

Addressing Agricultural Drivers of Deforestation

Opportunities for Catalytic Donor Interventions

Charlotte Streck and Monika Zurek

July 2013



CLIMATEFOCUS

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This project is part of the International Climate Initiative (ICI). The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

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Federal Ministry for the
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based on a decision of the Parliament
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The objective of this paper is to review strategies on how to counter agricultural drivers of deforestation and develop recommendations how international donors can support such strategies. The paper starts with a review of the drivers of deforestation, with particular emphasis on agricultural drivers. This is followed by an analytical review of policies and measures that governments can take to address these drivers. Based on this general review of policy options, we will develop models for public private partnerships and other interventions that could be supported by international REDD+ funds. We conclude with summarizing our recommendations for public support.

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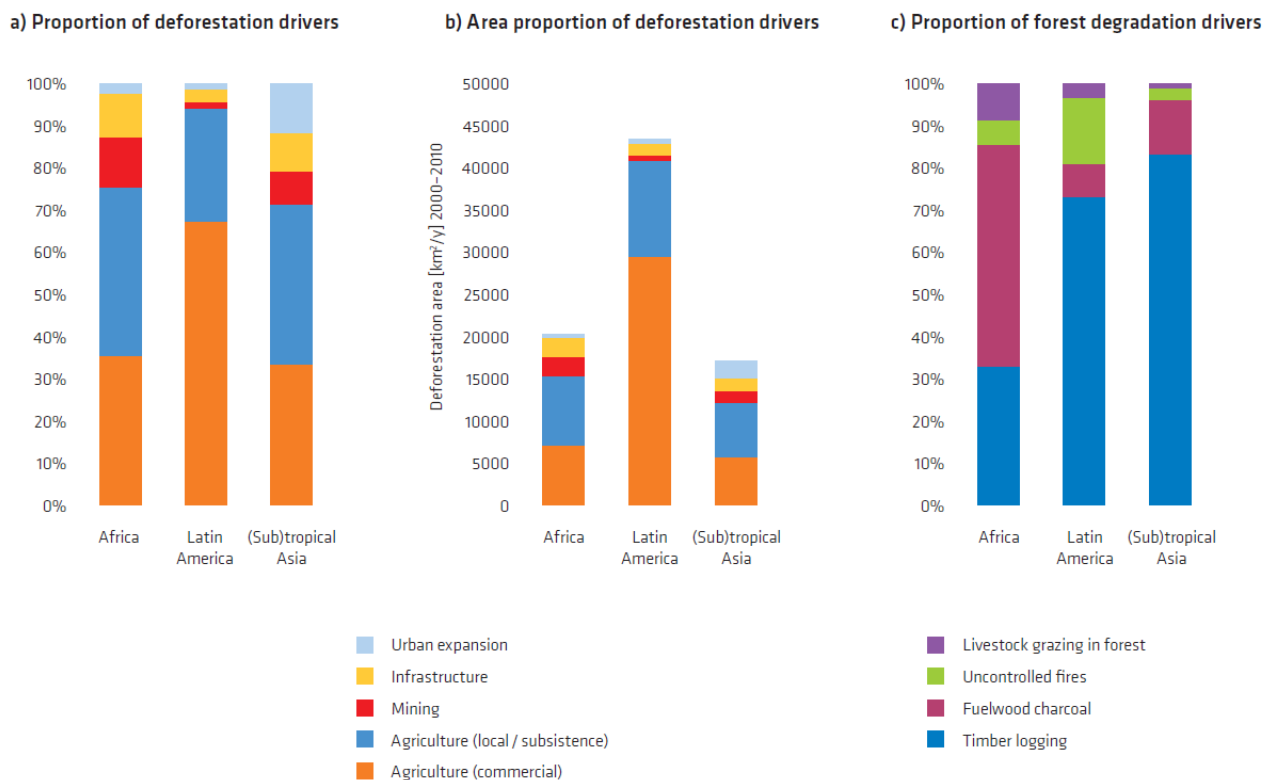
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1. Drivers of Deforestation and Forest Degradation

The deforestation and degradation of tropical forest areas is caused by a variety of direct and indirect factors. Direct drivers of deforestation are defined as all human activities that directly reduce forest cover, either completely resulting in deforestation or partially resulting in forest degradation (e.g. Geist und Lambin 2002, Schaeffer et al. 2005, Kissinger et al. 2012). Direct drivers include the expansion of agriculture, infrastructure development, and wood extraction. In addition, new direct drivers such as urbanization and mining are important in selected regions. Mining has been cited by many countries in Asia and Africa as a factor, while urban expansion seems to be more relevant in Asia (see Figure 1) (Kissinger et al 2012).

