Integrating Agendas for Forests, Agriculture and Climate Change Mitigation:

Rationale and Recommendations for Landscape Strategies, National Policy and International Climate Action

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EXECUTIVE SUMMARY

Re-Thinking the Sectoral Approach to Land Use in Climate Strategy

To date, land use related climate policy and programs have tended to separate forestry and agriculture. In reality, the interface between these sectors is highly diverse and dynamic. With the influx of Reducing Emissions from Deforestation and Forest Degradation (REDD) finance, and the rising attention to agriculture within climate change discussions, an opportunity is emerging to re-shape the relationship between forestry and agriculture to address these interactions for the benefit of not only the climate, but for people and ecosystems throughout rural landscapes. This paper identifies the critical issues for understanding the relationship between forestry and agriculture and applies them to develop recommendations for action to support effective and equitable climate change interventions in mixed forest-agriculture landscapes.

Agriculture, Forests and Climate Change: The Interconnections

Rural communities draw holistically on the full range of land-based resources available for food security and rural livelihoods. Any efforts to utilize either agriculture or forest lands to support climate mitigation activities will need to consider ways in which both climate and food needs can be met simultaneously. Despite the positive synergies between forests and agriculture, they compete for space, and agriculture is the world's leading driver of deforestation. However, agricultural drivers are complicated to untangle and include a wide range of locally-led and public policy factors depending on context. Interventions to protect forests where agriculture is a leading driver must be based on a clear understanding of these root causes.

Many agriculture and forest policy circles, including within the United Nations Framework Convention on Climate Change (UNFCCC), assume that intensification of farming through use of additional or improved inputs is the key to reducing agriculture-led deforestation. While intensification is certainly an important component of a landscape management strategy under many conditions, as a generalized principle there is not a direct relationship between intensification and forest protection for a variety of reasons, including the fact that many markets are not local, demand for agricultural products is elastic, farmers diversify their crops in response to market signals, and agricultural productivity can attract in-migration.

Effective climate strategies for forest-agriculture landscapes require a nuanced understanding of the mitigation impacts of various land use systems. The greenhouse gas (GHG) implications of deforestation differ depending on where and how it occurs. Agricultural systems, even when producing the same crop, can vary considerably in their emission as well as their management of associated trees and forests.

In most cases, forest and agriculture in a given landscape have distinct tenure and access rights regimes; the development rights to carbon stocks and emission offsets add further complication and potential conflicts to these systems. The effectiveness of climate mitigation initiatives will depend upon clarifying and securing agriculture, forest and carbon rights.

A Landscape Approach to Integrating Agriculture, Forestry and Climate Needs

The complicated interactions between agriculture, forests and climate mean that efforts to manage any of these in isolation to achieve the inter-related objectives of food security, livelihood development and climate change mitigation will be difficult. Project and program designers and policy makers will need to incorporate the perspectives of all stakeholders and the status of all relevant rights regimes into plans. A landscape approach provides a framework to develop such synergies, by encouraging a spatial understanding of land uses and their interactions as well a process for coordination that reflects the institutional diversity of forest-agriculture mosaics. Landscape strategies will require changes in programs and policies guided by three basic principles:

1) A shift from sectoral focus on forests, agriculture and climate to cross-sectoral frameworks;
2) Support for multi-stakeholder processes for policy development and planning;
3) Reconciling and securing the tenure and rights regimes for agriculture, forest and carbon.

Landscape Scale Interventions

At the landscape scale, a framework for action aims to achieve scale, synergies, coherence of investment and action within economically and socially dynamic areas. Rather than freezing current land uses, strategies are needed to achieve an overall increase in the proportion of land under forest and other high-carbon cover and management. In landscapes where the primary driver of land use change is agriculture, a critical component of long-term forest conservation will be the development of Climate-Smart agricultural production systems that are functionally linked to landscape management strategies. Support of these agricultural systems will require investments in technical assistance and capacity-building programs including agricultural education, extension, and research to identify new Climate-Smart practices. These systems will also need to identify new sources of finance and markets. Incentives mechanisms include eco-certification and eco-standard systems, along with payments for ecosystem services schemes and market opportunities for foods and products under forest cover.

For integrated landscape management plans to be sustainable and equitable, all stakeholders should have a voice in the landscape planning process. Negotiation training and empowerment activities targeted at marginalized groups and individuals will be essential to a meaningful, productive and equitable negotiated landscape plan. Large-scale agribusiness and forestry companies will also play a major role in many of these planning processes. The most effective ones will be based on a shared technical understanding among stakeholders of a landscape's physical features, socioeconomic characteristics, opportunities and constraints. They will require access to efficient systems for communication and tools to track and assess lessons learned throughout the planning and dialogue.

Programs aimed at conserving forest within agricultural landscapes and supporting Climate-Smart agriculture practices will need to find a balance between regulations mediating the clearing of forests and unsustainable farming practices on the one hand and incentives to support alternative approaches on the other. The key to developing effective regulation to restrict agricultural expansion into forests will be the extent to which policy makers accurately identify and target the underlying deforestation drivers.

Investments will be needed in measurement and monitoring systems to ensure that the overall impacts of interventions are actually Climate-Smart. To fully capture the benefits of landscape scale interventions, the co-benefits of these projects and programs, along with improvements to rural livelihoods, rights and other ecosystem services, should also be monitored.

Inter-Sectoral Policy Action

Sectoral policies and programs across agriculture, forestry and climate institutions need to be harmonized, along with other relevant sectors including environment and rural development. In most countries, the development of cross-sectoral policies will require a rethinking of the spatial division of labor within ministries. To shift towards cross-sectoral collaboration, people working in sectorally-focused institutions at the national level will need training on integrated planning and program monitoring and evaluation. At the sub-national level there is a need to increase flexibility for district and state ministerial offices so that they can participate in, and respond to, requests from landscape initiatives.

Presently, climate and agricultural development finance streams are poorly integrated, and therefore climate funds are less effective than they might otherwise be in shifting the trajectory of rural development to a lower-emission, higher carbon sequestration pathway. *To move towards integration, one opportunity might be to utilize REDD funds* to support Climate-Smart agriculture and institutional developments that are necessary to create and maintain multi-functional landscapes. Funds could also go to integrated landscape planning exercises or extension support for Climate-Smart agriculture practices or agricultural intensification where these interventions are likely to take pressure off forests. Climate funds could also be applied creatively in rural credit programs, to direct agricultural lending to low emission practices and farmer conservation of forests, or to mitigate farmer risks in the transition to Climate-Smart systems.

Secure land and resource rights can incentivize land managers to plant and protect land, trees and carbon stocks, and lay the foundation for investment in the long-term productivity of their land. Relevant rights issues include clear, recognized and socially-legitimate tenure rights, respect for livelihood choices and traditional practices, the right to a safe environment/housing, and freedom of movement.

Supportive national policy will be critical for efforts to sort and strengthen land and carbon rights at the landscape scale. Tenure reform should suit long-term and dynamic social and economic development needs, not simply be driven by the prospect of carbon markets. In this process, particular attention should be paid to indigenous peoples, forest communities and agricultural users, all of whom play important roles in maintaining forest cover, ecological function and landscape carbon stocks. International best practices and guidelines (e.g., Voluntary Guidelines for the Responsible Governance of Tenure of Land, Fisheries and Forests) are emerging and can guide national processes for tenure reform. Tenure reform processes require the provision of technical support (for mapping rights, delineation and facilitating the negotiating of rights), along with support for contentious and long-term political processes inherent in restructuring property rights.

Implications for International Climate Programs

International policy makers are challenged with developing institutional and funding environments that support integrated climate projects. For agriculture to gain a significant foothold in the Clean Development Mechanism (CDM), in whatever form it takes after 2012, there will likely need to be reform of the system of temporary crediting, along with the general complexity of land use project development. Program of Activities (PoAs), an emerging project development model allowing for the bundling of many small projects into a single large one, may have the potential to reduce the transaction costs of landscape scale projects. Nationally Appropriate Mitigation Actions (NAMAs) could be an alternative source of financing to the CDM within the UNFCCC system that has the potential support for the development of landscape projects. The UNFCCC could also broaden its perspective on agriculture and land use by strengthening links to other international agricultural and food security policy processes such as the Food and Agriculture Organization of the United Nations' (FAO) Committee on Food Security and the fulfillment of the Right to Food.

Climate mitigation and adaptation financing streams have been treated separately within the UNFCCC negotiations, which may make sense for many sectors, but within the land use sector, the interventions that produce mitigation benefits are often identical to the ones that will be necessary for adaptation. While this convergence is widely recognized, particularly for interventions with smallholders, climate financing mechanisms need to be re-designed to reflect this reality.

In addition to climate related research, more work needs to be done to understand the synergies and trade-offs of various land uses on livelihoods and ecosystems. For the carbon component of these projects, critical technical questions regarding monitoring, reporting and verification (MRV) systems need significant support, as does the testing of institutional models for integrated landscape projects and programs. While these issues have begun to be addressed with the support of universities, the Consultative Group on International Agricultural Research (CGIAR) system, FAO, private foundations, bilateral funding agencies, and non-governmental organizations (NGOs), these research programs would benefit from an official outlet within the UNFCCC process in the form of a Subsidiary Body on Scientific and Technical Advice (SBSTA) focused on agriculture and integrated landscapes.

RETHINKING THE SECTORAL APPROACH TO LAND USE IN CLIMATE STRATEGY

Agriculture, forests and land use play a central role in climate change, producing more than 30% of the world's greenhouse gas (GHG) emissions. An estimated 17% are from forests (primarily deforestation), another 14% is from agriculture (soil erosion and cultivation, livestock and manure, and rice cultivation) (UNFCCC 2007). Moreover, only land-based carbon sequestration efforts currently offer the possibility of large scale removal of GHGs from the atmosphere through photosynthesis and soil carbon sequestration.

