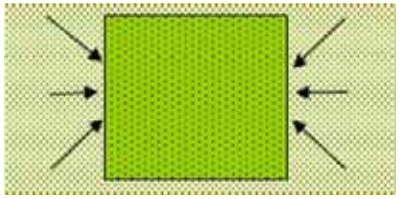
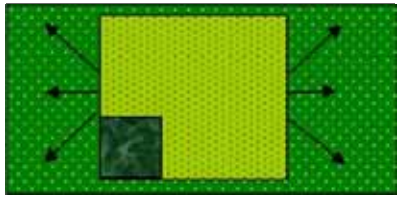
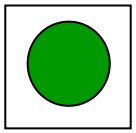
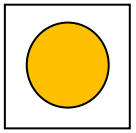
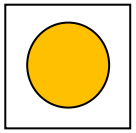
Need to match eco-certification approach to conservation needs

In addition to the above, eco-certification fine-print includes a need for further development of the schemes to make them more adaptable for all the settings in which they could potentially aid conservation and development. Table 5 shows three categories of systems in transition and how eco-certification could finance conservation and development in them.

To date, eco-certification schemes primarily address the first scenario where one crop has at least two management practices – one that is biodiversity-friendly and one that is biodiversity-hostile. Jungle rubber illustrates this category given the threat to its higher biodiversity levels by low biodiversity rubber monocultures. However, eco-certification could be a solution with other conservation threats. For example, shea, which is grown in the Sahel as part of forest-grassland eco-systems that harbour many wildlife species, is being displaced by monoculture systems that produce more income per land area. If eco-certification of the shea could increase the price to producers, then maybe grassland -forest could compete with other uses. Finally, intensive production of very high value crops that require little land could be certified to finance the conservation of biodiversity habitat in other areas. However, current schemes do not have processes or standards to effectively tie conservation and development in these scenarios. The table lists some features that sustainable eco-certification would need in these settings.

Table 5. Characteristics of settings where eco-certification could contribute and features needed for it to achieve conservation goals in these settings.

Cases of Systems in Transition			
Potential of Eco-Certification to Mitigate Bio-diversity Threat	*Competing crop practices* – Certification could keep the less biodiversity friendly practice from supplanting a more friendly practice, if certification produced a return competitive with the alternative practice.	*One crop practice, competing land-use* – certification of biodiversity friendly land-use could result in returns that would make it competitive against a less friendly land-use.	*Certified intensive use in one area of a landscape provides benefits to producers so they can forego use of critical conservation areas.*
Examples	*Timber* – clear-cutting and/or monoculture plantations that threaten sustainably managed natural forest *Coffee and Cacao* – monoculture coffee and cacao threaten shade coffee *Rubber* – monocultures threaten jungle rubber	*Shea butter* – conversion to other crops and systems threaten African grassland tree systems *Truffles* – Forest systems necessary for truffle production are threatened with conversion to non-forest system	*Rubber* – maintaining some monoculture rubber can finance keeping other land in jungle rubber. *Nepenthes* – Intensive use of small land area to produce a very high value crop might provide income so communities can maintain livelihoods without expanding intensive management into orangutan habitat
Level	Plot	Plot	Landscape

Cases of Systems in Transition			
Key features needed for eco-certification scheme to ensure conservation & development	*Producer knowledge* about biodiversity consequences of different management practices. *Indicators* of successful biodiversity conservation. *Price premiums* to signal demand to producers and make biodiversity friendly land-uses competitive with biodiversity-hostile uses. *Consumer education* so they understand the biodiversity services they are purchasing.	*Conservation agreement that makes payments conditional on achieving biodiversity performance* *Producer knowledge* *Indicators* *Price premiums* *Consumer education*	*Conservation agreement* *Producer knowledge* *Indicators* *Price premium* *Consumer education*
Facilitated by existing conservation schemes	Yes 	No 	No 

Chapter 2: For sustainable eco-certification, value chain dynamics must change

As the previous chapter noted, eco-certification, while conceptually promising, comes with much fine print that its users must observe if it is to secure conservation and improve livelihoods in the tropics. The previous chapter discussed choices that projects can make based on their specific circumstances to help fullfill the requirements of the fine print. However, even with all the best choices in place, eco-certification has qualities that severely hamper its abilities to make good on its promises.

As of 2005, more than 30 percent of temperate forests had become eco-certified, while less than 2 percent of tropical forest had – an ironic result since eco-certification came about as an effort to protect tropical forests. Research to date finds as key culprits the lack of price premiums for producers coupled with high cost both of changing management practices to meet eco-certification standards and of footing the bill for certification processes. (Gullison 2003; Cashore 2006) In the Jambi research site, for example, jungle rubber yielded about one-third the amount of raw rubber per hectare of monoculture rubber. This statistic may seem to imply that eco-certified rubber needs to earn at least 3 times the price of monoculture rubber for farmers just to break even. However, though we lack experimental data to date, there is evidence that farmers would not need to see such steep price premiums to maintain their jungle rubber. For example jungle rubber in Jambi provides farmers with a multitude of products with value internal to their households. These products include building materials, medicines, foods to eat as well as to sell, environmental services such as water supply regulation that ensures supplies for micro-hydropower plants and fish, and risk-buffering against the price volatility of the global rubber market. (Budidarsono not dated) However, even with these additional values, achieving sufficiently high prices to maintain jungle rubber appears very challenging, especially with the evidence that eco-certified wood has not yielded price premiums for producers.

Obstacles to understanding price premium dynamics

Figuring out why price premiums have not consistently appeared for wood is problematic. First, studies to measure consumer demand for forest protection services show mixed results. In several surveys, consumers indicate a willingness to pay more – and in some cases, nearly 100 percent more – for wood products that include forest protection services. However, other studies show that factors other than eco-certification and price have equally strong or stronger influence on consumers' purchasing choices. Also, surveys have produced mixed results as to

whether a group of eco-motivated consumers exist that will act similarly toward environmental purchasing across the range of product and service lines.

Many studies find consumers do not respond to common environmental motivation across product choices, but rather respond on a product by product basis. However, a recent study (Thogersen 2006) finds that such motivation does exist but previous studies did not did not find it because they did not control for consumer's background characteristics. Studies examining "green" marketing and product awareness postulate that green marketers have not sufficiently defined environmental products in terms that matter to consumers. (Ottman 2006)

Finally, other studies find that eco-certification is still in such a nascent stage that consumer awareness is low. This means that the market for eco-certified products has significant opportunity to grow. Certainly evidence as to whether consumers currently will pay extra to purchase biodiversity conservation services is important data for determining whether eco-certification can generate increased farmer incomes, which will act as financing for biodiversity conservation services. However, at this point, consumers have largely not been invited to do so.

A gap between the eco-certification theory and implementation reality

In 1993, several major international conservation NGOs (INGOs) launched grass-roots campaigns against Home Depot and Lowe's Home Improvement Centers. (Gereffi 2001) Eventually, both retailers adopted policies of preferring to purchase eco-certified wood when available. However, these companies have not significantly or systematically invested in developing demand among consumers for the eco-certified wood and the biodiversity services that underlie it. (Taylor 2005) Visitors to the companies' websites can find with varying difficulty their stated commitments to sourcing their wood from eco-certified sources.

This approach bodes badly for price premiums needed to make eco-certification a sustainable mechanism. However, viewed through the perspective of value chain analysis, it is understandable and predictable. A value chain consists of all the intermediaries and their activities that bring a product or service from initiation through production to delivery to final consumers. (Kaplinsky 2001) Each successive intermediary transforms the commodity in some way that adds value. Intermediaries attempt to claim some portion of the value they create as a return for their efforts. The portion of value an intermediary can appropriate depends on a variety of factors such as its position in the value chain and the structure of the industry it is in. Business strategist initially used the value chain as a heuristic for individual firms to improve their competitiveness by better coordinating their activities within the chain. (Ponte 2005) However, it has evolved into an analytical framework that economists, sociologists and others use to gain insights into the determinants of the distribution of

economic rents – and by applying it to global economic sectors, identify policies that can mitigate trends toward inequality of distribution of rents. (Kaplinsky 2000)

Using value chain analysis to predict the adoption of eco-certification within industries, Sasser found firms most likely to commit to eco-certification if they:

- Had strong brand identities that contributed to a command of large market share.
- Belonged to concentrated industries.
- Faced threats of condemnation from INGOs with credible clout.

Furthermore, Sasser found that these variables differed for firms differently situated along the value chain, leading to different actions and power dynamics among retailers, primary processers, secondary processers and so on up the value chain. Sasser predicted that the relative degree of industry concentration at each position would govern the power that firms wielded. In "producer driven" value chains, such as cars, the locus of power remains with the manufacturers, but in buyer-driven value chains, such as apparel, the locus of power rests with retailers. (Gereffi =1999) Firms with strong consumer recognition and thus market power would seek to maintain an appearance of good corporate citizenship by adopting a preference for eco-certified products, while at the same time deflecting as much of the costs of eco-certification as possible back-up the value chain to less powerful intermediaries.

The state of eco-certification in the wood products industry bears out these predictions. INGOs have targeted the dominant retailers in highly concentrated sectors. For example, bowing to INGO pressure, Lowe's and Home Depot, which together account for 71 percent of the US do-it-yourself market, agreed to adopt policies of purchasing lumber from eco-certified sources when possible. (Sasser 2003) B & Q, the dominant British do-it-yourself retailer, and IKEA, the Swedish home furnishings monolith, have adopted similar policies, committing to sourcing wood from eco-certified suppliers. Their acquiescence represents a protective strategy to avoid bad publicity and boycotts which could alienate consumers and undermine their sizable investments in creating positive reputations. (Sasser 2003; Gulbrandsen 2004) The companies can portray themselves as actively concerned about the environment, while at the same time using their market power to pass the costs of eco-certification to suppliers further up the value chain.