The major forces driving deforestation are food and fiber production (Houghton 2012). Degradation of forests is mainly caused by timber production and logging, particularly in Asia and Latin America while in Africa, fuel wood collection, charcoal production and livestock grazing are the more important causes (Kissinger et al. 2012) (see Figure 1).

Figure 1: Direct drivers of deforestation and forest degradation (Kissinger et al. 2012)



The expansion of agricultural land, either for subsistence or commercial farming, is considered to be the most important direct cause of deforestation in tropical countries, accounting for about 80% of tropical deforestation worldwide (Kissinger et al. 2012). While subsistence farming and population growth were identified as the main reason for this trend in the 1980's, more recently it has been shown that commercial actors producing goods for the international commodity markets as well as supplying the growing cities in many developing countries have become the main drivers (DeFries et al. 2010, UCS 2011). The commercial production of beef, soybeans and

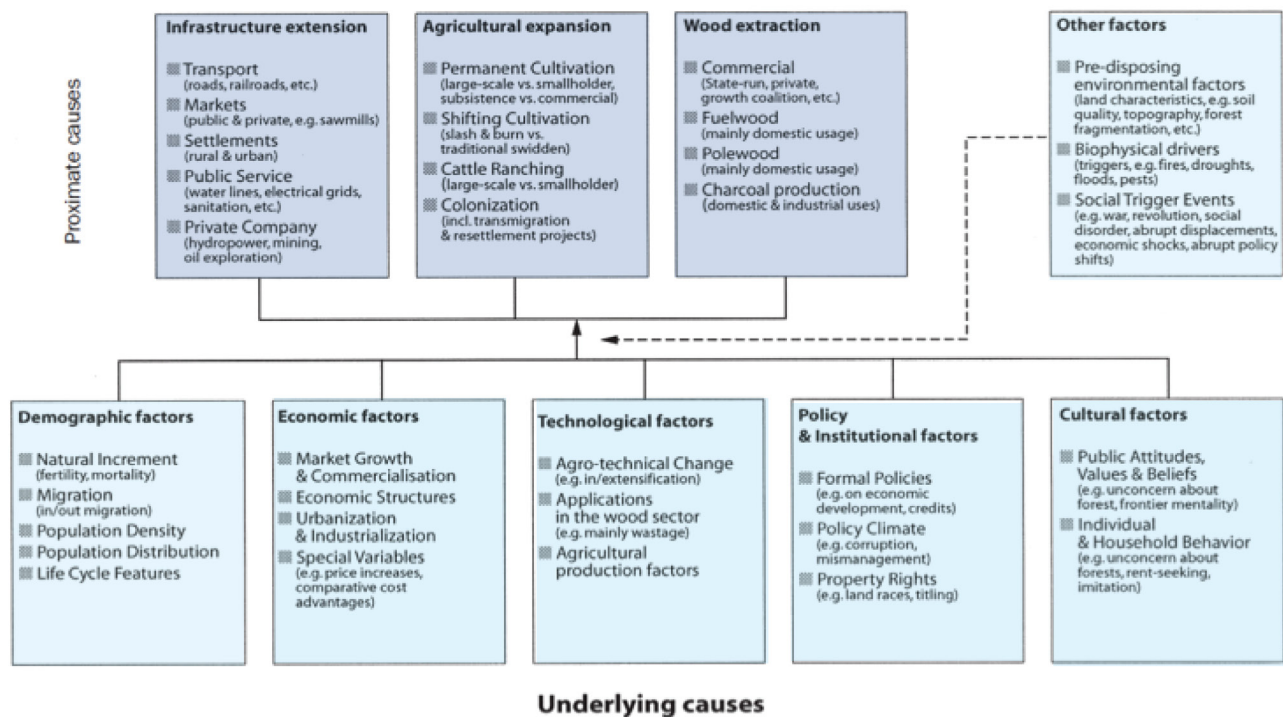
other cash products is more important in Latin America, while both commercial and subsistence agriculture drive deforestation in Asia and Sub-Saharan Africa.

1.1. Underlying causes and global trends

The drivers of deforestation and forest degradation are influenced and conditioned by a complex set of underlying factors which account for country and region specific differences. Any measures to deal with tropical deforestation and degradation have to take these indirect factors into account to be successful in the long run. The most important indirect drivers of deforestation include economic, technological, cultural, demographic and institutional and political factors (Figure 2) (Geist and Lambin 2002).