Within international policy discussions, efforts to mitigate climate change through land use have largely focused on forests. Funding pledges for Reducing Emissions from Deforestation and Forest Degradation (REDD) have prompted a burst of optimism for the approach, particularly for tropical forest conservation. Since REDD began to gain significant political momentum around 2005 within the context of the United Nations Framework Convention on Climate Change (UNFCCC) negotiations, forest and climate change mitigation advocates have scrambled to design programs that could effectively use these new funds. As significant commitments to REDD have been made by donors, led by Norway with the pledge of US$1 billion, which is additional to the $3.5 billion promised by world leaders at the 2009 Copenhagen Climate Change Conference, pressure has mounted to quickly begin the implementation of on-the-ground activities (Zwick 2010). Yet al.ong with REDD's political, financial and operational advances, there has been a parallel rise in anxiety among skeptics who on one hand are concerned about potential risks that REDD could pose for forest dwellers, and on the other hand that the very concept of REDD is based on faulty assumptions about the possibility of developing large-scale forest carbon projects that can produce tradable, fungible carbon offsets (Kissinger 2011; Munden Project 2011).

While the general concept of REDD—paying land owners not to cut down their trees or otherwise degrade forests—is simple and clear, implementation is complicated. The work on REDD since its inception in 2005 has tended to focus on the development of financial mechanisms and measurement and monitoring systems. The creation of these technologies and methodologies will remain a significant challenge, and some critics have argued that deficiencies in these systems are one of the many barriers to the ability of forest carbon to attract private capital (Munden Project 2011). However, even if these issues are resolved quickly, for REDD to be successful on a scale of space and time that will be meaningful to climate change mitigation efforts, there must be a more sophisticated vision for how REDD resources will be used on the ground to limit deforestation and forest degradation.

The question of "How can deforestation be stopped?" may sound straightforward, but the answers are complicated and contested. In most cases, the answer begins with agriculture, the major driver of tropical deforestation (DeFries et al. 2010; UNFCCC 2007). Agriculture has received less attention historically than forestry at the UNFCCC, but has enjoyed a rising profile in the past few years. Along with intensified discussion of agriculture as a driver of deforestation, the climate change policy community is beginning to seriously explore the potential of Climate-Smart agriculture systems to deliver multiple wins for climate mitigation, adaptation, livelihoods

and ecosystems (Negra and Wollenberg 2011). Advocates for the inclusion of agricultural development and food security discussions within international climate policy have begun to make their voices heard not only within the UNFCCC (Meridian Institute 2011), but also in other high level international policy process organized to push forward the concept of Climate-Smart agriculture (Global Conference on Agriculture, Food Security and Climate Change 2010; FAO 2010).

Recent research efforts have explored the links between agriculture, food security and climate change, and examined the potential of Climate-Smart agricultural interventions such as enriching soil carbon, farming with perennials, low-GHG livestock production, restoring degraded watersheds and agricultural and grazing areas, in addition to protecting key forested areas within agricultural landscapes. The Consultative Group on International Agricultural Research (CGIAR) has initiated a 10-year research program on Climate Change, Agriculture and Food Security (CCAFS), designed to provide technical, institutional and policy support for agricultural management strategies that boost climate resilience and improve rural livelihoods (CCAFS). The Food and Agriculture Organization of the United Nations' (FAO) Mitigation of Climate Change in Agriculture (MICCA) is also working to build the knowledge base for the successful implementation of agricultural carbon projects among smallholders (FAO 2011b). The Global Research Alliance on Agricultural Greenhouse Gases (GRA) is a 32 country coalition, initiated by New Zealand, working to develop cheaper and more accurate methods of agricultural GHG budgets (GRA 2011).

Overall investment in land-based climate mitigation is growing. But initiatives have tended to focus narrowly on a single land use—avoiding deforestation in public forests, or private forests; trees and land regeneration on communal lands, agroforestry and improved soil management on private farmlands. Efforts have generally not been integrated, nor even linked with climate adaptation. Programs have not fully considered the rights implications of climate projects and programs in forest-agricultural landscapes.

The effects of these silos have been particularly evident in the discourses on REDD within the international climate change community. For example, a separate "Forest Day" and "Agriculture and Rural Development Day" have been organized for the past several years parallel to the UNFCCC Conferences of the Parties. REDD language in the Cancun Agreements makes few references to agriculture, except for its designation as a driver of deforestation (UNFCCC 2011; Meridian Institute 2011). Agriculture is clearly acknowledged as a major driver of deforestation in these plans (e.g. DRC, Guyana, and Indonesia), but the plans are light on implementation details (Kissinger 2011; Scherr et al. 2011a). This separation complicates efforts to develop and implement Climate-Smart land use programs that integrate sustainable agriculture development with efforts to retain and enhance forest cover.

Forest and agricultural land uses are closely intertwined, economically and ecologically. How policymakers respond to demands on rural landscapes within the context of climate change will have profound implications for production, ecosystems and rural livelihoods, including people's land and resource rights.

As REDD finance begins to flow to projects and programs and Climate-Smart agriculture has entered the international climate discourse, an opportunity is emerging to refresh the relationship between the forestry and agriculture sectors for the benefit of not only the climate, but also for people, production and ecosystems throughout rural landscapes.

This paper examines the critical relationships between forestry and agriculture and implications for development of effective and equitable climate change interventions in mixed forest-agriculture landscapes. Section 2 discusses the inter-relationships between forestry, agriculture and climate change - in providing food and ecosystem services, in deforestation and overall emissions, and in land and forest rights regimes. Section 3 proposes a multifunctional rural landscape framework that supports climate goals along with those of communities, food supply and ecosystems. Section 4 discusses integrated strategies at the landscape scale; Section 5 provides guidance for supportive policies; and Section 6 concludes by discussion implications for international climate programs.

AGRICULTURE, FORESTS AND CLIMATE: INTERCONNECTIONS

The relationships between agriculture, forests and climate are variable and dynamic, and sectoral solutions in isolation will not be sufficient. This section addresses these biophysical, socioeconomic and spatial relationships, including the synergies between agriculture and forest systems that provide for food security and ecosystem conservation, agriculture as a driver of deforestation, the impacts of agricultural intensification on forests, working agricultural land as a source of GHG emissions and potential carbon sequestration, and the complex tenure and rights regimes that interact among forests and farms, including emerging carbon rights.

Forest – agriculture synergies for food security and ecosystem conservation

Rural communities draw holistically on the full range of land-based resources available for food security and rural livelihoods, and any efforts to utilize either agricultural or forest lands to support climate mitigation efforts need to consider ways in which climate and food and fiber needs can be met simultaneously. Analyses over the past few decades have demonstrated that rural food security depends on productive, sustainable and resilient agriculture, and access to wild foods gathered or hunted from forests and savannahs (UN Millennium Project 2005). The latter can be particularly important as sources of 'famine' foods during periods of drought or other food shortages, and for the poor and landless (Bharucha and Pretty 2010; Sunderland 2011).

In addition to forests' role in providing food directly, agricultural production is sustained by ecosystem services supplied by forests and other natural vegetation, such as water for irrigation, protection from floods, habitat for wild pollinators, and microclimate regulation (Lipper 2000). For example, windbreaks planted on farms in northeast Costa Rica not only serve as biological corridors between forest patches and provided habitat for migratory songbirds, but they also increase coffee yields and improve health of cattle herds on surrounding fields (McNeely and Scherr 2003). Forests are critical sources of non-farm income in rural areas, from wood and non-timber forest products (FAO 2006; WWF 2011).

Thus farmers and farming communities are also the stewards and managers of a large share of the world's forests, grasslands and natural habitats. Spanning at least 370 million hectares, these areas are often managed by local and indigenous communities for low-intensity forestry, agroforestry, agricultural or grazing purposes. Their forests can often protect livelihoods as well as wild areas, as documented in Indigenous reserves in the Amazon highlight (Molnar, Scherr, and Khare 2004). Thus any strategy for climate change mitigation which sustains and increases forest cover needs to see farmers as a key potential ally and their agricultural interests as a central concern.

Agricultural drivers of deforestation

Despite these positive synergies between forests and agriculture, they compete for space. In the 1980s and 90s, the total net increase of agricultural land across the tropics was more than 100 million hectares (ha). 55% of this expansion came at the expense of primary forest and 28% resulted from the clearing of disturbed forests that had previously been impacted by some other sort of economically productive activity (Gibbs et al.. 2010). By 2050, the world's population is expected to expand to roughly 9 billion people (FAO 2009), and the food, fiber and energy needs of this more populous world will certainly put additional pressure on forests. Some estimate that agriculture will expand onto an additional 120 million ha in the developing world (Angelsen 2009). **If climate policy limits fossil fuel energy consumption but does not cap terrestrial GHG emissions, biofuel production is likely to further expand into areas currently under forest and natural cover.**

Direct agricultural drivers of deforestation are highly variable. While the numbers are contested (Bryan and Shearman forthcoming), some studies estimate that subsistence agriculture accounts for 42% of deforestation and degradation and industrial agriculture is responsible for 32%; only 19% is from wood extraction (Geist and Lambin 2002; Chomitz 2007). While much more work is needed to understand the dynamics of direct drivers, these broad categories of subsistence vs. industrial mask local complexity as well as the national policy drivers. Given the variety of rural contexts, an understanding of the implications of specific land use patterns as well as the socio-economic and political dynamics underpinning them, is needed to shape effective terrestrial carbon strategies. Each of these diverse locally- and policy-led agricultural drivers requires a different set of strategies, involving different stakeholders.