The INGO strategy to target the major retailers brought a large measure of eco-certification success, achieving eco-certification protection for a significant area of forest with a manageable degree of effort. With its acceptance by big retailers/retailer-manufacturers, FSC certification accounts for more than 70 percent of the demand for eco-certified timber. (Poku-Marboah 2003). However, this strategy may actually represent a deal with the devil in terms of making eco-certification a sustainable mechanism for conservation and thus for development in tropical countries.. Though they take credit for progressive environmental

stances, these stores identify few certified products on store floors, so consumers have no option to "vote with their dollars" and pay more to purchase biodiversity services.[12]

How conservation and development loses

The downside from this deal is at least three-fold. First, with the major outlets for eco-certified wood exercising their power so they do not channel any return for eco-certified products up the value chain to producers, they keep any increased financing for biodiversity from going to producers. While a significant number of producers in temperate countries apparently have had the capability to absorb these costs, poor small holders in the tropics cannot do so without continuing to be locked into poverty. Faced with no prospect of increased income but assured increased costs of meeting eco-certification requirements, the rubber farmers of Jambi could not justify devoting time to becoming eco-certified.

Second, when retailers and end-product manufacturers do not promote products as eco-certified to consumers, an important opportunity is lost for synergy between business intermediaries' interests in developing a competitive advantage through a positive environmental image and conservationists' interests in raising awareness and concern for environmental services. So far, INGOs with budgets in the tens of millions of dollars for promotion have not made a serious dent in consumer awareness about the impact of product choices on the environment. However, retailers and end-product manufacturers already spend heavily on promoting their products. By including messages about the environmental benefits of their eco-certified products, these intermediaries could leverage their already allocated promotion dollars to also serve the interests of biodiversity conservation. Considering the possibility for jungle rubber, 90 percent of rubber makes its way to intermediaries that produce car, truck or airplane tires (Gouyon 2003). In a single year Goodyear Tire company was estimated to have spent $50 to 60 million in the US alone on creative services (Elliott 2004). If Goodyear would devote only 10 percent of those funds to advertising that included messages intended to build competitive advantage based on environmental image, it would significantly augment the amounts conservation INGOs have to spend on raising consumer awareness.

Third, because the intermediaries using eco-certification to protect their image have not marketed eco-certification to consumers, more than a decade of selling eco-certified products has passed without producing reliable data on the strength of current of consumer demand and evaluating whether it represents a potent, untapped source of financing for forest protection or the right combination of product mix and messages to increase consumer demand. The lack of learning about how to most effectively engage consumers with products that conserve

[12] Recently, a search for "Home Depot" yielded an "eco-option" link which does offer consumers the chance to purchase products for their environmental service attributes. However, eco-products do not appear on the main company homepage.

environmental services is a key deficiency. Some observers conclude that because consumers currently do not pay a price premium, they will never pay one. However, research in new product introduction demonstrates that consumers must go through the stages shown in figure 6 to fully adopt new products (American_Marketing_Association Accessed 2008).

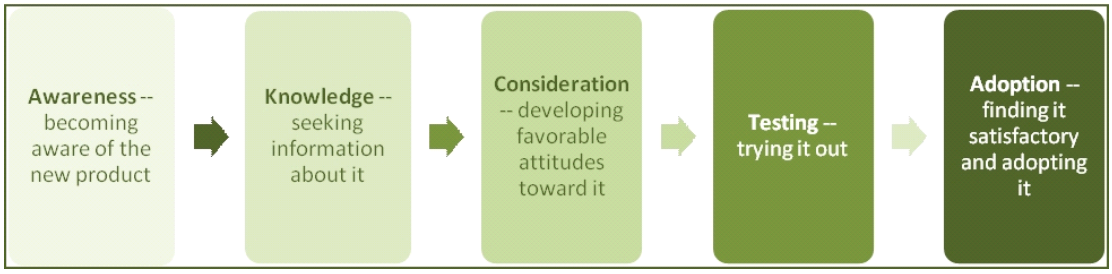


Figure 6 Stages in consumer adoption of new products. Eco-certification can be considered to offer consumers a new environmental service product with these stages leading toward consistent adoption.

Some research suggests that as yet large numbers of consumers – and even intermediaries in the wood value chain – have not reached even the awareness stage. (Rametsteiner 2002; Poku-Marboah 2003; Hubbard 2005) This suggests that eco-certification is still much too nascent a product for accurate conclusions to be made about whether consumers will ultimately accept it. Furthermore, marketing of eco-certified products is still in a somewhat unsophisticated stage that has not drawn extensively on lessons learned in marketing other products. Marketing so far of green products has generally appealed only to the virtuousness of environmentally friendly purchases. Yet it is well-established that successfully wooing consumers means fulfilling their needs as *they* perceive them. The need to conserve environmental services is just one from a set of attributes that each consumer has for specific products. Expanding the demand for environmental service products will undoubtedly involve "bundling" the environmental attribute with other product attributes to best fulfil consumer needs and thus appeal to them. (Ginsberg 2004; Rex 2007)

So far, the literature reports little or no experimentation by the intermediaries bringing eco-certified products to the public with messages and bundles of attributes to understand how to best stimulate consumer demand for environmental services. Finally, little has been done to understand the segment of customers that is environmentally motivated and whether awareness-raising for conservation of biodiversity services generally will spill-over to benefit specific products. (Thogersen 2006) For conservation INGOs to best strategize, it would be enormously helpful to know if targeting consumer awareness about biodiversity generally would create synergies with campaigns to sell wood, rubber, coffee or other specific products with biodiversity benefits.

Next Steps

The gap between the concept of eco-certification and its current implementation underscores the need for fundamental research to improve the ability of eco-certification to make good on the promise to deliver conservation and, necessarily, development in the tropics. The research must include competitive and marketing analysis to delve into these questions:

- Why has the gap developed and what strategies could narrow it?
- Will the big retailers ever truly try to build demand for the eco-certified products they are offering?
- What strategies could entice them to find ways to tap consumer spending and channel it to producers of biodiversity conservation services?
- Can increased value chain understanding and competitive analysis help with the previous questions?

Chapter 3: Contracts that separate biodiversity from raw material value chains can bring multiple benefits

The conditions in Jambi were such that eco-certification as currently practiced appeared to be a significant long-shot for achieving sustainable development and thus conservation. However, the constraints there suggested modifications to current eco-certification schemes with the potential to narrow the gap between the theory and the reality of eco-certification discussed in chapter 2. These modifications could also provide a platform for practices that could: reduce eco-certification's perverse incentives; reduce a major source of transaction costs that help keep eco-certification out of reach for poor producers in the tropics; and provide necessary upfront financing for producers to secure eco-certification for their crops.

As noted earlier, rubber has been traded from Indonesia for more than a century. Its primary demand comes from outside the country's borders so even very remote producers have channels connecting them to consumers throughout the world. Figure 7a shows that the rubber value chain has much complexity, travelling through many intermediaries to get from remote rainforest villages to wholesale and retail outlets Europe and North America.

Contracts can shorten the value chain for biodiversity

Each of the intermediaries in the ***rubber*** value chain performs a needed operation – such as, transport, amassing threshold quantities, and processing. However, most of these intermediaries would not transform or add value to the ***biodiversity services*** once the jungle rubber left producers' plots. Rather, each intermediary would generally adds costs because of the resources that would be required to keep certified and non-certified rubber separate as required under current schemes. Also, besides adding costs that do not add value, if each intermediary approaches pricing by adding a percentage mark-up to their cost for acquiring the rubber, then any premium charged by the producers for eco-certification would get amplified many times before finally reaching consumers. This could result in an unacceptably high price to consumers without producers receiving much of the premium.

With wood, eco-certification has evolved so that the biodiversity services go through the same value chain as the physical material. However, it may be possible to decouple the biodiversity services from the physical material. Figure 7b shows a value chain for eco-certified rubber that includes only the intermediaries that transform the biodiversity services. Companies very close to end-consumers are positioned to understand consumer needs and design products that feature environmental services as part of a total product mix that provides enough total value to consumers to generate a market.

These companies can add value for these eco-motivated consumers in the evolving green marketing of ecosystem services such as biodiversity conservation. The added value may include, designing products that use eco-certified jungle rubber as a component and a marketing strategy that educates people about the biodiversity benefits of jungle rubber in addition to communicating a set of overall product benefits valuable to targeted consumer segments.(Crosby 2006; Ottman 2006; Selden 2006). While advertising rubber or wood products as friendly to the environment may not seem on the surface seem to add value, marketers see that informing consumers and giving them the opportunity to select products with environmental qualities they value does indeed generate benefit for the consumers. Among other things it helps them save time in dealing with the information asymmetry arising because they do not know what impacts specific products and production practices make on environmental services they value.

In a paper on lessons that forest certification could learn from fair-trade, Taylor points out that fair trade succeeds in getting price premiums to producers through contracts executed directly between them and coffee retailers or processors. (Taylor 2005) Similar contracts used in eco-certification could cut biodiversity conservation services loose from the physical product, significantly shorting the biodiversity value chain. Figure 7b illustrates where such contracts could be placed in order to shorten the biodiversity value chain. Assessments of fair trade certification have shown it has generated higher incomes and other benefits to producers. (Bacon 2005; Becchetti 2005; Taylor 2005).

The contract mechanism together with the shorter value chain has the potential to deliver to farmers benefits beyond better prices and to *generate better biodiversity results by*:

- Eliminating perverse incentives,
- Enabling an "accounting" chain of custody that can reduce transaction costs and fraud contributing to deforestation.
- Potentially providing upfront financing needed for producers to secure eco-certification.

Thus, such contracts offer a conceptually attractive mechanism to test through action research negotiation of terms that would meet the needs of both producers and the biodiversity intermediaries. As the biodiversity intermediaries have so far resisted any set up that would send more money up the value chain stream, the competitive analysis discussed in the previous section will be important in devising contracts and structures that would attract the powerful intermediaries.