In an analysis of 152 studies of tropical deforestation, Geist and Lambin (2002) found that over one third of all cases combined all five indirect drivers. Economic factors are, in general, the most important indirect drivers. They include changes in national and international prices for agricultural products, national prices for land or labor, as well as the domestic or international demand for wood products. Examples of institutional and political factors include policies to push back the forest frontier and encourage the establishment of infrastructure and settlements as well as undefined or unclear property rights near forest boundaries. Inappropriate land use practices in agriculture and forestry and inadequate capacity in mapping and monitoring are some of the important technological factors that help drive deforestation and forest degradation. Cultural factors such as the public or private views on the usefulness and importance of forests affect how land users will see their value, which in turn influences their behavior towards forest protection and conservation. Demographic factors were often found to be less important than previously thought. Changes in population density due to migration into agricultural frontier areas are, for example, more important than high fertility rates in these areas.

Figure 2: Direct and indirect drivers of deforestation and forest degradation (Geist and Lambin 2002).



Geist and Lambin (2002) also showed that there are usually patterns of indirect driver interactions that underpin two or three direct drivers. An example of this is the extension of roads into remote areas, which in turn enables logging and wood extraction, but also the migration of settlers and the expansion of agricultural lands. This development is usually influenced by a combination of political factors (e.g. policies that foster deforestation, such as credits for plantation and agriculture expansion), economic factors (e.g. prices of cash crops) and cultural factors.

Another characteristic of indirect drivers is that they act at multiple geographical scales, which is important to take into consideration when developing measures to change their strength or direction. Drivers that are more important at the local (e.g. poverty, subsistence farming) and national scales (e.g. governance structures, national policies) can be better controlled by local or national decision makers or governments, however, they will have to adapt to international drivers such as international commodity prices. Up to now these international pressures have been difficult to control and many countries have only started to deal with the local and national factors of deforestation (Kissinger et al. 2012).

It is important to take a number of global trends and developments into account that are likely to shape land use dynamics in the future. Table 1 gives an overview of the most important developments that are likely to impact indirect and direct drivers (Kissinger et al. 2012). For agriculture, there are clearly a number of major trends that will change food systems and therefore impact land use in tropical countries. The need to substantially increase food production over the next few decades, as well as changes in diets to include higher consumption of meat, are examples of some trends that are likely to increase pressure on forests (Rademaekers et al. 2010). Population growth, coupled with rapid income growth expected in many emerging economies, will also fuel the demand for minerals and timber products as well as for land for infrastructure development and urbanization. With economic development, energy demand will grow in all countries leading to likely increases in biofuels and thus intensifying the competition between different land uses.

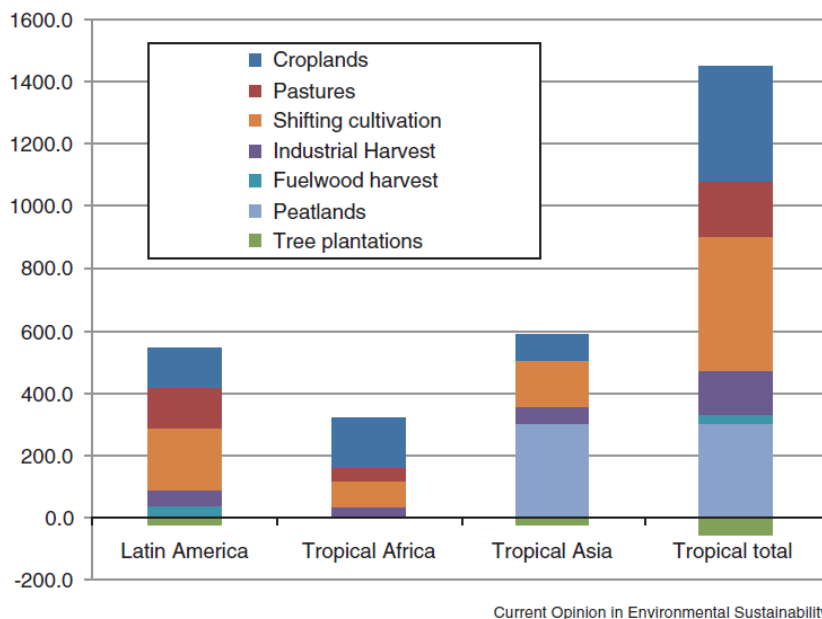
Table 1: Overview of major global trends important for governing drivers of deforestation and forest degradation in the future (Kissinger et al. 2012)