Locally-led drivers

Some causes of deforestation are local, and can be addressed through local interventions:

Shortening of forest fallows in shifting cultivation systems under population pressure. Under conditions of low population density, agricultural systems in forested regions have historically used long-cycle forest fallows to regenerate soil fertility and manage pest complexes. As population grows due to high natural fertility, the area of forest available for fallow use declines and the proportion of forest cover overall declines. In this type of dynamic, interventions must focus on assisting farmers to switch to sustainable short-fallow or permanent production systems, with stewardship of remaining standing forest.

Agricultural land degradation pushing farmers to clear new forested lands. In areas with long-standing permanent cultivation, many agricultural lands are degrading through soil erosion, loss of soil physical structure, salinization, excessive tillage and other causes. Degradation further accelerates in many types of soils once vegetative cover and tree canopy are lost. In many forest areas, soils under forest cover are more fertile, so that degradation in crop fields leads farmers to clear more land, on their own farms or in unclaimed forest lands. In this type of dynamic, forest conservation requires supporting farmers to restore and sustain soil, land and water quality, as well as stronger forest protections.

Natural growth of agricultural population pushing young farmers to clear new lands. In agrarian economies where population is growing beyond replacement rate and few non-farm jobs

are available, children of smallholder farmers will often seek farmlands outside their parents' land, typically by clearing forest. In this dynamic, a combination of responses is needed including labor-using technical interventions on farms to accommodate smaller sub-divided farms and generating non-farm employment.

Uncontrolled burning in agricultural systems that spreads to forests. Approximately 300-400 million hectares of forest and other lands are annually affected by fires and wildfires. These fires typically spread from controlled burns intended to regenerate pastures, reduce weeds, or increase fertility in crop fields (Goldammer 2010). In these situations, interventions are needed to assist farmers and communities to switch to controlled or no-burning practices (usually requiring local rules development and enforcement).

New market opportunities incentivize farmers to intensify and clear new lands for increased production. A rise in farmgate prices for agricultural products may encourage farmers to clear forest to take advantage of these new income opportunities. Price increases may reflect growth in economic demand in sub-regional, national or international markets, which in turn stimulate traders and other middlemen to secure new sources of supply from farmers in forested areas, outside any public policy action. Addressing this dynamic, where the market actors are highly dispersed and incentives difficult to dampen, requires local governance interventions to tax market activity, support actors conserving forests, and penalize conversion while providing technical and marketing assistance to enable farmers to grow more profitable products without expanding land under production.

Public policy drivers

In other cases, deforestation in agricultural areas starts not with the saw of the logger or the machete of the farmer, but with policy decisions and actions that set up incentives to deforest and/or promote it directly (White 2011).

Private commercial agricultural concessions in public lands. In the tropical world, about 65% of forests are owned or controlled by governments (ITTO-RRI 2011). Estimates reveal that millions of hectares have been granted to medium to long-term private sector agribusiness for agricultural concessions — for oil palm and soy, and more recently for biofuel crops. These generally involve large-scale forest or savannah clearing. In these situations, climate action calls for limits to the area granted in concessions in favor of strengthened local management.

Private commercial agricultural and ranching development through land purchases or leases. Rising national and global commodity prices have prompted major increases in private sector investment in agricultural land and agricultural production. Since 2001, an estimated 227 million hectares of land have been transferred to investors (Oxfam 2011), and an estimated 46 million (some estimates are as high as 80 million) hectares of large-scale farm deals have been purchased or acquired through long-term leases between 2008 and 2009, with more than 70% of these deals in Africa (Deininger and Byerlee 2011; Borras et al. 2011). Many of these areas are in woodland and savannah regions under communal use for grazing, long fallow cycles or gathering. Of the global acquisitions, only 21% have actually been developed, so some of these land buys may represent land price speculation (Deininger and Byerlee 2011). The lands actually being developed are principally producing for agricultural exports. These drivers can only be addressed through land use controls, enhanced protection of local land rights, and by requiring Climate-

Smart agricultural production systems to be used, either by government regulation or through incentives in supply chains.

Insecure tenure rights propelling farmers to clear land to stake their property claims and maximize agricultural output. In many forest regions, legislation has been put in place that requires land-clearing and cultivation or livestock grazing by farmers in order to substantiate and secure land claims, for example, "uso social" in Brazil and "mise en valeur" in the Congo Basin. This has often accelerated land-clearing beyond what would otherwise be done by farmers, and undermined socio-cultural values to retain forests in land use systems. Such legislation is often found where land-clearing is seen as beneficial for military or security reasons, to generate tax revenues or other purposes, and where customary land tenure is not secure in law. In the latter case, even without legislation that encourages clearing, customary law itself may strengthen land claims for land that is actively 'used'. This type of driver must be addressed through changes in legislation, by strengthening or securing customary rights of farmers, agroforesters and forest communities.

Agricultural investment programs led or supported by governments. Many national, state and district governments are promoting economic development and expansion of food production by investing in infrastructure, inputs, technical assistance and marketing support in rural areas. Commonly, these investment programs ignore ecosystem concerns and planning guidelines in their design and implementation. Even where Environmental Impact Assessments are required by law, these focus on reducing direct negative impacts from investments, rather than sustaining or enhancing ecosystem and climate benefits. This type of driver can be addressed by changing the design features of the investment programs, such as spatial patterns of infrastructure, technical specifications of irrigation systems, or by tying agricultural credit to incorporation of sustainable practices. A second round of land-clearing induced by immigrants attracted to new employment opportunities in the region (for their own food production or to feed new local markets of immigrant workers) can sometimes be dampened by prioritizing the employment of local people.

Large-scale migration into forest areas for subsistence farming. While large-scale migration into low-population forest or rangeland areas can be the result of millions of individual family decisions, there are often major policy drivers inducing migration. These may include land policies that evict large numbers of farmers who are tenants or otherwise have weak land rights, resettlement of landless farmers into forested areas, economic policies that raise unemployment, and technology policies that replace low-wage labor with labor-saving machines. Because there is such an indirect relationship between the driver of migration, the movement of individuals, and immigrants' use and management of land, it is difficult to address such drivers at the local landscape scale. Mechanisms such as strengthening the rights of local communities to prevent or sustainably integrate the settlement of outsiders, or directing migrant communities to already-cleared areas may be relevant responses. Rather than resettling landless farmers in forest areas, breaking up large agricultural landholdings can be a solution, where politically feasible.

Impacts of agricultural intensification on forests

Despite the numerous associations of agriculture with deforestation, there is also a commonly held belief in many agriculture and forest policy circles, including at the UNFCCC, that intensification of farming through use of additional or improved inputs is the key to reducing agriculture-led deforestation (UNFCCC 2006). The idea that increased agricultural productivity limits agricultural expansion has been referred to as the Borlaug hypothesis, for crop breeding/green revolution pioneer Norman Borlaug, or the "land sparing hypothesis" (Angelsen and Kaimowitz 2001). This notion is based on the idea that if a farmer needs less land to produce the same yield, then more land will be available for natural ecosystems, and suggests that farmers should be encouraged to intensify production.

While intensification is certainly an important component of a landscape management strategy under certain conditions (McNeely and Scherr 2003), empirically the Borlaug hypothesis does not hold up very well. Pirard and Treyer (2010) summarized recent studies on the land sparing hypothesis and drew the conclusion that there is little evidence to confirm it. Rudel et al.. (2009), using historical data from 1973 – 2005, found evidence to support the hypothesis in only 34 countries, while it did not hold in the rest of the 161 countries studied. There are a variety of reasons why intensification does not directly lead to reduced pressure on forests:

Many markets are not local. Much of agricultural production is actually sold on national or global markets in which prices are set by non-local dynamics. This hypothesis would hold in a world in which increasing production translated directly to a decrease in price for other farmers. If an increase in productivity does not affect price, a farmer's response to the potential for improved productivity may actually be to speed expansion into a forest.

Demand for agricultural products is elastic. The hypothesis assumes that there is no elasticity of demand. Yet even when markets are local, it is possible that increased productivity will lead to higher incomes, increased demand for food and thus increased incentives for agricultural expansion (Angelsen and Kaimowitz 2001).

Farmers diversify. Often farmers grow more than one crop so that they can diversify their income and hedge against problems of crop failure or a market crash in a particular crop. If there are gains in productivity, and therefore income, from one crop, this can be reinvested in others. Even if an increase in productivity in a given crop in a given area reduces the price, there may still be incentives for farmers to clear additional land as they invest in other crops.

Success attracts migrants. If productivity increases in an area, there may be incentives for migrants to come in to take advantage of the benefits of new agricultural profit opportunities. This migration could lead quickly to agricultural expansion.

Intensification can play an important role in reducing pressure on forests, but it must be accompanied by a suite of other interventions and institutions that address incentives for the full array of stakeholders within a landscape, and explicitly sustain forest cover on farms and in the broader landscape.

GHG emissions from agricultural production and land use change

Effective terrestrial climate mitigation requires a nuanced understanding of a full range of GHG emissions from various land use systems. Although deforestation generally leads to increased emissions, the GHG implications of deforestation differ depending on where and how it occurs. Emissions from agricultural drivers of deforestation vary depending on the nature of the system that takes the place of the forest. For example, conversion of tropical rainforest to palm oil in Southeast Asia or soybeans in Brazil releases approximately 700 $tCO2_{eq}$/ha, whereas conversion from peatland rainforest in Southeast Asia can emit more than 3,500 $tCO2_{eq}$/ha (Fargione et al.. 2008). The GHG budgets of some land use systems, such as shifting cultivation, can change dramatically along the spectrum of carbon emitting to carbon sequestering when measured over a period of time. With an understanding of land use across a landscape, carbon mitigation interventions can be targeted to the areas that will optimize benefits to farmers, foresters and ecosystems.