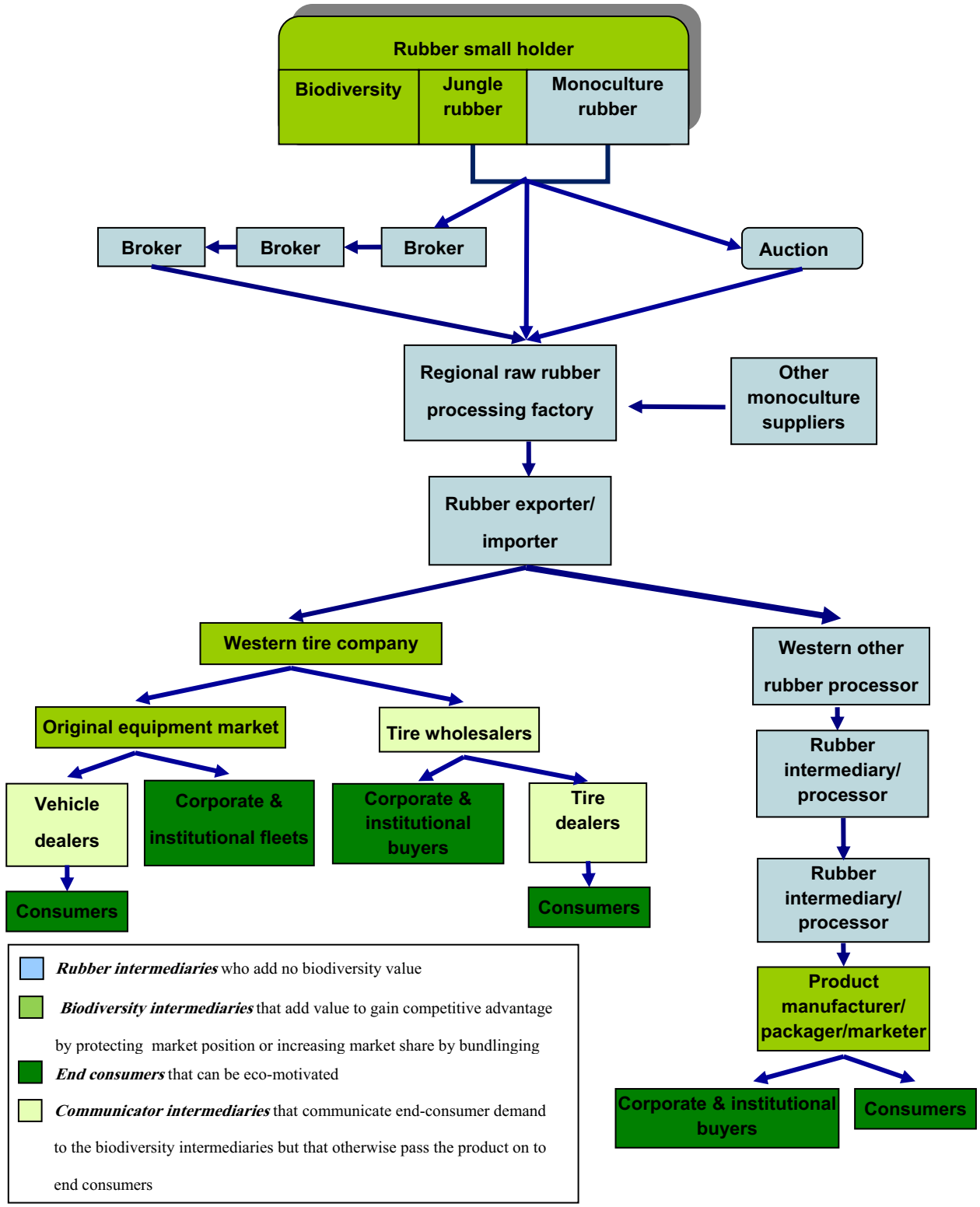


Figure 7. a) Current jungle rubber value chain. The dark blue arrows show rubber's complex value chain, often going through several middlemen before reaching the first raw rubber processor in Indonesia. Even after initial processing, some products require work by many more processors to meet exacting standards for products used in manufacturing processes and specialized vehicles. In most current eco-certification schemes, any price premiums that eco-motivated would consumers pay for biodiversity services would need to be transmitted through all the intermediaries in the rubber value chain to reach the rubber farmer.

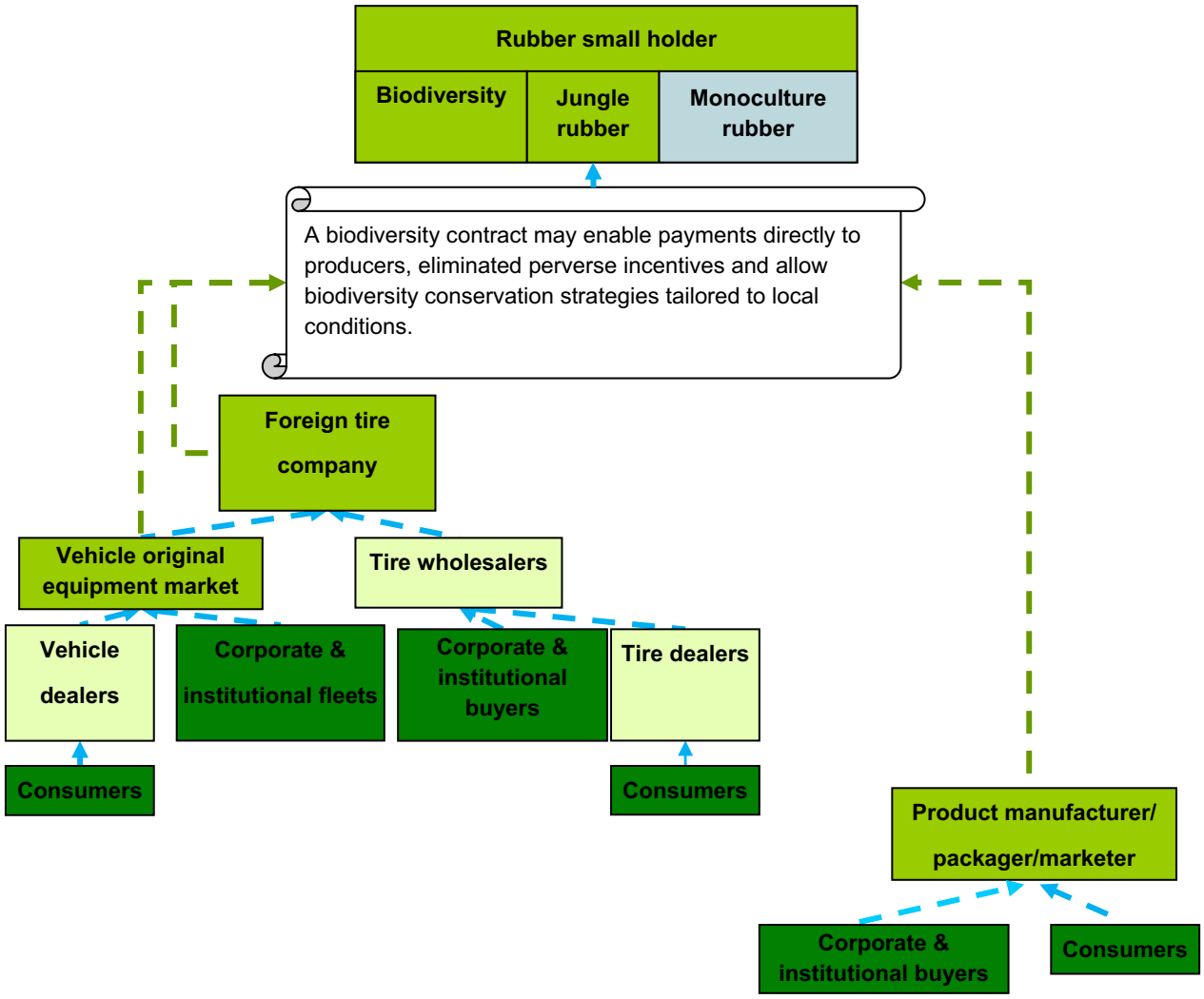


Figure 7. b) Shortened biodiversity services value chain. Here, the green line shows how direct contracts between the biodiversity intermediaries produce a shortened, simplified value chain. With this structure, price premiums no longer would go through the all the intermediaries in the rubber value chain, each of whom may absorb some of it for themselves. The light blue line indicates that to recoup their investment in biodiversity services, the biodiversity intermediaries must figure out how translate consumer demand into payment for the service.

Contracts can potentially replace perverse incentives with self-monitoring regimes that promote continuing improvement

Along with certified timber, certified shade (or bird-friendly) coffee has achieved some prominence as a product providing biodiversity services. Shade coffee, like jungle rubber, is a traditional agroforestry practice in which the cash crop coffee grows among native forest species. Coffee can tolerate shade, so growers can maintain a multi-strata system with coffee growing under a canopy of other tree species. Researchers find that because the degree of biodiversity varies with the density of the canopy, traditional coffee plantations provide an important refuge for species diversity in many high-conservation value areas. However, for

coffee, like rubber, monocultures yield more cash per land unit than the traditional, more biodiverse multi-strata systems. The higher incomes for monoculture coffee have caused conversions away from traditional shade coffee. (Joshi 2003; Philpott 2003; Perfecto 2005)

To combat the trend toward "sun coffee," certified shade coffee programs attempt to make the practice more lucrative by paying for the shade's biodiversity conservation service. Farmers obtain certification by conforming to standards for canopy density, structure and floristic make up that research has shown to enhance bird habitat. (Migratory_Bird_Center 2002) The farmers then attempt to negotiate with coffee roasters for higher per pound prices for their coffee that can be labelled bird-friendly. According to the Smithsonian Institute's Migratory Bird Center, reports they receive suggest that farmers often get 5 to 10 cents per pound more for bird-friendly coffee though one Japanese importer has paid 28 cents per pound representing an 18 percent premium. (Rice 2007) The roasters also agree to pay the bird-friendly certifiers 25 cents per pound "to support research and conservation programs." (Migratory_Bird_Center 2008)

This set-up for channelling payment to farmers for environmental services could create perverse incentives. For example, farmers willing to take extra steps to produce truly optimal bird habitat could only improve their livelihood if they grew more *coffee*. This is because the certification scheme pays for *coffee*, not the environmental service of *canopy* which produces superior bird habitat. If the farmers' habitat improvements reduced their *coffee* production, they would actually get less money for producing more of the *habitat* the scheme is designed to produce. Such an approach may encourage farmers to skirt the edge of minimally acceptable habitat conditions, rather than look for the trade-off between habitat and coffee production that could bring the best overall result for them and for birds. Researchers are also concerned that higher prices per pound of coffee will encourage coffee farmers to expand coffee production into natural forest areas, though without the shade premium, coffee production would not be profitable there. (Rappole 2003)

Contracts executed directly between producers and the downstream biodiversity intermediaries could reduce the potential for perverse incentives, if the intermediaries paid producers based on indicators of biodiversity habitat health rather than on quantities of physical commodities. A company that could gain increased market share, consumer loyalty or other benefits by supplying eco-certified products would enter into a contract directly with producers. The company would agree to pay set amounts conditioned upon the producers' achievements in maintaining biodiversity habitat measured by the indicators. Basing the indicators both on scientific methodologies and local knowledge as well as including those acceptable to both producers and biodiversity intermediaries would help guarantee workable measures with buy-in all around.

