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Prioritizing food security and livelihoods in climate change mitigation mechanisms: Experiences and opportunities for smallholder coffee agroforestry, forest communities and REDD+

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Growing attention to climate change around the world has led to a wide array of policy measures to mitigate its effects. In the tropics, this has led to the proposal of mechanisms to change land use patterns in order to reduce carbon emissions, or promote carbon capture and storage. The rural communities that depend on these resources have increasingly been included in discussions around these mechanisms, in the hopes that rural development could be promoted simultaneously with climate change mitigation. Success in achieving these dual goals has been elusive however, driving continued debates around which territories, actors and mechanisms are best suited to support these efforts.

This policy brief examines these issues in the light of new research on smallholder coffee agroforestry, recent evidence on sustainable forest management, and experiences with reduced emissions from deforestation and degradation, forest conservation, sustainable management of forests, and the enhancement of carbon stocks (REDD+). In Mesoamerica, it is becoming increasingly clear that smallholder coffee farmers and forest communities can contribute significantly to mitigate climate change, yet existing mechanisms have offered few avenues for benefitting these actors, and in some cases even threaten to undermine their livelihoods. This work examines these challenges and proposes alternative approaches to climate change mechanisms that could generate opportunities to more meaningfully incorporate and benefit local actors.

A number of climate change initiatives have been underway in Mesoamerica for some time, with a handful of projects dating back more than a decade. Growing recognition of the need to mitigate climate change in recent years has sparked a new set of initiatives at regional and global levels, with new interest in how to promote rural development with climate change mitigation mechanisms. Despite these experiences and interest, policy makers are still struggling with how best to design and implement climate mitigation mechanisms that can benefit communities in the complex territorial scenarios of Mesoamerica.

A starting point for addressing some of these challenges can be found in new evidence that underscores the importance of smallholder coffee farmers to potentially mitigate climate change through agroforestry. A recent review has shown that these smallholders may be among the most effective climate allies, as traditional polycultures – most commonly managed by smallholders and cooperatives (Bacon et al 2008) – can outperform other types of coffee management in carbon sequestration (Table 1).

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Table 1. Comparison of carbon stocks between different types of shade coffee systems from Latin America, Africa and Asia

Coffee Management Type	C Stocks Reported (t C ha-1)		
	Mean	Min	Max
Rustic polycultures: use the existing forest canopy and have coffee in the understory; they usually contain the highest levels of plant and structural diversity; they use little or no synthetic fertilizers or pesticides (inputs).	na	41.2	41.2
Traditional polycultures: have a shade tree canopy with remnant forest trees and planted trees, which usually resulting in high species and structural diversity; use low or no levels of synthetic input use.	49.9	25.0	74.0
Commercial polycultures: have a diversity of useful shade tree species that replaced the original forest canopy, and frequently use synthetic inputs.	26.6	17.1	92.0
Shaded monocultures: have one species of shade tree (the genus Inga is popular in Mesoamerica), and usually use high levels of synthetic inputs.	23.1	14.2	97.2
Unshaded monocultures: have no shade trees, coffee is grown in full sun, and there is heavy use of agrichemicals and sometimes heavy machinery.	18.5	15.0	44.0

Source: modified from Méndez et al 2011.

This potential could have substantial impact at large scales, given the importance of coffee production at both regional and global levels. In Mesoamerica, although coffee does not boast the dominant economic position it once held, it remains a crucial source of income and livelihood support to farmers across the region, employing well over one million seasonal workers, and sustaining approximately 290,000 farmers (Castro, et al 2004). These farms are predominantly located in Mesoamerica's mountainous ecosystems, which contain high levels of biodiversity and play key roles in sustaining the middle and upper watersheds that supply urban centers below.

Coffee is also important at a global level; land dedicated to its production covers approximately 9.71 million ha in the tropics (FAO 2010). There are approximately 4.3 million smallholder coffee farmers that hold 10 ha or less in 14 of the top producing countries (Jha et al, 2011), which might bring the global total close to the 25 million figure cited in several studies (e.g. Donald, 2004; Gresser and Tickell, 2002).