In addition to the variability of emissions from different land use changes, agricultural systems, even when producing the same crop, can vary considerably in their emissions (Guerra; Hergoualch et al.. 2008, Adviento-Borbe et al. 2007; Robertson et al. 2000). Verchot et al. (2007) found that converting from managed forests to crops, pastures or grasslands could release anywhere from around 300 $tCO2_{eq}$/ha to 900 $tCO2_{eq}$/ha. Conventional agricultural intensification, even where it does reduce pressure on forests within the landscape in the short-term, may not produce an overall carbon benefit when the emissions from the agricultural interventions are taken into account. Agricultural intensification can greatly increase emissions in the form of carbon (e.g. from intensive soil tillage or eliminating fallows) or from the far more potent GHGs methane and nitrous oxide (e.g. from nitrogen fertilization or livestock wastes).

Agricultural interventions can also reduce GHG emissions and sequester carbon. Low emissions strategies such as enriching soil carbon with minimum tillage or the addition of biochar, reducing use of nitrogen fertilizer, and increasing the use of perennial crops, grasses, palms and trees should be considered along with forest protection in a landscape when calculating total carbon from interventions. Figure 1 illustrates order of magnitude carbon sequestration potential of various Climate-Smart agricultural practices applied in sub-Saharan Africa, including both site and landscape management practices and both belowground and aboveground carbon pools (Milder et al. 2011).

Figure 1. Relative magnitude of potential carbon sequestration or emissions reduction from different conservation agriculture components.

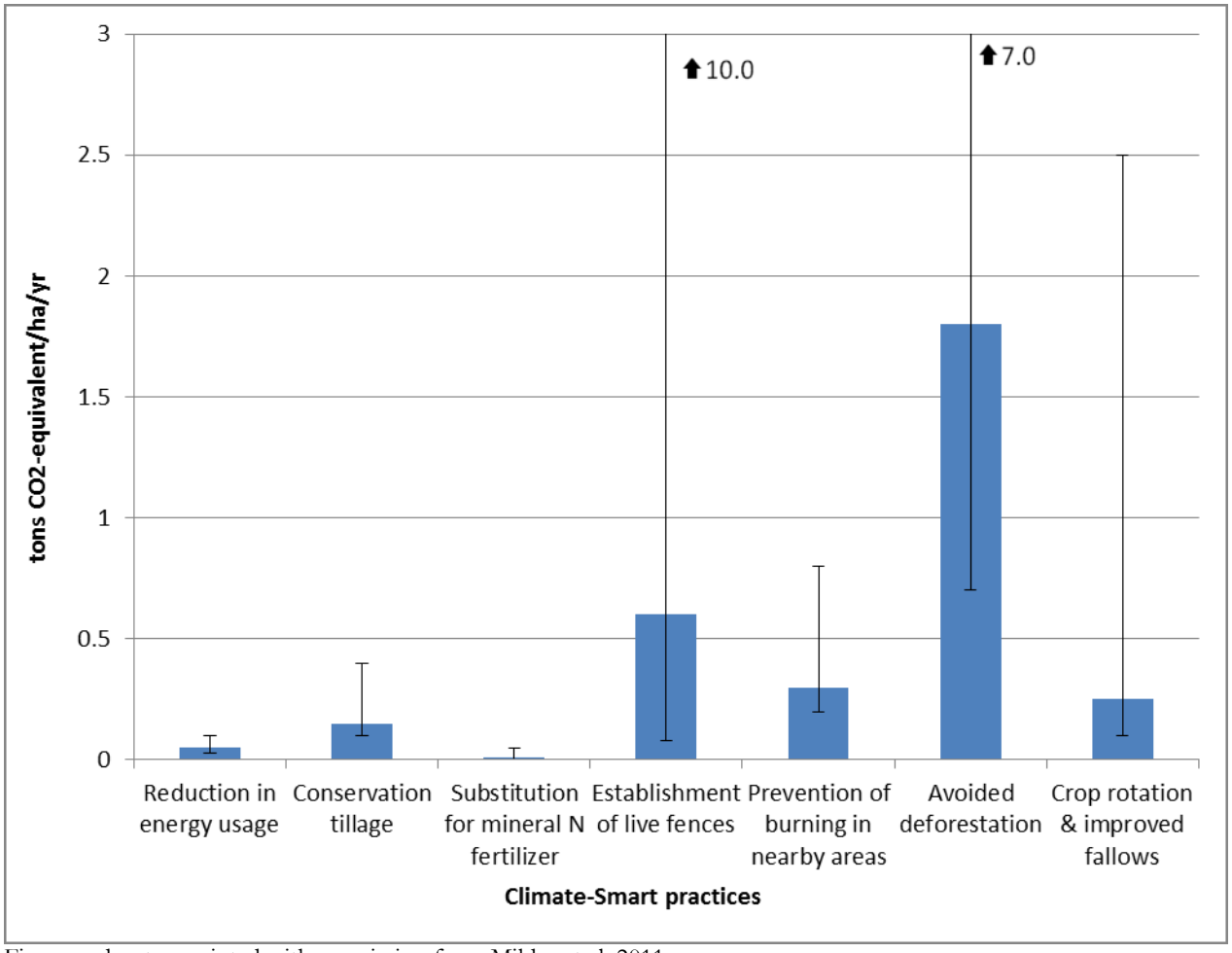


Figure and note reprinted with permission from Milder et al. 2011.

Note: Since the ranges of recorded GHG mitigation values for some of these practices is quite wide, the relative size of these mitigation benefits could shift considerably in specific situations. The range of values indicated by the error bars are based on data from a literature reviewed for; actual ranges may be even wider. The relative size of bars on this graph are mid-range estimates based on a synthesis of the literature on the GHG mitigation potential of each practice in semi-arid to semi-humid environments in sub-Saharan Africa. The data for avoided deforestation assume that Climate-Smart practices provide a sustainable system for sedentary agriculture, thus eliminating slash-and-burn agriculture and the conversion of native ecosystems to farm fields. Values for avoided deforestation are per year, averaged over a 50 year analysis period.

Interactions between forest, agriculture and carbon rights regimes

Systems of formal and customary rights are typically distinct for forest and agriculture lands. Household rights to own, sell, use, manage, clear, harvest, rent and exclude others from agricultural land, are in general, stronger than for forest lands, over which the state typically exerts more control. Community forest tenure regimes present a variety of combinations of

associated rights, but in many cases, the right to manage forest land is subject to heavy regulation and limited in duration (Almeida and Hatcher 2011).

A single farm may include diverse sets of rights over its cropland, planted trees, forest, grazing land and water, and it is important for these tenure systems to be recognized and coordinated to ensure their durability. In many countries, proving social/productive use of land is a requirement to gaining or maintaining land claims – and for many, the easiest way to prove occupancy is to clear the land of trees. Policy and law changes are required to alter the "use it or lose it" "mise-en-valeur" requirements in many land laws – especially if related to forest land. The tension created in each of these cases can be compounded when multiple jurisdictions are involved.

The interactions can become even more complicated when the question of carbon rights is introduced. Without defined land and carbon rights, carbon projects have the potential to create incentives for governments to force forest dwellers out of forests. If REDD creates an overriding focus on protecting the carbon stored in forests, the livelihoods of indigenous people could potentially be criminalized (IUFRO 2011). On the other hand, securing land tenure for indigenous populations and forest reserves can actually lead to better protection of forests (Porter-Bolland et al. 2011; Chhatre and Agrawal 2008; Nelson and Chomitz 2009; Bryan and Shearman forthcoming).

In many countries, even those with substantial institutional capacity to develop carbon projects, policies around carbon rights have not been clarified. This lack of clarity can lead to confusion and potentially tension among project stakeholders. For instance, within a REDD project if a forest is protected as result of reduced encroachment of agriculture, who receives the benefits from the carbon project (the project developer? forest dwellers? farmers? government?) and in what proportion? If these questions are not resolved, the diversity of actors with the potential for differing interests creates a risk of exacerbating existing poverty, corruption and social tensions (De Koning et al. 2008). It is critical to understand the tenure and rights dynamics and diverse potential sources of conflict for different stakeholders in developing landscape scale carbon strategies.

Farmers who are themselves forest owners/managers may fear losing rights over their own resources. Climate policy actions that seek to conserve standing forests and other perennial vegetation on private lands can threaten farmers' rights if perceived as restrictive and punitive. Many lessons can be learned from international experience of public regulation of trees on private lands, particularly that restrictions on use of trees on farms can sharply reduce incentives for farmers to retain and grow trees on farms.