TYPE	MAJOR FEATURE TREND
Global population	<ul style="list-style-type: none"> • Global increase, predominantly in urban areas, to 8.2 billion in 2030 • Largest increases in population in Africa (+235 million) and Asia & Pacific (+255 million) • Stabilized population level of 8 to 10 billion after 2050 due to rising living standards, urbanization, and declining birth rates
Economic growth	<ul style="list-style-type: none"> • Brazil, the Russian Federation, India and China are anticipated to continue growing over the next ten years at 8% per annum (OECD/FAO, 2012) • Developing world will account for more than half of global economic growth throughout 2012/14 (World Bank, 2012)
Agricultural commodities	<ul style="list-style-type: none"> • Overall, 70% increase in demand for food products by 2050 (FAO, 2009)
Oil seeds	<ul style="list-style-type: none"> • 23% expansion of oil seed production between 2011–2020 (OECD/FAO, 2011) • Two-thirds of global expansion is expected to occur in the developing world • Developing countries (particularly Asia), will likely continue to dominate the increase in vegetable oil (and oilseed meal) consumption (OECD/FAO, 2011)
Oil palm	<ul style="list-style-type: none"> • 45% rise in palm oil output (mainly by Indonesia and Malaysia)(OECD/FAO 2011)
Meat	<ul style="list-style-type: none"> • 85% increase in the volume of meat produced by 2050 (FAO, 2009) • Developing countries will account for about 78% of the additional output, mainly in Latin America (Brazil) • Growth in demand from large economies in Asia, Latin America and oil exporting countries (OECD/FAO 2011)
Biofuels	<ul style="list-style-type: none"> • Global production expected to increase rapidly over the next ten years • Ethanol increasing from 100 to 160 billion litres and biodiesel from 20 to 42 billion litres from 2010 to 2020 (OECD/FAO, 2011)
Wood products (Pulp, Paper and sawlogs)	<ul style="list-style-type: none"> • Annual potential sustainable production capacity of plantations will reach in 2020 around 1.8 billion cubic meters per year • More than 80% of this potential is located in the tropics and other countries in southern hemisphere • Brazil, China and Russia will take over as world leaders with India and Vietnam increasing their relative market importance of the international trade of wood products by 2020 (FAO Advisory Committee on Paper and Wood Products, 2007) • International trade represents only 3.5% of the total global roundwood production (Rademaekers et al., 2010), thus domestic consumption, domestic fuel wood use and illegal logging are not represented in trade statistics
Fuel wood/ Charcoal	<ul style="list-style-type: none"> • People reliant on traditional biomass use globally will decrease by 175 million between 2008 and 2030 • 34% increase in fuel wood consumption from 2000–2020 for Sub-Saharan Africa (FAO, 2009)
Mining	<ul style="list-style-type: none"> • Projected to increase due to population growth and economic development • Developing countries and emerging markets will see greatest supply and demand expansion (PriceWaterhouseCoopers, 2012)

1.2. Direct agricultural drivers

The direct demand for forest land mainly comes from agriculture. Deforestation is largely driven by the opportunity of farmers or companies to capture forest rent by converting forests into pastures or croplands (Angelsen & Kaimowitz 2001). The most important drivers of deforestation are agricultural practises that involve the conversion of forest land to agricultural land, in particular shifting cultivation and commercial agriculture (see Figure 3, Houghton 2012). Shifting cultivation, a type of small-scale farming, typically involves clearing the land, burning much of the plant material to fertilize the shallow tropical soils, planting and harvesting crops for a few years, and then abandoning the plot of land (letting the land go fallow) before moving to a new plot (Lininger 2011). During the fallow period, forests can regrow, and be re-burned at a later date. Shifting cultivation is therefore typical in mosaic landscapes of forest, fallow and field. If the fallow period is long enough (over 10 years) the shifting cultivation system can be managed without major environmental consequences. Over the past decades, shortened fallow periods in many parts of the tropics resulted from population pressure, unclear land tenure rights or specific national policies fostering deforestation – until recently in a number of Latin American countries, for example, farmers could only maintain their land use rights if they kept the land forest-free. Often, other farmers moved in behind shifting cultivators and established permanent pastures for cattle or other staples or cash crops. Shifting cultivation prevails in regions with a low population density, e.g. in Laos, North East India and Mozambique. It can be anticipated that the importance of this driver will gradually decline. The relevance of commercial agriculture in contrast has increased over the last decades and it is now the most significant driver of deforestation. In Latin America, commercial agriculture, in particular the clearing of tropical forests for cattle ranching is a major driver of deforestation (Houghton 2012). Beef production differs from other kinds of livestock (pigs and chicken) because it relies on pasture and forage crops (rather than grain crops) to feed cattle. Stocking rates are generally very low, which results in the need for large amounts of land to produce small amounts of meat. This explains how cattle pasture has become one of the main drivers of deforestation in Latin America over the last few decades (Kaimowitz 1997, Boucher 2011). Another large source of emissions is the conversion of forests to permanent croplands which causes a significant loss in carbon density.