For example, FSC certification requires that forest management practices retain intact or enhance ecological functions and values of the forest including: a) forest regeneration and succession; and b) genetic, species, and ecosystem diversity. (Forest_Stewardship_Council 2000) Researchers in Jambi have already identified some indicators that could operationalize assessment of these attributes in jungle rubber. They are:

- Trees of the present indicators
  - More than 4 trees other than rubber at least 10 cm in diameter at breast height (dbh) per randomly selected sample plot.
  - Less than 2/3s of total basal area at breast height accounted for by rubber (when there are more than 8 trees with dbh at least 10 cm this measure need not be taken as it is labor intensive and when the 8 tree criteria is met the basal area criteria is usually met also).
- Trees of the past indicator
  - At least 1 tree per sample plot with dbh greater than 40 cm.
- Trees of the future indicator
  - At least 4 species of saplings within randomly selected sample plots. (Tata 2007)

These indicators came from work completed using standard scientific techniques. Next steps for further action research include:

- *Further development of the indicators by discussing them with jungle rubber farmers and modifying them to account for suggestions raised* – Indicators developed in concert with farmers should benefit both from local knowledge of the most effective ways to promote biodiversity given local conditions and from science-based methods.
- *Putting the indicators into practice to see if farmers can measure and use them to reliably assess the effects of their management on biodiversity* – If they can, then payments based on the indicators should become true incentives for farmers to improve their biodiversity services. With the farmers doing their own monitoring – even if the certification process will require independent verification – a feedback loop could develop where farmers see the effects of changing their practices and then adjust them, potentially creating a cycle of continuous improvement.
- *For moving jungle rubber eco-certification beyond Jambi, the indicators need testing as to their validity in other locations* – Research to investigate the factors that control the scale over which indicators remain valid would contribute substantially to an overall goal of developing transparent certification criteria that give meaningful assurance of biodiversity protection to distant buyers, account for local variations and keep transaction costs low.
- *Working with certification authorities to yield further learning on how to incorporate contracts and payments based on indicators into certification schemes* – A rigorous, documented program of self-monitoring could reduce certification transaction costs by reducing the time the independent auditors must spend in the individual sites. A similar approach is standard in financial auditing where reliance on a verified system of internal

controls allows reduced testing time by the independent auditors and lowers costs. (AICPA 2006)

Shortening the value chain can enable "accounting" certification of chain-of-custody

A very short value chain could possibly diminish another barrier to adoption of eco-certification by small holders in the tropics – the need for certified chain of custody. Chain of custody certification seeks to verify that, for each intermediary in a value chain, products leaving it as eco-certified really are eco-certified. This requirement maintains consumers' confidence that when they pay for eco-labelled goods they really receive products from biodiversity-friendly practices, not ordinary products pawned off as eco-certified by unscrupulous actors. When chain of custody breaks down it can undermine whole supply systems. For example, in the Lampung Province of Sumatra allegations that coffee illegally grown in protection areas for endangered species has found its way into certified, legally grown coffee has tainted the reputation of the entire coffee crop from the area.(WWF 2007) This situation demonstrates risks created by the temptation to sneak non-certified products into value chains of certified products to benefit from higher prices without bearing the higher costs of certified production practices.

Chain of custody certification performs a vital function, but as currently designed it adds much administrative labour and complexity. Obtaining FSC certified chain of custody requires that **every intermediary** performing **any transformation** or taking physical or legal ownership of the certified product must:

- Maintain a documented control system for sustaining the integrity of the eco-label guarantee.
- Have a system for ensuring that inputs to its processes have valid chains of custody.
- Keep certified inputs separate and identifiable from non-certified products and keep records on purchase, delivery, receipt, forwarding and invoicing of certified products.
- Maintain a secure system of product labelling for its outputs.
- Maintain an invoicing system that ensures any product sold as eco-certified has necessary documents to confirm that it came from eco-certified sources and is correctly labelled.
- Provide auditors with sufficient records to trace back any certified output to the certified inputs. (Gomes 2002)

These requirements impose costs that soak up funds need for biodiversity preservation and create barriers to participation in eco-certification schemes, particularly for small producers (UNFF_National_Focal_Point_for_Germany 2002; Vidal 2005) without adding anything to biodiversity services. According to the field researchers in Jambi, where some rubber brokers

gather rubber by motorcycle because of remote, rugged terrain, changing the supply channels to accommodate chain of custody requirements appears a nearly impossible effort. (Jasnari 2007) Also, a long, complex value chain adds many opportunities for introduction of uncertified products into the chain of custody.

The very short value chain diagrammed in Figure 7b) that includes only the biodiversity intermediaries might enable another approach, one that would not disadvantage small producers and that could potentially better protect the value chain from intrusion by bad actors. Figure 8 illustrates such an approach using jungle rubber as an example. This depiction is more descriptive than prescriptive, designed to focus attention on the possibilities and to start discussions to address any short-comings in this proposed system.

- At step **A**, the biodiversity intermediary would contract to buy at prevailing market prices the quantity of rubber generally produced from a specified area of certified jungle rubber over a specified time. The contract would also set a price to be paid to jungle rubber farmers who achieve over the defined area specified levels of biodiversity conservation as measured through established indicators. The intermediary would use average production rates for establishing what area would provide the quantity of rubber produced to eco-certification standards that the intermediary would need.
- At step **B**, the producers sell to a processor the raw rubber produced from the certified jungle rubber area. The processor issues receipts which the producers retain for the rubber.
- At step **C**, the biodiversity intermediary purchases rubber products equivalent to at least the contracted amount of raw rubber and is issued invoices from the manufacturer. The intermediary retains the receipts.
- At step **D**, the auditors from the certification scheme verify that the agreed upon indicators show the producers have successfully husbanded biodiversity services. The intermediary pays the farmers the agreed upon amount for biodiversity services.
- At step **E** the chain of custody audit verifies that the amounts of certified rubber documented by receipts as **sold by the growers** to the raw rubber processor is equivalent to rubber **purchased and used by the intermediary** to produce the products the intermediary labels as eco-certified.

With a long biodiversity value chain, this accounting chain-of-custody could be very “holey” if not impossible to verify. However, with only two intermediaries – the producers and the key biodiversity intermediaries – it could work much more securely. Furthermore, because farmers would be paid on the basis of biodiversity indicators rather than through a premium per pound of rubber, they could not earn unjustified premiums by passing-off conventional rubber as biodiversity friendly. The farmers might try to produce more rubber in the certified area than specified in the purchase agreement based on harvest averages. However the extra rubber would go into regular market channels and earn prevailing rates for conventional rubber. As long as they met specified levels for the biodiversity indicators the extra rubber

production would not be threatening the biodiversity. To encourage optimum trade-offs between production and biodiversity uses of land, the contracts could provide for increasing payments for increasingly improved biodiversity outcomes.

This last point brings up “leakage” as a consideration., Similarly to the concept of leakage in carbon sequestration, leakage in eco-certification would mean that if biodiversity conservation resulted in lower productivity for a product with constant or growing demand, the reduction from the target area would lead to new intensification or forest clearing somewhere else. Some studies have indicated that rubber may have the capacity to reclaim degraded areas in the tropics. Projects aimed at conservation could potentially look to marry eco-certification projects with restoration projects (which would also produce eco-certified rubber), but ensuring that this or some other mitigation always happened would be a challenge. Finally, although producers would not have an incentive to cheat the system, the biodiversity intermediaries might want to sell non-certified rubber as certified particularly if a strong price premium developed. While this is a problem that needs attention, biodiversity intermediary cheating would give them unmerited income, but not lead so directly to the same destruction of habitat that happens with producers cheating by encroaching on non-certified areas.