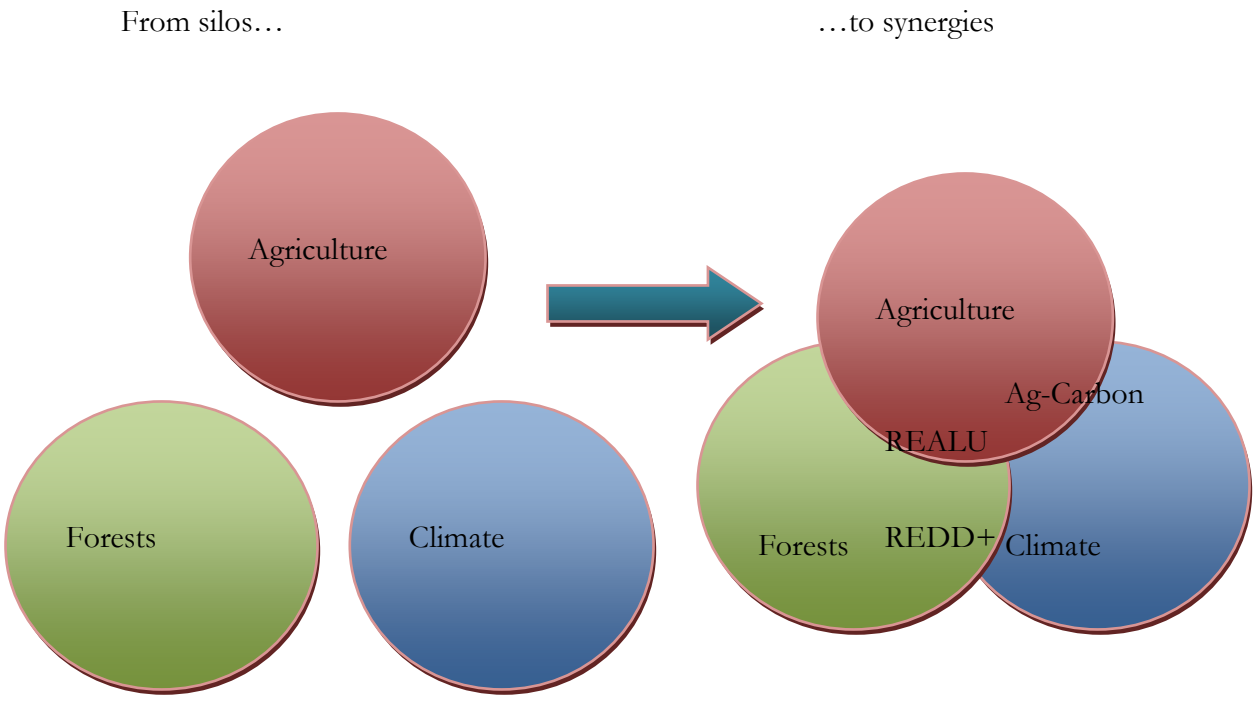
Farmers who rely on forests that are controlled by local government may fear change in access rights. Farming communities may also resist policy changes that limit their access to local government forest resources. While local governments may see financial opportunities from forest restriction, farmers' livelihoods may depend on such access, including inputs for crop production and fodder for livestock production, as well as building materials. The promotion of farm forestry and agroforestry can offset the loss of such resources, but the loss of rights must also be compensated in some way.

Commercial agricultural developers on private land, public land and community forests may conflict with local community rights. Commercial agricultural developers often acquire land for development through arrangements with individuals and companies or government landowners who statutorily own or control land. Local people who may also hold legal or customary rights to these lands are frequently not consulted during the negotiation of such deals. In some cases, the land itself may be legally sold or leased, but customary access rights of communities may be extinguished without compensation for communities. In these cases, the introduction of carbon benefits certainly has the potential to exacerbate tensions.

A LANDSCAPE APPROACH TO INTEGRATING AGRICULTURE, FOREST AND CLIMATE NEEDS

While land-based climate mitigation and adaptation programs are growing, they have tended to focus on a single land use within the landscape. Projects have been developed to support public forests, private forests, trees and land regeneration on communal land, agroforestry, and even soil carbon on private land, these individual components have generally not been well integrated. The complicated interactions between agriculture, forests and carbon described in the previous section make it difficult for efforts to manage any of these in isolation to achieve the inter-related objectives of food security, livelihood development and climate change mitigation. Project and program designers and policy makers will need to incorporate the perspectives of all stakeholders and the status of all relevant rights regimes. This requires moving from sectoral 'silos' to a synergistic approach that integrates forest, agriculture and climate objectives (see Figure 2).

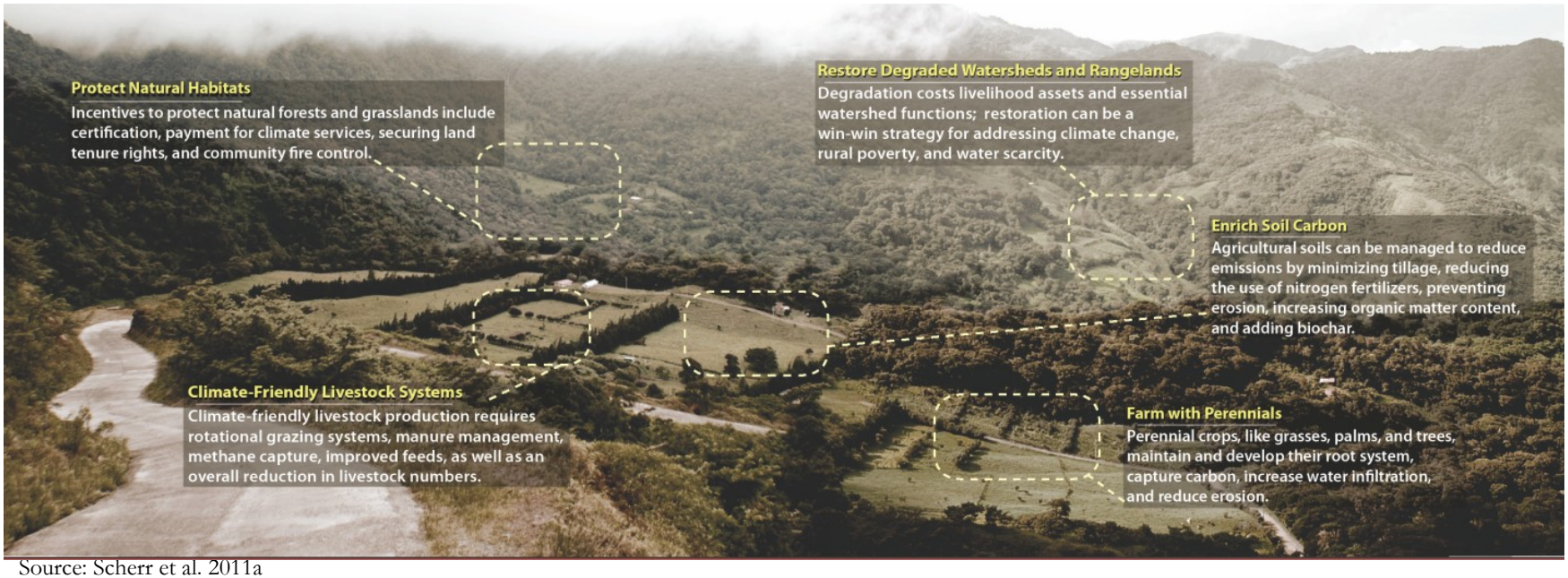
Figure 2. Shifting from silos to synergies



A landscape approach provides a framework to meet these requirements, by explicitly addressing spatial interactions of land uses, and coordination among diverse institutions in forest-agriculture mosaics. Multi-stakeholder landscape approaches have been gaining traction in recent decades within the forest and conservation communities as forest landscape restoration, biological corridors, participatory watershed management, territorial development, and model forests, though the role of agriculture in these has in practice been relatively minor, focused more on limiting environmental damage from agriculture than on promoting robust agricultural development. Agriculture sector activities have remained focused mainly on farm scale and market supply chains, not landscapes, but this is changing, with growing interest to expand 'socio-cultural' (satoyama) landscapes that explicitly conserve resources important for agricultural production within local cultures; efforts to 'green' agro-industrial corridor investment programs; and large-scale efforts to restore degraded watersheds in agriculture-dominated landscapes (Milder et al. 2011). Meanwhile, numerous research organizations, including many of the CGIAR centers, are undertaking more integrative, landscape-scale research, and new partnerships and platforms are improving the knowledge base needed to support these. Incorporating agricultural development within a landscape approach has been promoted by EcoAgriculture Partners since 2004 (McNeely and Scherr 2003) and a global Initiative began in late 2011 to scale up the approach by joining with other major champions of ecoagriculture throughout the world in the Landscapes for People, Food, and Nature (LPFN) initiative (LPFN 2011).

Investment and management to reduce trade-offs and enhance synergies among different areas and practices in the landscapes can increase resilience to climate risks and mitigate climate change, while providing direct benefits for bio-energy, water management, biodiversity and rural well-being. A diverse mix of strategies can generate synergies between mitigation, adaptation and livelihoods. In the production areas, farmers reduce GHG emissions and sequester carbon by minimizing agricultural pollution; using ecologically-compatible soil, water and vegetation management; modifying farming systems to mimic the structure and function of natural ecosystems; and maintaining diverse crop species and varieties. In non-farmed areas of the landscape, communities and other land managers can create conservation reserves that benefit local people; provide connectivity of habitat or water systems through production areas; reduce or reverse land conversion by increasing agricultural productivity; and adapt farm management plans to protect wild species (Scherr and McNeely 2008). **Figure 3 illustrates ways in which components of a mixed use landscape can work synergistically to provide livelihood and ecological benefits, including climate mitigation. Designing and implementing actions to do so requires local institutions that can facilitate compatible or coordinated sectoral action across the landscape.**

Figure 3. Capturing synergies from agriculture and forests interventions for climate change mitigation at landscape scale.



Source: Scherr et al. 2011a

A movement to scale up integrated Climate-Smart agricultural landscapes will require design and policy changes guided by three basic principles:

1) A shift from sectoral focus on forests, agriculture and climate to cross-sectoral frameworks;
2) Support for multi-stakeholder processes for policy development and planning;
3) Reconciling and securing the competing tenure and rights regimes for agriculture, forest and carbon rights holders.

In the following sections, these principles are applied at the landscape, national and international levels to develop recommendations for action.

Landscape Scale Interventions

A landscape framework for action aims to achieve scale, synergies, coherence of investment and action within economically and socially dynamic areas. Rather than freezing current land uses, strategies seek to achieve an overall, sustained increase in the proportion of land under forest and other high-carbon cover and management. Strategic needs include promoting Climate-Smart agricultural development; supporting platforms for stakeholder engagement and negotiation; and monitoring landscapes for multiple objectives including GHG.