Figure 3: Carbon emissions resulting from various conversions of forests in tropical areas to other land uses in the period of 1990-2009 (Houghton 2012)



Sources (+) and sinks (-) of carbon (TgC yr^{-1}) from activities contributing to deforestation and forest degradation in tropical regions.

The draining and burning of peatlands for agricultural production (mostly oil palm) in Southeast Asia is another major contributor to global greenhouse gas emissions. Much of the forest clearing in Southeast Asia is driven by industrial plantation industries. The Indonesian government encourages deforestation by designating vast tracts of forest land for conversion to plantations through issuing concessions to small groups of individuals on very favorable terms (Saxon & Roquemore 2011). During the period of 1990 to 2005 at least 55% of plantation expansion in Indonesia and Malaysia entailed deliberate forest clearing (Koh & Wilcove 2008). An increasing percentage of palm oil plantations are established on former peatlands, which are cheap and not favorable to other crops.

2. Addressing agriculture as a driver of deforestation in the context of REDD+

To develop specific measures to reduce greenhouse gas emissions from agriculture, policy makers need to consider the differences between commercial agriculture and subsistence farming as a driver for deforestation and forest degradation. The relative contribution of subsistence farming to deforestation has decreased over the last decade, while the production of cash crops in plantation farming, such as palm oil and soybeans, has been a major cause of deforestation, particularly in Latin America and Asia.

Some of the measures to halt the expansion of agricultural lands, such as the enforcement of land tenure security, better ways to deal with the risk of agricultural production or effective information systems for land use planning, are needed in both commercial and subsistence agriculture. Other interventions – such as improving research and extension/information delivery systems, enhancing farmer’s access to capital, input supply and marketing chains – have to be tailored to the specific crops and farmer types.

Table 2 summarizes a number of possible intervention strategies to address the drivers of deforestation (modified and updated from Angelsen & Kaimowitz 2001) for smallholder and commercial agricultural systems.

Table 2: IPCC Data Tiers for Differences in Data Accuracy across Accounting Levels^{1,2}

Context and Driver	Strategies	Risks
Shifting cultivation, small scale forest penetration	New technologies can, in principle, reduce the need for land (intensification). Since this driver is expected to decline policies to accelerate this process should be adopted.	Farmers may still choose to expand land area. If migration is also attractive, the innovation can further increase deforestation. Technology often only adopted after forest land has become scarce.
Cattle Ranching	Improved pasture technologies, if adopted, tend to increase farm income and deforestation, presenting a win–lose situation. Policy packages have the potential for ‘win–win’	Capacity for monitoring and enforcement of zoning and other regulations needed to protect forests
Commercial crop production	Direct regulations (e.g. protected areas) and command-and-control measures needed. Economic incentives to shift activities to degraded lands.	Commodity booms tend to involve export crops since demand is generally elastic. Difficult to stop if institutional and access conditions exist to benefit from high prices.

While the focus for subsistence farmers needs to be geared more towards staple crops such as maize, rice, yams or beans (all crops for which research and extension systems have been neglected over the last 20 years until recently), commercial crop production requires a different crop focus. Many commercial companies have also their own researchers or research suppliers. Here the question is how to best bring climate and environmental

¹ Marshall, A.R., et al. Measuring and modelling above-ground carbon and tree allometry along a tropical elevation gradient. *Biological Conservation*, Vol. 154, Oct 2012, pp. 20–33. Available at: <http://www.sciencedirect.com/science/article/pii/S0006320712001607>.