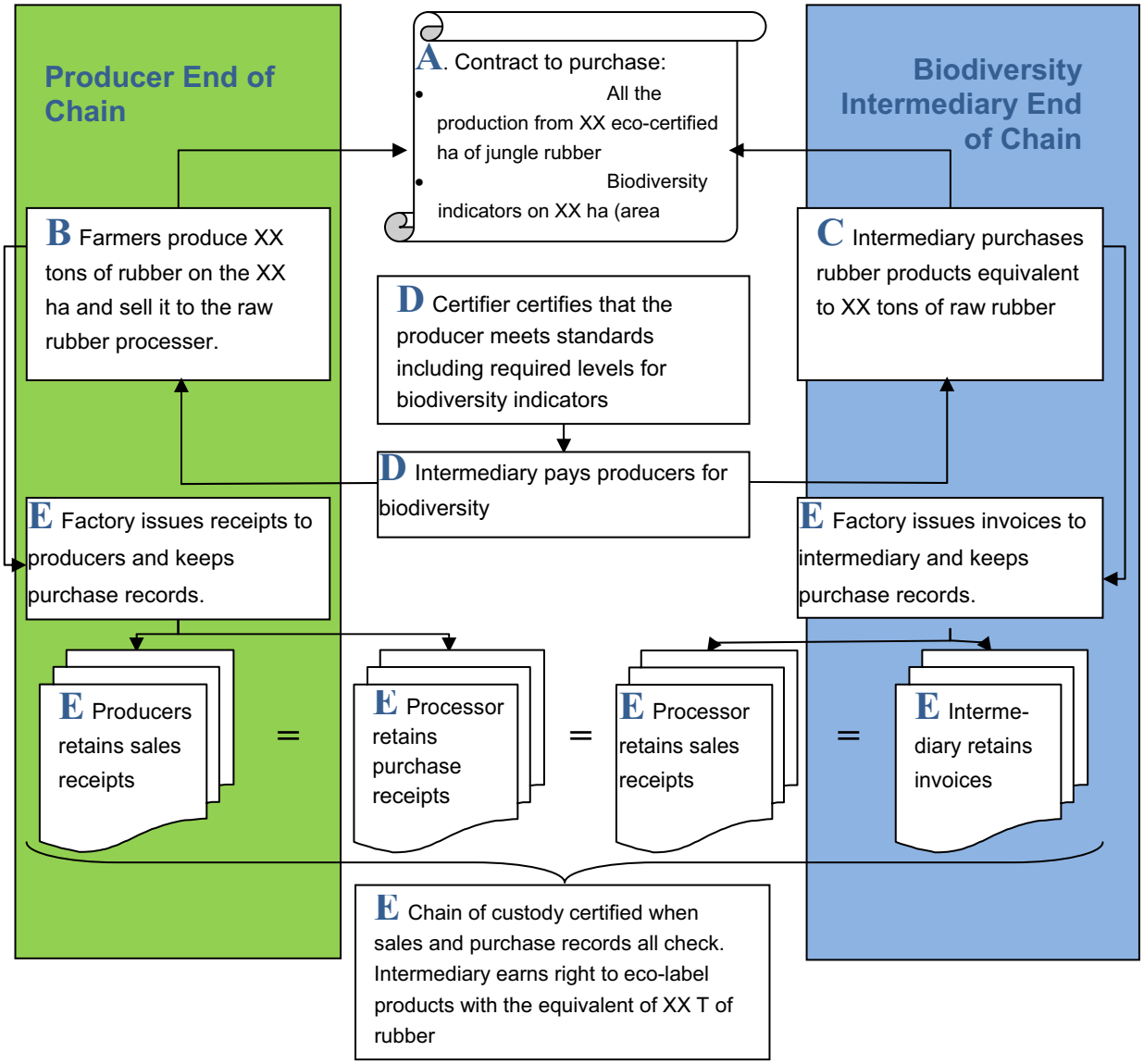


Figure 8. Example of one potential process of an "Accounting Chain of Custody".

Contracts can help spread eco-certification among poor communities by offering predictable financing for covering eco-certification costs

Researchers in Jambi did not think they could make real progress toward securing eco-certification of jungle rubber without assurance that a market for it existed. Working with researchers on developing PES projects, jungle rubber farmers in Jambi have already devoted significant time and energy to learning concepts of biodiversity conservation and how jungle rubber contributes. They have embraced the idea of maintaining the biodiversity in their jungle rubber plots and take pride in their unique role in preserving some of the world's biodiversity. Still, without knowing that eco-certified jungle rubber would have a rewarding

future, these poor small farmers could not justify spending their scarce time on the process. Up-front contracts with a purchaser would change this dynamic, giving the jungle rubber farmers justification for developing necessary governance structures and making changes in marketing channels.

Direct costs of eco-certification have also blocked widespread adoption hoped for in tropical developing countries. Direct costs are those of the certification process itself, such as the cost of audits. (Gullison 2003) Even though FSC, the only international certifier, has worked hard to find ways to reduce these costs for small, disadvantage growers, they still appeared prohibitive in Jambi. Action research could test whether contracts provided a vehicle to negotiate a workable split of the certification costs between the producers and the biodiversity intermediaries, if not allowing for the intermediaries to pay all the costs as happens in fair trade. (Taylor 2005)

Chapter 4: Boundary spanning – key for a knowledge-to-action value chain for sustainable eco-certification[13]

The need is urgent for developing the know-how to make eco-certification effective for delivering sustainable conservation and therefore development and to widely disseminate it. Eco-certification has promise as a mechanism for protecting forests. Since its inception in 1993 more than 253 million hectares of forest and timber plantations have been certified. (Cashore 2006) Yet certification also has drawbacks that restrict it from delivering on this promise in the tropics. The extent of eco-certified tropical forests remains small and tropical forests continue to disappear at a rapid rate. Through the 1990's, for example, 5.8 million (+/- 1.4 million) hectares of humid tropical forest disappeared each year with another 2.3 (+/- 0.7) were visibly degraded. (Achard 2002) The tropics present an especially challenging situation since some of the world's poorest people occupy these forests and depend on them for livelihoods while the world depends on many of these forests' products.

The Initiative on Science and Technology for Sustainability (see box) studies factors that make some development efforts more effective than in others for harnessing science and technology to achieve truly sustainable development. The Initiative has found that achieving truly sustainable development is an especially knowledge intensive endeavour. However, according to the Initiative knowledge – or know-how – remains in most instances under-produced, unevenly distributed and under used. By examining case studies of successful development projects the Initiative has discovered that they almost always have individual or organizational actors that work explicitly to span boundaries between other actors, institutions and cultures and make sure that some actors are focusing on filling in gaps in knowledge.

Boundary spanners create value chain views of knowledge-to-action. They map out how knowledge is mobilized and disseminated throughout the project space. They identify missing nodes and linkages in the chain. And they also identify incentives needed to coax appropriate actors to provide the missing nodes.

Melding together a multiplicity of knowledge strands

Differences in cultures lead to barriers in developing knowledge and having it used by all actors. The actors' different backgrounds and working environments lead to different

[13] This chapter incorporates ideas throughout from a presentation made by Bill Clark of the Initiative on Science and Technology on July 31, 2007, at the World Agroforesty Center in Bogor, Indonesia. (See Clark 2007.) Unless otherwise referenced, any reference to the Initiative, concepts on knowledge-to-action value chains and boundary spanners come from that presentation. The author takes sole responsibility for any application of these idea to eco-certification, but hopes to have interpreted and applied the concepts of the Initiative as its scientists would.

perceptions of problems, solutions, and what constitutes reliable knowledge. Cultural differences occur between those who rely on scientific knowledge versus those who rely on experiential knowledge; between researchers and decision makers; and between local and global organizations – among others. This means that without careful attention to defining among all actors the problems, research questions and acceptable methods for answering, knowledge developed in the eco-certification space by one group of actors – academic researchers, for example – might not be recognized as true, relevant or unbiased by another group such as business intermediaries. Also, communication can fracture during transmission across boundaries between different cultures.

Box 4 – Boundary Spanning Organizations

The Initiative on Science and Technology for Sustainability, a joint effort by the Academy of Sciences of the Developing World, the US National Academy of Sciences and Harvard University works to mobilize learning to strengthen the ability to accomplish sustainable development. The Initiative's researchers have found:

- Development requires a foundation of information, learning and adaptation.
- Successfully "navigating a transition toward *sustainable* development will be an especially knowledge-intensive activity."
- Nonetheless, in general, relevant knowledge remains underproduced, underutilized and unevenly distributed.

Three things stand out as barriers to effectively linking knowledge to action:

- Mutual lack of comprehension between scientists and decision makers.
- Fragmentation of the knowledge system.
- Inflexibility in a world of ignorance and surprise.

Bringing down these barriers requires research organizations to "boundary span" across multiple cultures – those of scientific versus experiential knowledge as well as of researchers, local, regional, national and international decision makers, and global organizations ranging in size, sophistication and resources. Research organizations also need to commit to the central role of "use-inspired basic research."

Successful, sustainable development requires:

- Developing a supply chain picture of the way knowledge in the system in which the research is occurring is used and disseminated to identify missing nodes and links, and to construct incentives to fill them in.
- Recognizing that efforts to link knowledge with action will often involve radical institutional innovations that may antagonize the status quo. These efforts therefore demand safe space where researchers can learn from errors and pursue sensitive questions.
- That the organization that plays the boundary spanning role not be co-opted by any special interests in the project space in order to build trust needed to negotiate with all other actors and to deliver research that is:
  - Credible – gives a convincingly reliable account to decision-makers of how the world works.
  - Salient – addresses the changing needs of specific users, producers and decision makers rather than just the interests of research scientists and donors.
  - Legitimate – serves the interests of decision makers rather than being a tool to manipulate their beliefs.
- Systematically educating the research and donor communities about the central role in production of useful knowledge of institutions that support close engagement between researchers and users at all scales.

From Clark, 2007.

Eco-certification has spawned the need for very non-traditional associations among the complex variety of actors shown in Figure 9: producers who range from large corporations to poor small holders; INGOs, regional, national and local NGOs; research organizations; governments; and businesses of all sizes – and across oceans also. Also, eco-certification is forging new territory with private schemes taking on the kind of regulatory activities once the sole province government. This multiplicity of actors in complex relationships with one another creates a situation ripe for fragmenting eco-certification know-how rather than building it into a productive asset for the whole space.