Promote Climate-Smart agricultural development

In landscapes where the primary driver of land use change is agriculture, a critical component of long-term forest conservation will be the development of Climate-Smart agricultural production systems (FAO 2010) that are explicitly linked to landscape management strategies. Climate-Smart agriculture, according to FAO, refers to agricultural systems that sustainably increase productivity, resilience (adaptation), and reduce/remove GHGs (mitigation) while enhancing the achievement of food security and development goals (FAO 2011a). Many of these plans will include the protection and restoration of standing forest resources on and off farm. Supporting these agricultural systems will require investments in technical assistance and capacity-building programs including agricultural education, extension, and research to identify new Climate-Smart practices. These systems will also need to identify new sources of finance and markets that reward climate benefits. FAO is currently facilitating a process among UN agencies and global experts on Climate-Smart agriculture to develop a Sourcebook on practices. Many regional and national public, private and civil society initiatives to define and implement Climate-Smart agriculture are underway

A landscape approach can lead to balance between land needs of agriculture and forests as well as the development of synergies between them. For example in Brazil's unique and highly threatened Atlantic Forest, endemic flora and fauna compete for habitat with growing populations of people, land-clearing for coffee and sugarcane and livestock production, and uncontrolled fire used for pasture management. Dairy farming is one of the most important economic activities in the forest, but its low productivity requires ever-expanding conversion of forest to pasture. In the early 1990s, NGOs began to work with dairy farmers in one of the largest remnants of the forest to improve dairy productivity. In return for the technical guidance, farmers committed to reforest and regenerate part of their land as a conservation easement. Investments in improving genetics, mineral supplements, fodder and silage increased milk yields by over 100%, and reforested areas now serve as a buffer between agricultural and protected forest areas (McNeely and Scherr 2003; Pro-Natura 2010).

Locally-adapted forest-agriculture landscape management can only be facilitated, not imposed, as agriculture and forestry represents the actions of millions of independent actors. Some management changes call for shifts in thinking and practice by farmers, agribusinesses and other stakeholders that are difficult to make and represent new sources of risk. Therefore, programs aimed at conserving forest within agricultural landscapes and supporting Climate-Smart agriculture practices will need to find a balance between regulations mediating forest-clearing and

unsustainable farming practices on the one hand and incentives to support alternative approaches on the other.

Effective economic incentives will link financial benefits with climate and ecosystem stewardship by producers. A number of third party agricultural eco-certification systems are now established or in development that require forest protection on farms, such as "forest friendly coffee" and the palm oil and soy Roundtable certifications. Market demand for eco-certified agricultural products is growing rapidly, particularly in Europe and North America. Globally, these markets totaled approximately $56 billion in 2010, and are estimated to reach $261 billion in 2020 (Ecosystem Marketplace unpublished).

For example, in the Kenyan tea landscape of Kericho, Unilever, the world's largest purchaser of black tea, is working with eco-certifier Rainforest Alliance to promote sustainable tea production. Rainforest Alliance assists tea farms and processing facilities to achieve a set of social and environmental benchmarks necessary for them to receive RA certification. This certification, in turn, can increase the marketability and profitability of tea for farmers and processors alike. Certification currently requires sustainable production practices in tea fields, sustainable fuel sources, protection/extension of natural areas, and riparian forest protection and planting (Scherr et al. 2011a). Rainforest Alliance has recently developed a climate module which can be integrated into the certification (SAN 2010).

Some multinational food companies have also begun to establish their own internal "eco- and climate-standards" for their suppliers (Henson and Humphrey 2009; Smith 2008). These standards have focused on ecological and social benefits, but some of these are now beginning to turn their attention specifically to climate. There has been a recent flurry of development of "climate-friendly" eco-labeling for agricultural products using diverse methodologies, and some efforts to raise consumer awareness and interest in climate-friendly food buying.

Short- and long-term credit is a critical input for agricultural production, and there has been wide experimentation with using tied credit to incentivize farmers to adopt sustainable practices and implement investments to enhance watershed, biodiversity and other benefits. The African Wildlife Foundation, for example, has a well developed credit program for their African Heartlands program, with subsidized credit provided to farmers and processing plants who sign conservation management contracts that will ensure wildlife-friendly practices. By protecting forest habitat in the production mosaic, such programs already help avoid deforestation and encourage sequestration.

In southern Tanzania, efforts are underway to link agricultural carbon and REDD investments with large-scale agro-industrial corridor development, modifying private investments and public infrastructure design to reduce emissions and habitat destruction. The program will promote protected area management, REDD+ program implementation, and Climate-Smart smallholder agricultural development in a spatially explicit plan to manage trade-offs and promote synergies (SAGCOT 2011).

In some landscapes, opportunities may also be available for land managers to participate in private or public programs which provide them with payments for providing a range of ecosystem services, beyond carbon, including watershed services and biodiversity (Scherr, Milder and Inbar 2007). Other programs may support the development of livelihood and market

opportunities of non-timber forest products and high-value selective logging and processing. In some situations, market opportunities for foods and products under forest cover, such as rubber or nuts, could be developed.

Support platforms for stakeholder engagement and negotiation

For integrated landscape management plans to be effective, sustainable and equitable, local and non-local stakeholders need to have a voice in the landscape planning process, and the platform for dialogue and planning needs to be sustained over time. There are diverse models for such institutional platforms, which may be convened by local government, a trusted NGO, a regional commission with designated membership across sectors, forest or habitat management committees, or a voluntary group of champions. New governance mechanisms may need to be developed to work across sectors. Lessons for collaborative planning and management of complex landscapes can be drawn from international experience (Buck, et al. 2007; Milder et al. 2010; Landscape Measures Resource Center 2011). While such platforms have proliferated in recent decades as a result of challenges on the ground to reconcile agricultural development, rural well-being and ecosystem management, there are limited financial resources at their disposal and often significant barriers related to unsupportive sectoral rules that limit the scope of negotiated outcomes.

Some form of regulation will often need to be negotiated to discourage forest clearing; the details will depend on the primary agricultural drivers in a given area. A first step will be to implement and enforce national or local government restrictions on agricultural land use in public lands (e.g. protected areas, limited use buffer zones, concession policy) that are already in place. In some cases new large-scale agricultural concessions will have to be limited. In areas with large numbers of smaller actors, locally negotiated by-laws imposing agricultural land use restrictions on private land conversion, easements, riparian protection, and other critical areas can be supported.

The private sector's participation in these landscape wide initiatives, including large agribusiness or forestry companies, will be a critical to their success. Some companies have begun to consult more widely than they have in the past before making decisions on locating their operations or in their procurement policies. Some are playing a role in promoting public-private partnerships for sustainable development, offering their expertise and collaboration in addressing challenges of landscape conservation and restoration (Scherr et al. 2011b). But overall, sustainable supply chain initiatives led by individual companies, commodity roundtables and other business groups have focused on farm and supply chain actions with weak links to other landscape conservation and restoration strategies and policies.

The most effective multi-stakeholder planning processes will be based on a shared technical understanding among stakeholders of a landscape's physical features, socioeconomic characteristics, opportunities and constraints. The actors in a landscape may need support to understand how different configurations and locations for various land use and management practices will affect not only the carbon budget, but also the general ecological functioning of the landscape and the livelihoods of the people who live there. To bring together diverse actors in a landscape for planning processes, efficient systems for communication will be required—for example, through the creation of landscape roundtables. Key actors will also need tools to track

and assess lessons learned throughout the planning and dialogue process which can be reflected in evolving action plans.

In many of the world's rural and forested areas, there are stark power imbalances among stakeholders. Those with informal and secondary rights are in a much weaker position than those with statutorily recognized rights such as a concession holder. Negotiation training and empowerment activities targeted at marginalized groups and individuals will be essential to a meaningful, productive and equitable negotiated landscape plan.

Landscape planning platforms may be useful in negotiating solutions to the tenure conflicts and security issues discussed above, for establishing protections against land grabbing and for endorsing participatory mapping exercises. Key rights issues include clear, recognized and socially-legitimate tenure rights, respect for livelihood choices and traditional practices, the right to a safe environment/housing, and freedom of movement. When programs are designed, respect for Free Prior and Informed Consent (FPIC) is critical to the protection of the inhabitants' rights, but also fundamental to the long-term success of any intervention. Along the same lines, programs that adopt and implement safeguard policies early on will stand a better chance of succeeding.

Monitor landscapes for multiple objectives including GHG

Efforts to measure and monitor multiple Climate-Smart agricultural and land management practices across many farms within a landscape face significant challenges (Negra and Shames 2010). Similar agricultural practices will have different climate change impacts depending on their agro-ecological profile (van Noordwijk et al. 2009). Monitoring, reporting and verification (MRV) for agricultural systems is further complicated by challenges in measuring nitrous oxide and methane emissions, and varying carbon dioxide emissions and sequestration rates over time (Negra and Wollenberg 2010).

A landscape approach to measurement and monitoring for climate mitigation and other ecosystem and livelihood objectives, which focuses on large, ecologically and agriculturally diverse areas, can help to ensure that impacts are real and to guard against tradeoffs (e.g. forest cover vs. food security). Despite the aforementioned challenges, many key technological elements on which future methodologies can be built are currently available, however the costs of implementing can be prohibitive given the current price of carbon. A way to reduce complexity of landscape projects will be to move from single component forest or agricultural mitigation methodologies to ones based on the principle of modularity in which various components of a methodology can be added or subtracted depending on the mitigation opportunities in a given landscape. As the quality of modeling improves, costs are likely to go down over time. Promising innovations in participatory data collection, including the use of handheld GPS devices and cell phones, can also bring down costs (Negra and Shames 2010).