Forest communities and indigenous peoples have also received increasing recognition for their role in mitigating climate change through the sustainable management of forests. An analysis of carbon performed in Mexico has confirmed this potential, showing that the sustainable management of natural forests may hold higher carbon sequestration capacity than forest protection (Masera and Hernendez-Tejeda, 2004). This is significant considering that community and indigenous forests cover more than 10 million ha in Central America, and more than 40 million ha if Southern Mexico is included (Fundacion PRISMA and Grupo Cabal, n.d.).

These forest communities also continue to play a crucial role in avoiding deforestation. A review of deforestation by Nelson and Chomitz (2009) found that indigenous forests in Latin America are much more effective in reducing deforestation than protected areas. In Mesoamerica, indigenous peoples and forest communities have curbed deforestation where governments have supported their rights and territories, as observed in the forests of Peten, Guatemala and southern Mexico (Bray et al, 2008), the Bosawas International Biosphere Reserve, Nicaragua (Stocks et al, 2007), and Darien, Panama (Nelson et al, 2001), among others. Moreover, changing economic patterns in Central America are exerting new pressures over forests, in the form of expanding agriculture frontiers, extractive activities, tourism mega-projects and agrofuels (Cuellar et al, 2011). The ongoing efforts of communities to protect their forests from these forces must therefore be recognized in REDD schemes; doing so will be critical in helping to avoid what some estimate as a 30% loss of 2005 forest biomass levels by 2050, amounting to a loss of 45 gigatones (Gt) of carbon stock in the region (CCAD, 2005, as cited in Fundacion PRISMA and Grupo Cabal, n.d.).

The evidence indicates that small farmers, forest communities and indigenous peoples are clearly strategic allies in climate change mitigation mechanisms. There is also a significant potential to strengthen the livelihoods of these groups, as they are frequently among the most marginalized from market opportunities, political processes and development policies. Unfortunately, many of the current mechanisms have proven inadequate in supporting livelihoods and mitigating climate change, and have sometimes even undermined the livelihoods they are designed to support. A review of these experiences can help to identify the challenges associated with these initiatives, and delineate possible alternatives that could benefit rural communities.

Trade-offs in the context of extreme climate vulnerability

It is increasingly clear that carbon interventions pose important trade-offs between biodiversity, climate change mitigation and other ecosystem services.[1] Increasing tree cover to mitigate climate change, for example, may lead to diminished areas for crops, threaten water provisioning services, and reduce biodiversity. Recent studies have also shown that ecosystem services interact with one another in complex ways (Bennet et al, 2009), and it is yet unclear how these relationships affect conservation and ecological processes.

Climate change adds an additional level of complexity, as changing temperatures, rainfall patterns and extreme events will have unpredictable impacts on ecosystem services and livelihoods. This is especially important for Mesoamerica's communities, who have been identified as among the world's most vulnerable to climate change (CEPAL, 2010).

This situation calls for carbon interventions that are able to synergistically support livelihoods, adaptation and climate change mitigation. It is critical that these initiatives are able to understand these trade-offs, and incorporate them into community and territorial development goals.

Market-led governance: experiences with carbon, livelihoods and ecosystem services

Climate change mitigation mechanisms can be perceived as a form of environmental governance, which incorporates the regulatory processes, instruments and organizations through which environmental actions and outcomes are driven or influenced politically (Lemos and Agrawal, 2006). The forms of environmental governance shaped and influenced by these mechanisms must therefore be assessed for their potential to manage the aforementioned trade-offs and ultimately support the livelihoods and goals of smallholders.

The most common mitigation mechanism is the market-based approach, which provides direct payments in exchange for carbon sequestration or avoided emissions. A number of regulatory discussions have focused on this method; most prominent among them is the United Nations Framework Convention on Climate Change (UNFCCC), where negotiations have yet to reach a binding agreement on a post-Kyoto regime which will likely include some sort of trading of carbon credits between developed and developing countries. Existing market-based projects include those that provide direct payments for carbon credits through the Clean Development Mechanism (CDM), Plan Vivo, or the Voluntary Carbon Standard, among others. An example of this approach can be found in the highly cited Plan Vivo project in the Scolel-Te community in Chiapas, Mexico (Nelson and de Jong, 2003), where smallholder coffee farmers have planted trees on their coffee farms to capture and store carbon.