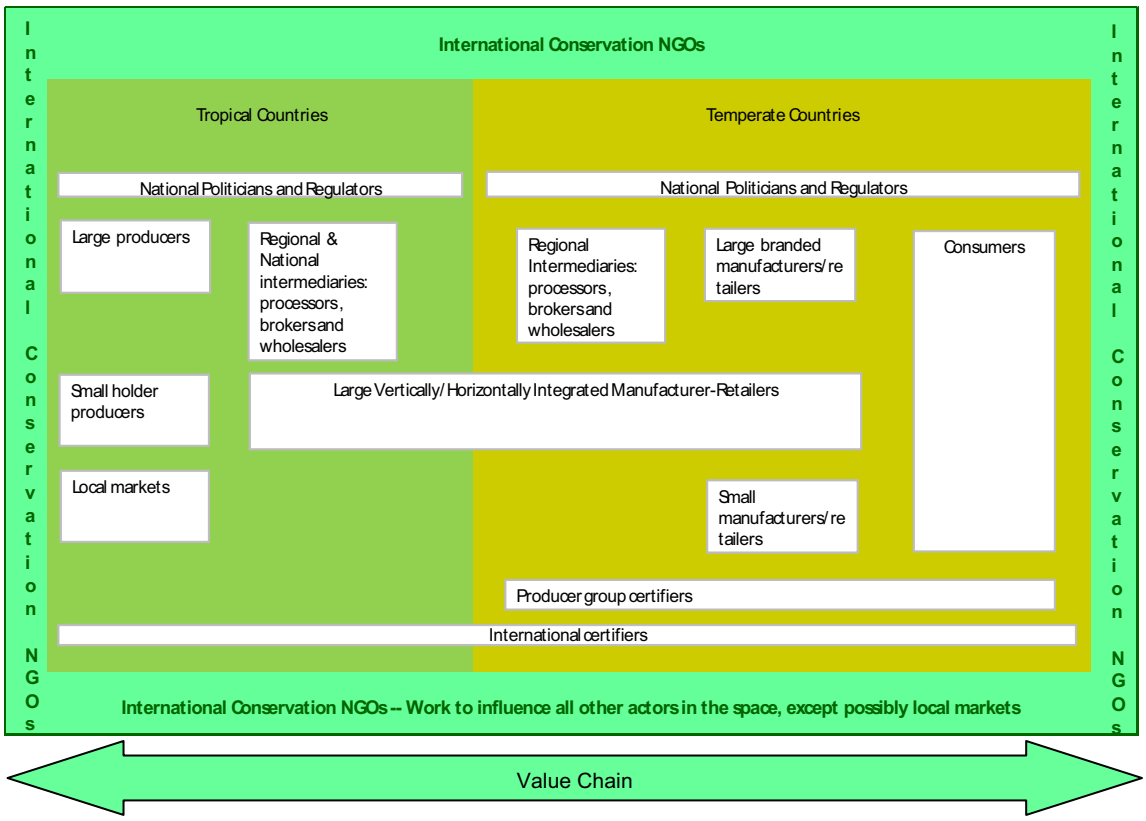


Figure 9. International eco-certification space. The location and relative width of the boxes indicates the actors' positions on the value chain and portion of the value chain within the actors immediate area of action.

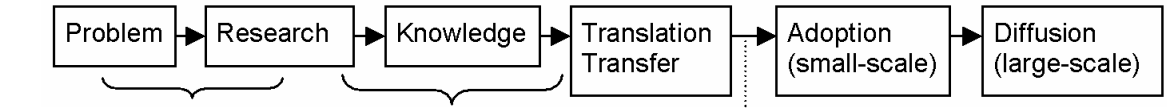
This situation suggests a critical need for an actor or actors to take on the role of spanning the boundaries among all these participants to forge linkages for an effective learning value chain to generate know-how that will serve the development of sustainable eco-certification.

Forging a know-how value chain for eco-certification

In identifying what makes some efforts more effective than others in creating sustainable development, the Sustainability Initiative finds that efforts perform better when they take a value chain approach to the production and subsequent distribution of know-how. Figure 10a) depicts a generalized knowledge value chain with each function/transformation shown as a node. Developing knowledge and transporting it across any one node can be difficult given the cultural differences that can exist. When there are several nodes between where the knowledge is developed and where disseminators and adopters are, the chain in 10a) can add up to less the sum of its parts. Knowledge can fall through the cracks anytime it is transferred from one group/culture to another on its way to adoption. This potential for knowledge to become lost is exacerbated because sustainability is often a public good with only weak incentives to go from initial research to large-scale adoption in real-world practice.

Although a knowledge value chain situation like Figure 10a) presents challenges, Figure 10b) shows that the situation for eco-certification is even more complex. For eco-certification, multiple actors from multiple disciplines make up each node on the chain. Within the chain, any actor may create knowledge which then needs to diffuse not only down the value chain from actor to actor but across the actors at each node

Boundary spanners explicitly tackle the know-how value chain. They map it, identifying and filling-in missing intermediaries and missing links between existing intermediaries. To do this, they must make sure the chain has the incentives, financial resources, institutions and human capital that give the learning system *capacity* to do its work. Building capacity for knowledge to action in a project space often means educating donors and the researcher community itself about the necessity for sustainable development of a functioning knowledge value chain.



a) The nodes in the know-how value chain representing the functions that must occur for know-how to flow throughout the development project space. Based on Clark 2007

Diffusion Down Nodes

Functional Node	Needs Value Chain Disciplines and Actors						
Research	Technical production	Organizational capacity/ social capital in producer communities	Competitive analysis	Marketing	Conservation	Economists	Political science (governance)
Diffusion (large-scale)	Producers	Development practitioners	Certifiers	INGOs	Government regulators and officials	Processors	Wholesalers & Retailers

Diffusion Across Nodes

b) A non-exhaustive list of the disciplines needed at the research node and the actors needed at the diffusion node for eco-certification that sustainably delivers both conservation and development. For an unbroken value chain, know-how must diffuse across as well as down.

Figure 10. The know-how value chain and its eco-certification actors.

Box 5 – Operating market based mechanisms means operating like a business – with business savvy

Evolving market-based mechanisms to serve the purposes of development and conservation means developing the facility to make research and development headway in learning the hallmarks of business – and in the case of eco-certification, in some of the most competitive, concentrated industries in the world . For example, ninety percent of the world's rubber supply ends up in tires for cars, trucks and airplanes. (Gouyon 2003) Agreement by a single tire maker to purchase eco-certified jungle rubber could potentially lead to conservation of significant portions of the estimated 1 to 2 million hectares Indonesia's jungle rubber. However, gaining access, attention and priority from decision makers in huge, international corporations did not fall within the core-competencies of the project staff conducting the action research on jungle rubber.

Although the project researchers in Jambi were very eager to test whether contacts that shortened the biodiversity value chain could serve the interests of producers and biodiversity intermediaries, research could not proceed without finding potential buyers of certified rubber to at the least engage in purchasing negotiations. Also without any knowledge base in buyer reactions, the project could not build capacity within producer communities to negotiate their own fates instead of becoming a tail wagged by the dog of international trade. While the INGOs have important resources to bring to the table in this research, the project did not find a way to enter into sustained work with them. Finally, because such research in marketing and selling was a not strength of the project – nor, in fact, of traditional conservation and development research organizations – donors have not yet supported pursuit of this critical area.

In the eco-certification space, an effective boundary spanner must explore the know-how value chain not just for missing nodes, but for the need to engage and integrate missing research disciplines and the actors that put eco-certification into large scale practice. For example, testing the hypotheses for shortening the *biodiversity value chain* would require methodological expertise in economics and agricultural field work commonly found in development organizations. However, this work would also require the value chain to have actors with the expertise, credibility and networks to systematically research questions on how to develop marketing and actual selling of end products to ultimate consumers. Agricultural development organizations have not traditionally had this kind of expertise.

Most prominent among the open questions on the ultimate viability of eco-certification is whether consumers will pay enough for eco-certificated products making land-uses that conserve biodiversity competitive with other land-use. At the moment the answer appears to be "no," but several researchers observe that the market for green products is still very much

evolving.(Rex 2007) “Green” concerns seem to be on the rise, which could make consumers more receptive to awareness-raising messages. (Grande 2007) Researchers are only now starting to understand motivations of eco-motivated segments of consumers. (Thogersen 2006) Furthermore, marketers have not yet fully figured out the bundles of product attributes and accompanying messages most compelling to consumers.(Ottman 2006)

This paper has mentioned eco-certification as having potential for jungle rubber and mixed agroforests in Indonesia, truffles in China, and shea in African grassland forests, to contribute to the conservation of the countryside matrices associated with these transition systems that sustain poor small holders as well as vanishing assemblages of species. Certification for bamboo, rattan, and chicle has also been explored by entities active in conservation and development. But, if eco-certification is to become potent at saving these unique landscapes with the species they harbour, researchers must find the most effective ways for small producers in remote villages in one hemisphere to **sell** their biodiversity products to retailer/manufactures in another hemisphere.

The major conservation INGOs have secured impressive victories in getting big retailers to stock eco-certified wood. As the INGOs continue to hone their abilities to navigate the international wood trade, they could expand the conservation effects of eco-certification if they will extend their skills to other products such as jungle rubber (see Box 5). With indications that environmentally motivated consumers will make choices according to underlying values, major promotion to increase consumers’ awareness of the biodiversity effects of their purchasing could enhance the effectiveness of conservation and development initiatives that introduce raw materials into the eco-certification market. INGOs with large, international memberships and the clout to gain access to business decision makers could: 1) initiate stewardship programs for conservation and development projects seeking to market eco-certified products other than wood; and 2) instruct them in effective strategies rather than allowing them to spend valuable resources on ad hoc efforts that invent the same (or less effective) wheels.

Using markets to correct market failure requires knowledge in business basics such as competitive analysis, marketing, and sales, particularly if eco-certification is to mature into a major conservation force. A crucial boundary spanning function for the eco-certification space centers on ensuring that the *knowledge value chain* has the capacity to build strengths throughout the space in the business basics foundational to integrating small holders into the highly competitive, but potentially lucrative markets of Northern countries. Currently, many conservation and especially development organizations do not have the resources or expertise to do this work.

This situation very much implicates the need for some actor(s) to take on boundary spanning, not only to fill in the *missing nodes* on the knowledge-to-action value chain, but to fill in the

missing disciplines across the nodes (figure 10b), with special attention to business disciplines. This paper suggests specific research questions for many of fields with relevance to eco-certification. For marketing, however, so little is known about what may work that only the broadest guidance exists as to hypotheses to pursue. Therefore, initial forays will very likely fail to confirm hypotheses. According to the Sustainability Initiative successful efforts build room for such failures into the *knowledge-to-action value chain*.