To fully capture the costs and benefits of landscape scale interventions, any co-benefits of these projects and programs, improvements to rural livelihoods, rights and other ecosystem services, should also be monitored. The results of this monitoring, particularly on the status of compensation, distribution of benefits, impacts on rights and conflict, will need to be transparent and easily accessible to all stakeholders within the landscape (RRI 2008). New cost-effective

monitoring systems, with locally-led verification, can be established to measure the impact of interventions on the rights and livelihoods of all users in the forest-agriculture landscape. Over the longer term, climate mitigation monitoring should be incorporated into sustainable landscape development monitoring (UNEP 2011; Sachs et al. 2011).

INTER-SECTORAL POLICY ACTION

In order to create an enabling environment for landscape scale action as described in the previous section, national and sub-national institutions and policies will need to play a supportive role. Priority areas for action include cross-sectoral policies for the forest-agricultural interface, strategies that link climate finance with agricultural development finance, and securing and aligning the rights of farming and forest communities to the resources that support their livelihoods.

Develop policies to manage the forest-agriculture interface

For national policy, perhaps the most critical need is harmonization of sectoral policies and programs across agriculture, forestry and climate institutions, along with other sectoral stakeholders including environment and rural development. Inter-sectoral conflicts arise from many typical rural investments. For example, promoting nitrogen fertilizer to raise agricultural production may increase farm income and food security, but have a negative effect on watersheds, GHG emissions and biodiversity. Expansion of protected forest areas may enhance biodiversity, watershed services and income from tourism, and avoid carbon emissions, but may reduce agricultural production and biomass energy. Climate objectives can only be reached by reducing aggregate net GHG emissions across all sectors and landscapes.

To achieve policy harmonization across sectors requires joint planning and coordinated implementation between ministries of agriculture, environment, rural development and finance. In most countries, the development of cross-sectoral policies will require a re-thinking of the spatial division of labor within ministries. Policies must be able to differentiate actions needed in forest-dominated landscapes with important agricultural activities within them and others that are predominantly agricultural, but with large areas of forest in and around farms. Meanwhile, climate strategies will need to embrace diverse land uses. Thus, rather than dividing up ministerial responsibilities by 'forest' and 'agriculture' areas, there is a need for spatial coordination of investments, definition of a shared set of goals within particular regions, and mechanisms for regular cross-sectoral consultations. The consultation groups may also need to include water, disaster management and other ministries in parts of the country where those areas do or should shape agricultural and forest policy. To shift towards cross-sectoral policies, people working in sectorally-focused institutions at the national level will need training on integrated planning and program monitoring and evaluation. These processes also require well-organized and –facilitated dialogue and mediation processes among leaders from the various sectors, including farm and community forest organizations, and civil society, as well as public agencies and private sector actors in agriculture and forestry.

At the sub-national level there is a need to increase flexibility for district and state ministerial offices so that they can participate in, and respond to, requests from landscape initiatives. Ministries and departments can work together in soliciting strong local input into planning within a cross-sectoral framework. Sub-national government entities may also need additional capacities to direct, shape, regulate and support synergistic forest-agriculture landscape development within a climate context.

In addition to structural cross-sectoral coordination, there are concrete steps that national policies and programs can take now to support land use climate synergies. For example, national governments can encourage perennial substitutes for annual crops or support farm and community forestry as part of agricultural programs that tie public agricultural credit programs to on-farm forest conservation. National policies can also help shift incentives towards Climate-Smart agriculture by eliminating perverse subsidies, promoting certification programs for agricultural commodities that encompass Climate-Smart criteria, including social standards; and through targeted government procurement policies.

Link climate finance to agricultural development finance

While climate-financed investments in sustainable landscape management will certainly be useful, in the context of all rural development investment needs, available climate funds are dwarfed by—and potentially undermined by—other flows of financial incentives within the landscape that currently encourage high-GHG emitting activities (Ayensu et al. 2010). Presently, these financial streams are poorly integrated, and therefore climate funds are less effective than they might otherwise be in shifting the trajectory of rural development to a lower-emission, higher carbon sequestration pathway. Often mobilized by conservation actors or private sector climate finance developers, neither REDD nor agricultural carbon projects is strongly linked with private or public agricultural development investments. In addition, agricultural mitigation and adaptation finance could generate synergies through better coordination and integration (see discussion in the next section). Therefore, to be most catalytic, climate investments in rural landscapes must link with, leverage and influence the much larger flows of mainstream agriculture and rural finance.

Finance integration efforts at the national level can support the development of programs by non-governmental actors and a lack of coordination can become a significant barrier. For example, a new CARE-supported agricultural carbon project in Western Kenya based on agroforestry faces a conundrum: while it was assumed that much of the financing would come from the carbon market, the project's primary objective is livelihood development and resilience to climate change for farmers. CARE is working to fully reconcile these agendas to make sure that the livelihoods objective maintains primacy throughout the life of the project. Meanwhile, given the current low price of carbon and costs of project implementation, carbon revenues are far less than the full costs of the project. This kind of project requires more flexible financial mechanisms that reflect the project's positive impacts on agricultural development, food security, ecosystems, adaptation to climate change as well as mitigation. (Shames and Scherr 2011).

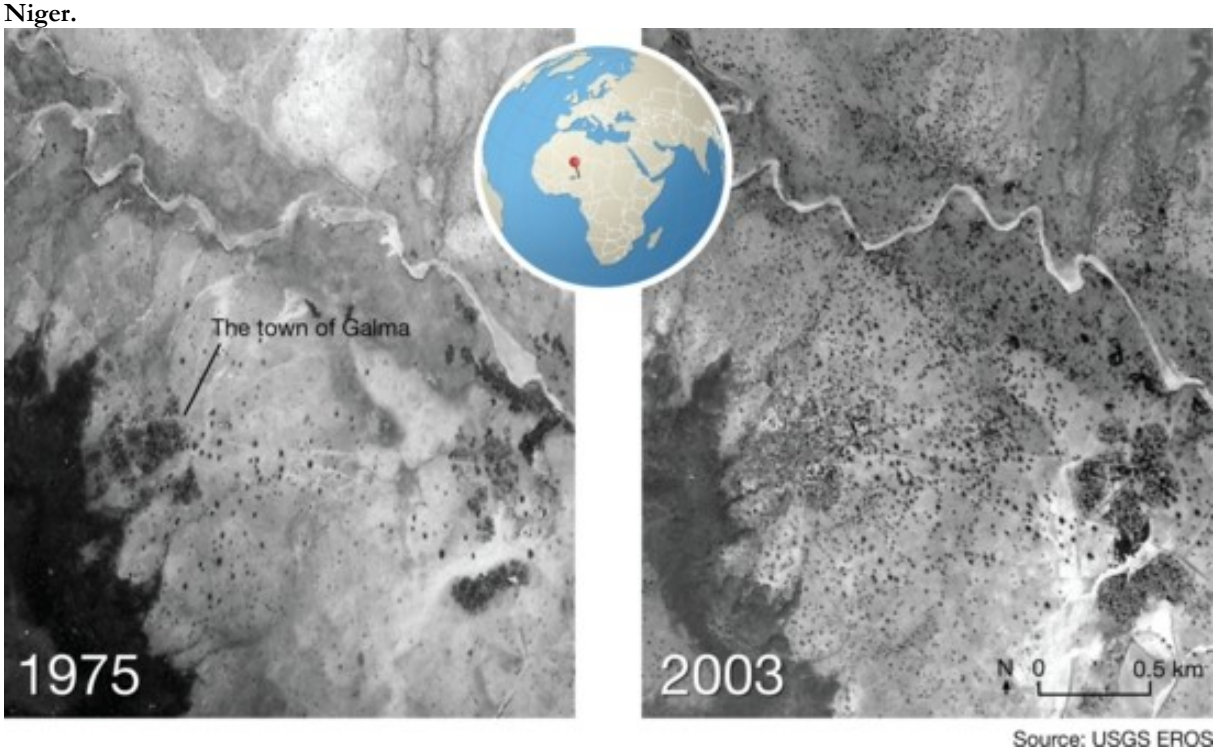
When climate finance is invested in rural landscapes, the interventions can be coordinated with co-located rural development activities. One way to do this is by utilizing REDD funds to support Climate-Smart agriculture and institutional development that are necessary to create and maintain multi-functional landscapes. Funds could go to integrated landscape planning exercises or extension support for Climate-Smart agricultural practices or agricultural intensification where these interventions are likely to take pressure off forests. It could be applied creatively in rural credit programs, to direct agricultural lending to low emission practices and farmer conservation of forests, or to mitigate farmer risks in the transition to Climate-Smart systems. **These interventions will need to be adjusted based on the particular dynamics in each**

landscape, including the type of agriculture practiced in the areas adjacent to the forest, the relationships between the land users, and the long-term agricultural drivers of land use change.

Secure and align the rights of farming and forest communities

A core incentive for land managers to plant and protect land, trees and carbon is for them to be granted rights to the benefits that flow from them. Supportive policy will be critical for efforts to sort and strengthen land and carbon rights in landscapes. This security reduces the perverse incentives that push farmers to clear land as a means to establishing property rights. Secure land tenure also lays the foundation for farmers and foresters to invest in the long-term productivity of their land, and take advantage of emerging markets based on sustainably produced agricultural and forest products. These rights also incentivize communities to organize to protect forests that secure agricultural benefits (e.g., for water, wild pollinator habitat, flood control, windbreaks). For example, the establishment of secure rights to trees for farmers in Galmia, Niger lead to a dramatic increases in tree planting and protection (Figure 4).