Although a handful of market-based projects such as Scolel Te have generated important positive results, the vast majority of territories in Mesoamerica contain complex socio-environmental conditions that are not easily adapted to the market model. Many of these difficulties stem from the Coasean conceptual framework utilized by these approaches, where environmental degradation is understood as the outcome of a 'market failure' in which the market allocation of environmental services by price is unable to incorporate environmental value. This perspective accordingly asserts that as long as property rights are clearly defined, and transaction costs are sufficiently

[1] Ecosystem services are defined as the direct and indirect benefits that humans obtain from ecosystems (Costanza et al, 1997)and can be categorized into 'provisioning services' (e.g. water and food); 'regulating services' (e.g. climate, and flood regulation); 'cultural services' (e.g. aesthetic or recreational benefits); and 'supporting services', (e.g. nutrient cycling). (Millennium Ecosystem Assessment, 2005)

low, owners will bargain amongst themselves until a social optimum is achieved. The policy solution, therefore, is a mechanism that internalizes these values into the market system.

The first difficulty facing this approach is not unique to Mesoamerica. The multiple benefits generated by ecosystems at different scales, their interrelationships, and their amorphous and overlapping boundaries make most ecosystem services ill-suited to the requirements of a market good or service.[2] In practice, the market emphasis on low transaction costs means that research to understand these complex relationships are prohibitively expensive; these projects therefore tend to adopt simplified views of complex ecosystem landscapes and focus exclusively on carbon. This simplification generates important 'blind spots' that can undermine key provisioning ecosystem services for livelihoods and adaptation.

Second, insecure tenure, resource conflict and the generally disadvantaged position of small farmers and forest communities vis-à-vis other powerful actors imply new sets of risks. In this context, the market focus on efficiency and transaction costs tends to favor the secure tenure and economies of scale offered by large land owners, leading to the exclusion of smallholders and the landless (Rosa et al, 2003). Land grabbing can also present a serious risk as powerful actors position themselves to receive carbon benefits, as recently reported by government officials in Honduras (La Tribuna, 2011). Smallholders and the landless can also be detrimentally affected by neighboring carbon projects, which crowd-out local food production, and decrease demand for wage-labor for competing land uses. Precisely these outcomes were identified in a review of payment for environmental services (PES)[3] projects performed by Zilberman et al. (2008), who found that where land distribution is unequal and income dependence on wage labor is high – characteristics common to territories across Mesoamerica – these systems can bring losses for the poor.

Third, communities wishing to participate in these mechanisms frequently find it difficult to meet the high degree of organizational and administrative capacity needed to administer market projects, including managing contracts with external actors, new management rules and other technical requirements.

Finally, the communities able to overcome these barriers are confronted with new risks, as the expansion of forest cover usually required by carbon initiatives may compete with local food production.[4] Flexibility for livelihood adaptation – especially important in the context of climate change – may also be restricted by rigid land use agreements necessary to ensure climate funds. Moreover, the fluctuation of carbon prices introduces serious risk and could amount to a second volatile market for coffee farmers. This group has already suffered grave impacts from market fluctuations, most recently experienced between 2001 and 2003, which resulted in a 42% loss of employment in the coffee sector in Mesoamerica (Castro, et al 2004). Given the devastating livelihood effects of market fluctuations, policy makers must critically examine the compounded level of risk presented by carbon market volatility.[5]

[2] Most ecosystem services are supplied at multiple scales, and are non-rival and non-excludable, meaning that their consumption or use by one person does not reduce the amount available for everyone else, and no one can be prevented from enjoying the good (Daly and Farley, 2004), making their allocation by markets problematic.

[3] PES projects refer to monetary compensation for environmental services, distinct from the alternative of 'Compensation for Ecosystem Services' discussed in this paper. The Zilberman study examined two types of PES: 1) land diversion programs, where lands are diverted from agriculture to other uses; and 2) working land programs, where agricultural production is modified to achieve environmental objectives.

[4] It is important to note here that opportunity cost is an inappropriate tool to use for land allocated for subsistence, as carbon payments cannot replace the food security offered by subsistence production.

[5] It should be added that some projects propose the pre-sale of carbon, or other insurance mechanisms to hedge against the exposure inherent in market schemes. Yet these arrangements frequently merely replace one type of risk for another. The complexities inherent in insurance mechanisms frequently give external actors and lawyers a lead role in their elaboration, constituting serious challenges for a community decision making process around livelihood options. The pre-sale of carbon may also commit a community to a rigid land use practices that may not allow sufficient flexibility for unforeseen conditions or events. In other cases, the operational costs may exceed the anticipated amount, leaving the community with far less benefits than expected.