Creating safe space for an eco-certification *learning system* from a base of use-inspired, basic research

The Sustainability Initiative found that pursuing use-inspired, basic research, rather than insisting on a strict separation between applied and basic research, can weave *knowledge-to-action value chains* into true *learning systems*. Use-inspired, basic research, typified by the work of Louis Pasteur, asks fundamental questions that answer immediate, real world needs. According to Paul Romer, this kind of research starts with everyday experience, moves to higher levels of abstraction and then returns to everyday experience. (Romer 2005).
Necessary components for achieving this transformation include:

- Forums to learn from the successes and failures experienced by others.
- Incentives to share failures and learn from them – rather than the more frequent tendency to punish failure.
- True evaluations of effectiveness.
- Close engagement between researchers and users at all scales.

Enabling use-inspired basic research for eco-certification will depend on spanning the multi-scalar space (remote village to international corporation) to bring together actors from wildly different cultures and views of knowledge into an *eco-certification value chain* that serves the needs of those actively engaged in making eco-certification work to achieve conservation and development. Doing so also requires making safe spaces for challenging the status quo.

According to the Sustainability Initiative use-inspired basic researchers can find themselves asking questions that established interests would view as threats to their well-being:

> *Efforts to link knowledge to action in support of sustainable development often entail relatively radical institutional innovations. These may involve new dialogues between users and producers of knowledge, new links across agency or disciplinary "stovepipes," intrusion into others' "turf," and generally doing things that have not been done before. The response to such efforts by established interests often involves resistance, efforts to co-opt, or – more generally – efforts to turn the radical innovation into something less threatening that has been done before. Successful projects and programs create "safe spaces" in which to carry out their experimental innovations. Such "spaces" protect innovators from hostile takeovers, encourage experimentation, and embrace error. (Clark 2007)*

With eco-certification estimated to generate annual revenues as high as $15 billion (Scherr 2007), it definitely has established interests. The INGOs have invested heavily in eco-

certification, creating the FSC as the world's first forest certification scheme. The FSC has achieved much since founding forest certification in 1993. (Sasser 2003) However, this success has not allowed the INGOs to declare victory and move on.

Producers that did not like the FSC standards responded by starting their own eco-certification schemes in Europe and North America. Of the schemes, FSC remains the only one that requires independent verification of compliance with standards that require producers to meet specific performance measures rather than committing solely to process or continuous improvement goals. These schemes, with less demanding standards, now certify more hectares in temperate countries than FSC, although FSC's clout with retailers has forced the other major certification schemes to more closely emulate FSC's scheme. Still, the competition from other schemes has put pressure on FSC. It has had to scramble to keep up with the demand of the big retailers which have indicated they will look to other schemes if FSC certified products cannot supply product quantities they need. (Taylor 2005)

Making basic changes to the institutional practices could look daunting to INGOs that must keep running fast to make only incremental gains or even to stay in place. Nonetheless, without changes, eco-certification may be an unsustainable mechanism for protecting tropical biodiversity, which ironically was the initial focus of forest eco-certification. FSC has indeed questioned many of its own certification processes and made changes to reduce barriers to small tropical producers by providing lower cost options. However, the changes needed for raising the funding from consumers to make biodiversity-friendly land-uses competitive for small holders in the tropics may require radical innovations in hard-won arrangements with massive retailers that the INGOs might be loathe to upset.

Solving some of the eco-certification dilemmas – such as closing the unintended gap between the concept of marketing eco-certification as a product to consumers and the reality that the big retailers do not do so – could require an actor that could gain the cooperation and engagement of key participants in facing up to the challenges of investigating changes, including potentially radical ones, if required to improve effectiveness of eco-certification for achieving its goals.

For example, with successful boundary spanning, retailers could possibly be convinced to participate in research as to whether consumers would pay a price premium for eco-certified products. Armed with research data, the retailers would be in a better position to design marketing strategies that would result in more money for conservation coming from consumers rather than from the retailers' bottom lines.

As another example, retailers linked to the eco-certification learning system might be willing to help learn whether consumers would be willing to accept "accounting chain of custody" which would ensure that their dollars really did support the amount of conservation the

retailer/manufacture claimed, but would not necessarily guarantee that the specific product purchased came from eco-certified areas. While the accounting chain of custody has the potential to arrive more effectively and efficiently at the same conservation result as the current physical chain of custody, it could backfire with consumers if they viewed it as corporations making misleading claims about their conservation efforts.

Conclusion/recommendations

Where this paper came from and its methods

This paper grew out of a project to investigate mechanisms to reward poor tropical producers of non-timber forest products for providing environmental services. One mechanism investigated in the Jambi Province of Indonesia involved eco-certification of jungle rubber, a traditional Indonesian management practice that retains a forest-like environment harbouring far more species than intensively managed rubber plantations ('monocultures'). The jungle rubber areas in Indonesia are emblematic of countryside matrix throughout the tropics with land-uses in transition *from* highly biodiverse, extensive non-timber forest product systems offering a range of environmental services and other products *to* production systems that emphasize a single cash crop.

Eco-certification protects environmental services by attaining agreement from producers to follow a defined set of environmentally-friendly management practices in exchange for permission to market their product as eco-certified which they hope will earn higher prices. In concept, eco-certification also offers a model to correct the markets failure to produce socially desirable levels of eco-services by making these services a product that consumers can chose to purchase. If consumers elect to pay price premiums for environmental services, the premiums signal to producers that demand exists for the services. These premiums add up to an increased pool of funds that pay for conserving biodiversity habitats making land-uses that provide biodiversity services competitive with land-uses that emphasize only crop production.

Field interviews revealed that while jungle rubber would have little trouble meeting eco-certification standards, many obstacles inherent in current eco-certification approaches would need to be overcome to make it a viable option for Jambi's rubber producers.

This paper synthesizes experience investigating the potential for eco-certification of jungle rubber in Jambi with a review and analysis of the literature on eco-certification. This synthesis points to specific changes to current eco-certification approaches that should be tested for their efficacy in delivering conservation and development in the tropics. While the changes would mostly occur far down the eco-certification value chain from the, tropical small holder-producers, the changes represents a perspective from their end of the chain as to what must happen to make eco-certification a mechanism for conserving biodiversity services and to become a sustainable part of viable livelihood strategies.[14]

[14] For a comprehensive discussion of the institutional barriers to eco-certification, see Cashore, B., F Gale, E Meidinger, D Newsom (2006). Confronting sustainability: Forest certification in developing and transitioning countries. New Haven, Yale School of Forestry and Environmental Studies.. Also, while this working paper has information

Basic Findings

Eco-certification to date has not resulted in high rates of conservation of tropical forests. As of mid-2005, less than 1.5 percent of tropical forests had become eco-certified, compared to more than 30 percent of temperate forests. Among the reasons for low rates of eco-certification in the tropics is that price premiums for producers of eco-certified products have not materialized.

Nonetheless, eco-certification has promise. Studies in temperate forests indicate that eco-certified forests are better managed than others. Also, eco-certification is based on using areas for economic purposes while at the same time protecting them and it necessitates work to integrate small producers into markets. Evaluation of integrated conservation and development projects indicates these factors are associated with ecological and economic success. Eco-certification comes with much fine print to observe if it is to deliver on its promise in the tropics. The fine print includes to following.

Sustainable eco-certification needs to enable development

Eco-certification cannot deliver sustainable conservation if it does not also deliver sustainable development. If biodiversity-conserving land-uses do not produce benefits for small holders that out-compete biodiversity destroying uses, producers will opt for the use that offers the best returns for their labour and resources, especially in settings like Indonesia where a high percentage of rural people earn $2 or less per day.

Certification choices should match local circumstances

Producers wanting to pursue certification should match the market and conservation strengths of the various types of certification (organic, fair-trade, eco) to the circumstances of their specific locale. Organic certification has shown the most evidence of price premiums for crops ingested or worn. Evidence also shows that fair trade produces price premiums. However, eco-certification schemes most rigorously and explicitly establish conservation protections, making it highly suited for situations with threatened biodiversity.

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relevant to eco-certification at all scales, it most strongly applies to products already internationally traded. For much more information on eco-certification concerns for producers of locally marketed crops see Shanley, P., A Pierce and S Laird (2006). Beyond timber: certification of non-timber forest products. Bogor, Indonesia, Center for International Forestry Research. Finally, for more on issues facing conservation and development projects for small holders, see Belcher, B., M Ruiz-Perez and R Achdiawan (2005). "Global patterns and trends in the use and management of commercial NTFPs: Implications for livelihoods and conservation." World Development 55(9): 1435-1452, Kusters, K., R Achdiawan, B Belcher, M Ruiz Perez (2006). "Balancing development and conservation? An assessment of livelihood and environmental outcomes of nontimber forest product trade in Asia, Africa, and Latin America." Ecology and Society 11(2): 20.and Belcher, B., M Ruiz-Perez and R Achdiawan (2005). "Global patterns and trends in the use and management of commercial NTFPs: Implications for livelihoods and conservation." World Development 55(9): 1435-1452.

Among *eco-certification* approaches, each has strengths as well as weaknesses for different situations. Research targeting weak areas for each situation could result in the best set of options for producers and their crops. Crops already traded internationally make the best choice for internationally-based eco-certification.

Recommendations for use-inspired, basic research needed to fill eco-certification knowledge gaps

Much of the research needed to answer the questions raised in this paper needs to be done at sites distant from Jambi where we investigated the viability of eco-certifying traditional jungle rubber. However, the questions are use-inspired in that they are grounded in the needs of small holders. They must be answered if eco-certification can become a practical mechanism that conserves biodiversity and improves the livelihood of the small holders by providing a return to make up for the foregone opportunity costs from producing services valuable to global society instead of pursuing intensive crop production.