Figure 4. Forest landscape restoration over time as farmers respond to forest policy reform in Galmia, Niger.



Source: Hugo Ahlenius, UNEP/GRID-Arendal

With a secure rights base, farmers and foresters will have the security to be innovative, practical and flexible – qualities necessary for climate change adaptation as well as mitigation. Jurisdictional rights within a landscape should also be clear and coordinated so that all rights-holders and stakeholders are confident that they are dealing with the correct authority and to avoid forum shopping to secure land rights. When and if implemented, tenure reform should suit long-term and dynamic social and economic development needs, not simply be driven by the prospect of

carbon markets. As changes in the landscape take place, new rights will be created and existing rights will be challenged. Policy will need to build on a base of secured traditional rights and permit flexibility and localized decision-making on land use rights. Governance systems should strengthen the capacity of communities, civil social and government to design and implement their own reforms, devise their own mitigation and adaptation strategies, and to monitor and learn from climate change initiatives (RRI 2008). Examples of land laws/policies that take a landscape approach and favor local management decision-making over highly bureaucratized structures do exist and can inspire other areas of the world. For example, in Mozambique in 1997 recognized historically occupied community territories that include woodlands, agricultural land, wetlands and pasture and provided accessible bureaucratic procedures to register territories (De Wit and Norfolk, 2010). Another example from Fujian and Liaoning provinces in China shows that policies permitting more local choice in how to manage forests has increased local incomes and increased forest cover (Xu et al. 2010).

Incentive structures for climate adaptation and mitigation must prioritize indigenous peoples, forest communities and agricultural users, all of whom play important roles in maintaining forest cover, ecosystem function and landscape carbon stocks. New interventions should be informed by the shortcomings of prior international efforts, which have had limited success on halting deforestation in large part because of inadequate recognition of human rights, lack of clarification on property, access and use rights, and lack of effort to foster local entrepreneurship as well as transparency and accountability (RRI 2008).

In the wake of scandal over large-scale land acquisitions for agricultural production, the international community put substantial effort behind the development of guidelines and principles to protect local livelihoods from these investments. Two concurrent initiatives in particular— Voluntary Guidelines for the Responsible Governance of Tenure of Land, Fisheries and Forests, and the Principles for

Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources—aim to give guidance and provide a framework for discussion for governments, and intergovernmental and civil society organizations (Liversage 2010). Other national policies can be implemented providing rights to developers contingent on forest and community protections. The UNFCCC Cancun Agreement with a detailed annex on safeguards, also provides significant support for the recognition of traditional tenure rights as part of climate interventions.

Tenure reform processes require the provision of technical support (for mapping rights, delineation and facilitating the negotiating of rights), along with support for contentious and long-term political processes inherent in restructuring property rights. The window of opportunity to address tenure rights in a meaningful way is open in many countries today – thanks in part to REDD and attention to large-scale land acquisitions. Rushing the process to secure rights can be dangerous, especially to those with secondary rights to land and forests including women in many cases. Setting up an equitable process for tenure reform now, by harnessing REDD or other climate funds, can lay the basis for more sustainable resource use, but it can also facilitate the negotiated land use planning required to support integrated landscape management.

IMPLICATIONS FOR INTERNATIONAL CLIMATE POLICY AND FUNDING

Land use climate change mitigation projects in general, and agricultural projects in particular, have faced significant challenges in international climate change negotiations, as these discussions have historically been more focused on industrial emissions. As the land use carbon agenda has moved forward, project and program designers are confronted with the need to integrate agriculture while international policy makers are challenged with developing institutional and funding environments that support integrated climate projects. Concrete policy steps to moves in these directions include the re-design of the Clean Development Mechanism (CDM) and Nationally Appropriate Mitigation Activities (NAMA) rules, integration of adaptation and mitigation finance, and the established of a Subsidiary Body on Scientific and Technical Advice (SBSTA) for agriculture and integrated land use.

Re-design CDM and NAMAs for diversified landscapes

To realize landscape-scale terrestrial carbon benefits, significant progress needs to be made in international climate policy to integrate agriculture, forest and climate. Although there has been some action outside of the UNFCCC process – particularly within the voluntary Verified Carbon Standard (VCS) and the regulatory markets of the Canadian province of Alberta, New Zealand and Australia – within the CDM, the full inclusion of agricultural emissions reduction and sequestration opportunities would provide new incentives to expand the scope of REDD projects and to develop new integrated landscape carbon projects. Currently, while afforestation and reforestation projects are allowed with the CDM, practices that would build soil carbon through cropland and rangeland management are excluded.

For agriculture to gain a significant foothold in the CDM, in whatever form it takes after 2012, there will likely need to be reform of the system of temporary crediting, along with the general complexity of land use project development. Currently, separate project documents are required for each mitigating component within a landscape. Ultimately, a cohort of accessible and relatively cheap measurement methodologies will need to be developed that can integrate a variety of carbon mitigation activities throughout agricultural landscapes. A promising project development model that has the potential to be applied to landscape scale projects in the future is Program of Activities (PoAs). While most CDM projects need to be approved separately by the CDM Executive Board, PoAs allow for the bundling of many small projects into a single large one. For landscape projects this model could significantly reduce transactions costs of project approval, MRV, and credit aggregation.

An alternative source of financing to the CDM within the UNFCCC system that could support the development of landscape scale carbon projects is that of NAMAs. NAMAs would allow developing countries to be compensated for mitigation actions, including policy development and implementation, but the emissions reductions would not be translated into carbon credits as in the CDM, and the MRV requirements would not be as strict. For land use activities where it can be difficult to measure emissions and sequestration cheaply with a high level precision, NAMAs

could become an attractive alternative to carbon markets. NAMAs may have the flexibility to fund policy development to support mitigation on a large scale. For example, NAMA funds might be used to improve land tenure security. Some countries are already developing NAMA plans, and 18 of 43 non-Annex 1 countries that have submitted them have included elements of agricultural mitigation (McKenzie and Childress 2011). However, the specific rules surrounding NAMAs have not been clarified within the UNFCCC and are an ongoing topic of discussions.

In addition to the opening of opportunities within the UNFCCC to integrate land use mitigation projects, the UNFCCC could also broaden its perspective on agriculture and land use by strengthen links to other international agricultural and food security policy processes such as the FAO's Commission on Food Security and the Right to Food Unit.

Integrate adaptation and mitigation finance

Funds currently available for adaptation to climate change are relatively limited compared to the need, but commitments have been made by developed country governments which may change this in the near future. The Green Climate Fund and the associated fast start financing, is supposed to be split evenly between adaptation and mitigation funds. Commitments have been made for $30 billion a year by 2012 and $100 billion a year by 2020 for vulnerable countries to address the impacts of climate change and to support their capacity to reduce their own emissions. However, it is unclear on what criteria these funds will be distributed, whose priorities will be driving the process, or who much of this will actually materialize. These financing streams have been treated separately within the UNFCCC negotiations, which may make sense for many sectors, but within the land use sector, and agriculture in particular, the interventions that produce mitigation benefits are often identical to the ones that will be necessary for adaptation. Agriculture is already widely included in countries' National Adaptation Programs of Action (NAPAs). While this convergence is widely recognized, particularly for interventions with smallholders, climate financing opportunities do not reflect this reality. Efforts could be made to coordinate these discussions and investments. The process of integrating adaptation and mitigation finance should link closely with the preciously discussed need to link climate finance generally with agricultural development funds.

Establish a SBSTA for agriculture and integrated landscapes

The success of an integrated agenda for Climate-Smart agriculture-forest landscape agenda requires a robust research program. In addition to climate related research, more work needs to be done to understand the synergies and trade-offs of various land uses on livelihoods and ecosystems. For the carbon component of these projects, critical technical questions regarding MRV systems, particularly for soil carbon, need significant support, as does the testing institutional models for Reducing Emissions from All Land Uses (REALU) projects and programs. While these issues have begun to be addressed with the support of universities, the CGIAR system, FAO, private foundations, bilateral funding agencies, and NGOs, these research programs do not have an official outlet within the UNFCCC process. The agreement produced at the UNFCCC 16th Conference of the Parties (COP 16) in Cancun included a call for a Subsidiary Body for Scientific and Technological Advice (SBSTA) on the subject of REDD. The SBSTA is tasked with developing a work program on the drivers of deforestation and for measuring, reporting and verifying forest-related emissions that result from the implementation of REDD

activities. Within this framework, agriculture is characterized as a driver of deforestation, but is not included within a broader integrated landscape framework. Ideally, the REDD SBSTA would expand to include a broader range of agricultural and landscape issues. If it does not, a SBSTA on agriculture will need to be developed to confront major research challenges for the integration of agriculture into climate mitigation projects.

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LIST OF ACRONYMS

A/R	Afforestation and Reforestation
CCAFS	Climate Change, Agriculture and Food Security Research Programme
CDM	Clean Development Mechanism
CGIAR	Consultative Group on International Agricultural Research
FAO	Food and Agriculture Organization of the United Nations
FLR	Forest Landscape Restoration
FPIC	Free, Prior and Informed Consent
GHG	Greenhouse Gas
GRA	Global Research Alliance on Agricultural Greenhouse Gases
Ha	Hectares
LPFN	Landscapes for People, Food and Nature Initiative
MICCA	Mitigation in Climate Change and Agriculture
MRV	Monitoring, Reporting and Verifications
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Program of Action
PoA	Program of Activities
REALU	Reducing Emissions from All Land Uses
R-PP	Readiness Preparedness Proposal
REDD	Reducing Emissions from Deforestation and Forest Degradation
RRI	Rights and Resources Initiative
SBSTA	Subsidiary Body on Scientific and Technical Advice
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

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