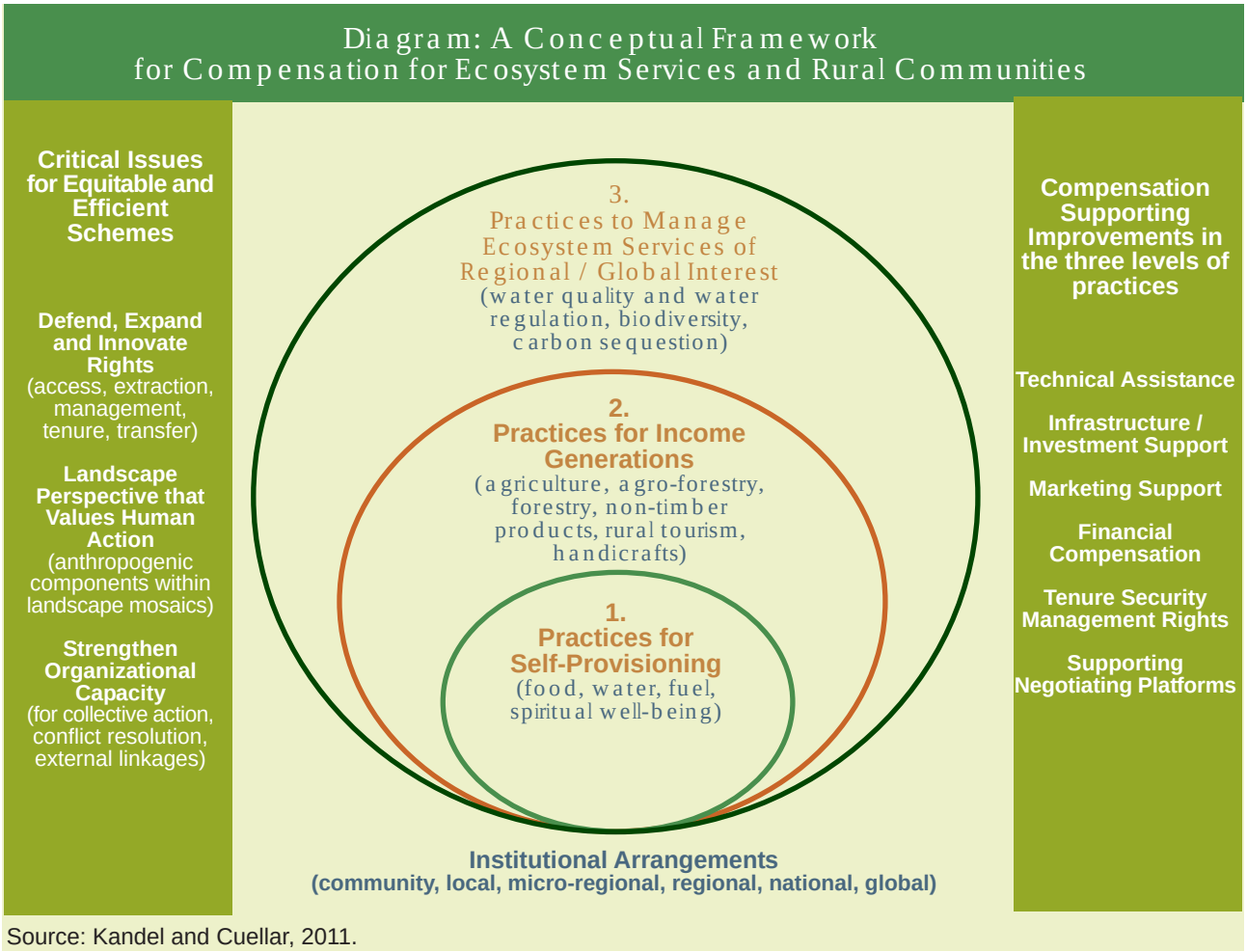
Compensation for Ecosystem Services: new pathways to strengthen food security, climate resilience and mitigation

Many of the difficulties and threats associated with market-based mechanisms stem from the Coasean framework that has guided their implementation. PES project managers have frequently dealt with these shortcomings by making ad-hoc adjustments on site in an attempt to fit local realities with the market model. We propose that for most circumstances in Mesoamerica, a more substantial shift is necessary in order to create inclusive compensation mechanisms able to synergistically support broader development goals, prioritize food security and adaptation, and incorporate ecological complexity.