Gap 1: There is not enough understanding about why eco-certification has produced little increase in biodiversity funding – Development effects, and thus, expected conservation effects in the tropics are dimmed because, so far, eco-certification is not increasing the pool of funds to pay fair returns for biodiversity conservation services.

Research needs for addressing gap 1:

Marketing to ***consumers and biodiversity intermediaries*** – Devise a learning system that will build a theory of marketing and consumer preferences for environmental services. Efforts should:

- Investigate how to exploit eco-motivated consumers and bundle eco-certified materials into products that will command significant price premiums.
- Demonstrate/predict direct bottom-line benefits to biodiversity intermediaries from selling eco-certified products.
- Determine whether eco-certification can induce consumers to spend money on biodiversity conservation above what they would contribute to other conservation measures, thereby adding to the conservation pool.

A full circuit value chain – Find methods to ensure producers have the sales tools needed to initiate and maintain the flow of purchases from consumers by:

- Investigating methods for forging sales linkages between impoverished producers and potential environmental service intermediaries in distant countries that have large segments of eco-motivated consumers.
- Learning how to create internal capacity in producer communities so they are effective actors in the process, not simply passive observers.

- Developing and field testing strategies for producers of eco-certified NTFPs to link to consumers and their intermediaries based on analysis of end consumers and their immediate suppliers.

Incubating the capabilities of development and local conservation organizations – Explore with partners from the large international conservation organizations:

- Their willingness to assist other organizations by leveraging their capacities to link producers of eco-certified NTFP products with consumers (and their intermediaries);
- Sketch out the form such assistance might take.
- Assess the increase in conservation benefits from doing the items immediately above.

Gap 2: We need more knowledge about price dynamics to ensure that producers receive premiums for environmental services – There is evidence that even if consumers were paying more for eco-certified products, the payments would not get to the producers where it is needed to make biodiversity conservation a competitive land-use.

Research needs for addressing gap 2:

Delivering price premiums to producers – Powerful retailers/retailer-manufacturers near the consumer end of the eco-certification value chain have agreed to stock eco-certified wood whenever possible. However, these retailers have not offered consumers choices between eco-certified and non-certified products, thereby giving them no way to "vote with their dollars" to communicate demand to producers. Furthermore, there is evidence these retailers use their market power to pass the costs of eco-certification up the value chain without passing along any price premiums that might materialize. Yet, if these retailers promoted eco-certified products, they could potentially gain market share and consumer loyalty while being able to cover the extra cost for the biodiversity services by collecting price premiums from the consumers and passing them onto producers. Research to address this situation should focus on:

- Whether price premiums are materializing for eco-certified products and who is benefiting from them.
- Competitive analysis leading to strategies for engaging the retailers and other actors in solving the problem of lack of returns to producers and in formulating a marketing strategy to gain the price premium from consumers.
- Whether the big retailers, producers and social welfare organizations could achieve results as good as or better than current by marketing environmental services directly to consumers.
- Ways to enlist the major retailers in leveraging their promotion dollars to market conservation.
- Likely competitive responses of actors in the biodiversity services value chain to actions to claim part of the revenue streams from eco-certification for producers.

Gap 3: There has been little work to distinguish the "biodiversity value chain" from the "raw material value chain" and the potential that separating them may have for reducing costs and improving biodiversity results – Forest certification programs evolved so that the biodiversity value chain followed the value chain for bringing wood to consumers. However, many of the intermediaries needed for transforming the raw material to products of value to consumers do not add environmental service value. Instead, the extra handling and paperwork required for separating certified and non-certified materials often appear to only add costs to the system.

Research needs for addressing gap 3:

Contracts for shortening the biodiversity value chain – Investigate the potential for direct contracts between producers and retailer/manufacturers positioned as biodiversity intermediaries to ensure price premiums get to producers. Such contracts are used in fair-trade certification which has effectively transmitted price premiums to producers. The contracts would, in effect, separate the biodiversity value chain created through eco-certification from the value chain for raw materials.

Transaction costs – Test hypotheses about ways to reduce transaction costs of eco-certification schemes without lessening their conservation effectiveness addressing specifically:

- The best contract terms and negotiation processes for shortening the biodiversity value chain, increasing conservation and meeting needs of both producers and sellers.

An "accounting chain-of-custody" – Selling products under an eco-certification label requires proof that the items were actually produced according to eco-certification standards. Currently, to offer such proof, each intermediary in the ***raw material value chain*** must keep certified and non-certified material physically separate and maintain documentation of doing so. This requirement adds transaction costs. Shortening the biodiversity value chain through contracts might enable a paper-trail chain of custody that would reduce opportunities for fraud as well as reducing transaction costs.

Basing contract payments on biodiversity indicators - Contracts might reliably produce more conservation if they paid producers based on indicators of biodiversity conservation, rather than amount of raw material produced. They could also possibly limit the potential for perverse incentives to encourage producers to produce more raw material than conservation when more conservation is the desired goal. Indicator research should focus on:

- Finding indicators that:

    - Accurately gauge the capability of different land-uses to support biodiversity,
    - Poor, local producers can accurately measure,
    - Producers, interested parties like INGOs and consumers see as meaningful.
    - Have validity over a scale that meets the needs of the certifiers to have meaningful standards and of local people for producing the best result at the least cost.
- Honing processes that incorporate the self-monitoring into certification and
    - Maintain integrity of certification to ensure biodiversity conservation and confidence of consumers and interested parties.
    - Exclude free-riders on the eco-label.
    - Reduce certification audit costs
    - Lead to feedback loops where farmers create a cycle of improvement by seeing from self-monitoring the effects of their practices on biodiversity indicators.

Gap 4: We do not know what mechanisms for conserving eco-system services are the best use of funding and other scarce resources – Each mechanism for achieving conservation in tropical forests has its ardent advocates. However, little methodologically sound evaluation has compared the efficacy and expense of these methods to find which most cost-effectively delivers the best results. One effort to evaluate mechanisms found that in certain circumstances paying directly for conservation produced better conservation and development results than eco-certification, while under other circumstances eco-certification gave better results than providing capital assets for income generating activities as incentive for local people not to engage in activities harmful to biodiversity. (Ferraro 2003) Also, little work has been done on how to best match certification types to specific local circumstances or on how to assure certification effectiveness in various circumstances.

Research needs for addressing gap 4:

Begin with evaluation in mind – Design research efforts to include factors that will give good data and allow sound analysis for comparing the results of eco-certification versus other market mechanisms.

Certification effectiveness and efficiency – Different types of certification have advantages for different settings. In addition, in some settings, multiple certifications would have marketing advantages. Research should look at how to eliminate weakness of eco-certification types that also offer strong advantages for specific settings or for leveraging investments. Finally, this research should look at ways to combine audits for different certifications so that a single audit could confer more than one certification. This could save significant costs.

Gap 5: We do not have sufficient insight into how to mobile of know-how

Several factors inherent to eco-certification act as barriers to generating and disseminating knowledge about these eco-certification questions and converting it to action. The factors include the huge variety of actors from different disciplines and cultures that do not often interact with each other; a status quo that has achieved significant, but still somewhat precarious success; necessary disciplines not represented in the research space; and a need for donor and research organization education on the necessity of dealing with these limitations. Overcoming these barriers to forge a learning system for eco-certification requires a boundary spanning organization that creates an environment for use-inspired, basic research.

Actions for forging the learning system:

Value chain creation for knowledge-to-action in the eco-certification space

- Understand all the actors in the biodiversity and knowledge-to-action value chains that supports their joint evolution.
- Form networks for recruiting researchers with expertise in competitive strategy, marketing and other disciplines that are missing from the knowledge-to-action value chain.
- Work on understanding the best ways to build supporting institutions.
- Understand what capacities producers need to sustainably participate.
- Devise strategies for how to build and use capacities.

Use-inspired basic research – Researchers should ensure that questions address real world needs and that they communicate results so they are perceived as credible, salient, and legitimate by the actors in the biodiversity value chain. Doing so requires:

- Protection for researchers – boundary spanning actors need to ensure the existence of safe space for researchers and other knowledge creators to ask challenging questions, to fail in initial hypotheses and to produce unbiased evaluations by:
    - Bringing effective incentives into the knowledge-to-action value chain for promoting risky work, both in the sense of challenging the status quo and investigating nascent questions with a high probability of failure in initial tests.
    - Carefully structuring a way to capture all lessons, even those from studies that do not pan out and to iteratively feed them back into further research.
    - Educating researchers, institutional management and donors about the criticality of boundary spanning and use-inspired basic research.
    - Intensively building social capital throughtout the value chain to reaching the needed level of capacity.

The research questions listed are all tied to needs for making eco-certification work as a mechanism that can give the jungle rubber farmers of Jambi a return for foregoing the profits of monoculture rubber to produce biodiversity conservation services and thus ensure

protection for a threatened habitat – as well as for people throughout the tropics earning livelihoods from forest lands that also provide biodiversity conservation services to the world.

The farmers in Jambi have demonstrated commitment so far to maintaining their jungle rubber practices, agreeing to do so while researchers work with them to fill eco-certification gaps discussed above. However, the farmers cannot wait indefinitely as they watch farmers around them gain the benefits from monoculture production regimes for rubber and oil palm. Solutions for the jungle rubber farmers may offer protections for species that inhabit hundreds of thousands of hectares of land and also provide livelihoods for poor people throughout the tropics. These are benefits that should not be forfeited to inaction.

a) A village member center, discusses issues involved in maintaining jungle rubber. The late-night community meeting is lit by single light powered by microhydropower generator driven by water from a jungle rubber watershed. b) The village member leaving to collect rubber the next morning. c) The village. d) A village leader at a signing ceremony for a conservation agreement between the villagers and researchers.

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Our vision

Our Vision is an 'Agroforestry Transformation' in the developing world resulting in a massive increase in the use of working trees on working landscapes by smallholder rural households that helps ensure security in food, nutrition, income, health, shelter and energy and a regenerated environment.

Our mission

Our mission is to advance the science and practice of agroforestry to help realize an 'Agroforestry Transformation' throughout the developing world.

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