The "Compensation for Ecosystem Services" framework developed by PRISMA as an alternative to "Payments for Environmental Services" provides an important starting point for re-conceptualizing climate change mitigation schemes. "Compensation" places an emphasis on support that may be either monetary or non-monetary, and "ecosystem services" – those environmental services that benefit humans – emphasizes services that benefit local resource users and managers, especially provisioning services such as food, water, firewood, etc. In this framework, these provisioning services constitute the foundation of livelihoods, and must be complemented by a second level of income producing activities (coffee, or timber, for example), to be followed by a third level of compensation for ecosystem services. The third level must support the first two, and ensure that regional and global values do not undermine the benefits ecosystem services provide to local users (Rosa et al, 2003).

This approach prioritizes the rights and aspirations of local communities as key elements in equitable and sustainable outcomes. Respect for rights, community decision-making processes and free, prior and informed consent are therefore considered central and indispensable elements for any successful carbon intervention. In addition, Rosa et al (2003) discuss the important potential of CES mechanisms to explicitly incorporate conflict resolution and social capital into

Diagram: A Conceptual Framework for Compensation for Ecosystem Services and Rural Communities



Source: Kandel and Cuellar, 2011.

project designs, thereby opening new avenues to more effectively address these issues. This broader approach towards carbon sequestration allows for a greater variety of mechanisms and arrangements to accommodate disparate socio-environmental contexts, valuing human actions in landscapes, more effectively evaluating trade-offs, and placing carbon within larger development goals.

These principles proposed in the CES approach must ultimately be translated into concrete policy actions. The myriad design considerations and institutional arrangements at international, national and local levels for climate change mitigation mechanisms are too numerous to mention here. However, they remain largely undefined, and can still be influenced to benefit the smallholders and forest communities that have demonstrated significant climate change mitigation potential. Many of these groups have already made important advances in attempt to shape these mechanisms, by advocating for the respect and expansion of rights as a condition of participation, and by developing endogenous visions for climate change mitigation, such as the Mesoamerican Community Carbon Reservoir initiative.[6]

In order to better serve these community efforts, the following points delineate four concrete alternatives for the carbon related policies in the region.

Ecosystem service definition

Instead of defining ecosystems individually, carbon could be 'bundled' along with other ecosystem services in order to better incorporate considerations for how climate interventions will affect other important services (Bennett et al, 2009; Raudsepp-Hearne et al, 2010). This approach could illuminate both community and territorial level ecosystem 'blind spots' inherent in a narrow focus on carbon, and thus better support informed decisions on food security and other trade-offs.[7]

Nature of Compensation

Although payments as compensation have dominated discussions, non-monetary compensation arrangements might be more beneficial and appropriate in some instances. This could be the case, for example, where farmers and communities do not have the organizational capacity to implement market agreements. This compensation could include technical support related to adaptation and agroecological production, livelihood options, or even the strengthening and expansion of rights to land and resources. These projects have the advantage of channeling resources through local organizations and institutions that may be more representative and resilient than new organizations created for carbon projects. Yet they must also succeed where other similar projects have failed, by ensuring the meaningful incorporation of farmers and communities in their design and implementation, and even including researcher involvement in actions for change (Bacon et al, 2005; Castellanet and Jordan, 2002; Fals-Borda and Rahman, 1991; Fortmann, 2008; Kindon et al, 2007). These approaches may be ideal for climate change mitigation, which is research and capacity-intensive. They may also be more attractive to communities where markets for ecosystem services are not compa-tible with local values.

Relationship between ecosystem delivery and compensation

The relationship between ecosystem delivery and compensation in carbon interventions is taken for granted in most current discussions, positing that the level of carbon reduction must be exactly commensurate with the level of compensation. An alternative to this approach would be to negotiate fair levels of compensation for the additional efforts of farmers and communities in supporting ecosystem service delivery. Given the enormous costs in establishing baselines, calculating credits and policing efforts necessary to achieve high levels of carbon precision, this approach discussed by Vatn (2010) might present a more efficient and effective use of resources for climate change mitigation. This type of mechanism would be guided more by a rationale of collective action than a market transaction between buyers and sellers and could therefore be more attractive to communities where market valuation

[6] The Mesoamerican Community Carbon Re-servoir (MCCR) is an alternative approach to REDD+ promoted by the Mesoamerican Alliance of People and Forests, an organization comprised by indigenous and community forest organizations across Mesoamerica. The MCCR focuses on supporting and strengthening the rights, organizations and territories of the communities that reside in and govern the 50 million hectares of forest represented in this initiative.

[7] Vatn (2010) notes that government mechanisms, in contrast to market vehicles, are more common for bundled services, and may be required to overcome transaction costs, especially as more users are included.

of resources is at odds with cultural values, and where payments are likely to crowd out non-market values aligned with conservation. Though this approach could indeed represent new benefits, it could also suffer from weaknesses, including high transaction costs, or the potential to disadvantage weaker actors in negotiation processes.

Collective tenure systems

Despite significant rhetoric surrounding rights, tenure and conflict, these issues have received scant attention in programs related to carbon mechanisms in Mesoamerica (PRISMA / Cabal, n.d.). Where actions are discussed, solutions are too frequently proposed as the mere formalization of individual property rights, while neglecting collective arrangements critical to the subsistence of indigenous, traditional and peasant communities. These institutions many times provide the most resilient and sustainable foundations for food security at a local level. Moreover, recognizing and supporting community management of resources can often lead to more effective conservation (Molnar et al, 2004) as well as more efficient use of resources in ecosystem service mechanisms (Corbera et al, 2007 as cited in Vatn, 2010). Policymakers should thus be careful not to limit tenure discussions to individual property rights, but also seek to understand and support collective institutions that strengthen food security and the sustainable management of resources.[8]

These are only a few elements of a broader discussion that must take place regarding how compensation mechanisms can be conceptualized to fit local development aspirations. The design and implementation of these schemes will not be easy, as they will require meaningful community participation at every step, the resolution of complex conflicts, and must contain built-in mechanisms for design revision. Although this type of iterative process may appear complicated and time consuming, these locally driven solutions are far more likely to achieve their desired results than uniform and theoretically eloquent 'grand designs' (Sayer et al, 2008). Challenges for project managers will be to find financing sources willing to support alternative and innovative compensation mechanisms. For national policy makers, a central challenge will lie in developing institutional frameworks able to support and facilitate the diversity of approaches necessary for disparate territorial conditions. Unfortunately, the opportunities for linking broad national and local options with international mechanisms seem to be narrowing. The increasing likelihood of an international carbon market in a post-Kyoto regime has had a homogenizing effect on many voluntary carbon standards, which have tightened their eligibility requirements to more closely adhere to ongoing regulatory processes at different levels, including the UNFCCC (Ecosystem Marketplace and New Carbon Finance, 2009). REDD+ readiness processes in Mesoamerica have also largely focused on establishing the technical and legal frameworks to facilitate narrowly defined carbon transactions (Fundación PRISMA, n.d.), rather than explore innovative pathways to promote an array of diverse options. These trends could significantly limit the avenues of community participation in order to satisfy market conceptions and requirements of offset legitimacy and credibility, as has occurred in previous carbon market mechanisms such as the CDM. (Corbera et. al, 2009)

Despite these challenges, Mesoamerica still has a key opportunity to develop alternative forms of climate change mitigation mechanisms that support and promote rural development. The nature of these schemes is still very much under discussion in several international and regional climate change fora. Moreover, policymakers in the region have expressed interest in developing autonomous national institutions appropriate for local realities (Fundacion PRISMA and Grupo Cabal, 2011), while ample experiences with PES and other environmental mechanisms give the region an advantage for pioneering alternatives that benefit rural communities. Coffee smallholders, forest communities and indigenous peoples are already demonstrating their potential as key allies in these efforts, and many have begun to develop their own proposals for carbon schemes. Taken together, these factors constitute a critical opportunity for enhancing smallholder and community livelihoods through innovative climate change mitigation mechanisms.

[8] Pacheco et al (2010) provide useful recommendations on how policy makers can best approach diverse local landscapes to achieve optimal outcomes.

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