² Gardner, T., et al. A framework for integrating biodiversity concerns into national REDD+ programmes. *Biological Conservation*, Vol. 154, Oct. 2012, pp. 61–71. Available at: <http://www.sciencedirect.com/science/article/pii/S0006320711004368>.

sustainability considerations into the companies' research priorities. This has to be done within the wider context of weakened research and extension systems for agriculture in many developing countries. Globally, the focus of agricultural research has, over the last 30 years, shifted towards the private sector, which understandably invests in the specific crops and farming system in their interest. This has left gaps in covering crops that are of location specific interest, such as tuber crops in Africa, but which are often important for smallholder farmers and food security in developing countries.

2.1. Commercial agriculture

There are three broad strategies to help commercial agriculture adopt more sustainable practices, namely the sustainable intensification of production, shifting production to degraded land and demand side measures. These strategies provide the enabling environment for land users to change production practices and tend to combine specific incentives and dis-incentives. Particularly when dealing with drivers that operate at the international scale, as is the case with many of the factors leading to the expansion of commercial agriculture, an integrated set of measures that include laws, taxes and/or regulations together with providing positive incentives for adopting more sustainable land use practices is essential to the ultimate success. This means that clear direct regulation has to support forest protection and other measures that help with land use planning and its enforcement, such as zoning. Countries would, for example, have to abandon government-sanctioned programs for the expansion of agricultural land into forests, mainly for commercial plantations of palm oil, rubber and other cash crops. These then need to be combined with incentive measures, such as credit and input schemes and adaptive research on new agricultural technologies.

2.1.1. Sustainable intensification of commercial agriculture

In order to satisfy expected future increases in demand for all kinds of agricultural products due to continued population growth and changes in consumption patterns, agricultural production will have to become more intense, efficient, environmentally friendly and less wasteful in order to avoid the further expansion into forest lands. Sustainable intensification practices that aim at productivity increase in a sustainable manner comprise of a wide range of land management methods which all need to be tailored to the specific ecological and socio-economic characteristics of the farming system. These include conservation agriculture and no-tillage practices, cover crops and crop rotations, integrated soil and pest management, agroforestry and the use of improved and better adapted crop varieties. New technologies are important to increase the output per land area and can help decrease the pressure on forests. Such technologies include high-yielding varieties, introduction of new crops, integrated fertilizer application and pest control, and improved fallows.

To date, intensification schemes mainly aim at increasing production outputs, placing the additional goal of preserving the natural resource base second. These more input intensive practices might then also result in increased greenhouse gas emissions due to higher fertilizer losses etc. Higher income at the farmer level can lead to relaxed capital constraints and stimulate further land expansion and farm investments. Depending on the relevant technology, the labor-market context and the role of credit, technology-driven policies that support intensification can also further increase the pressure on forests. To avoid these effects it is essential to design intensification programs with appropriate safeguards and in the context of regulations that protect forests and avoid negative environmental outcomes.

Sustainable intensification in farming practices needs to be embedded in a wider framework of sustainable land management schemes. There is currently a strong debate under way between proponents and opponents of the so-called land-sparing hypothesis. This theory maintains that increased productivity and higher yields resulting

from more intense production methods will help to decrease the pressure on forests because commodity prices and the need for more farmland decrease due to higher supply. Evidence is currently emerging that this theory works only when a number of conditions are met that allow for halting the expansion of the agricultural frontier which could occur as land values increase due to higher yield outcomes per unit of land. An analysis by Rudel et al. 2009 of cropland area changes in 161 countries for ten different agricultural commodities demonstrated that cropping areas only declined with intensification of production when conservation programs were in place and the country imported grains. This also points to the need for strong land tenure security and land use planning and zoning. Large scale and commercial agriculture intensification programs also need strong regulation and command-and-control measures. Forests would need to be put under protection and the issuance of forest conversion concessions discontinued.

2.1.2. Shifting production to degraded lands

The UN Food and Agriculture Organisation estimates that 25% of all agricultural land worldwide is severely degraded (FAO 2011) with another 8% classified as suffering from moderate degradation, all of which leads to a direct loss in agricultural productivity and other ecosystem services that agricultural lands provide. This increases the need to put more land into production. As can be seen in Figure 4, China and India are particularly affected, but also the Mediterranean region of Europe, parts of Central Asia and various developing countries in Asia, Africa and Latin America. Figure 5 names the major factors causing land degradation all of which result from human activities, mainly agriculture.

Solutions to the various specific forms of degradation such as erosion, salinization or pollution are well known. Conservation agriculture, agro-forestry systems, the use of cover crops and integrated soil management systems have proven to be agronomically viable options to restore soil fertility and curb other degradation problems while also increasing or stabilizing yields. However, adoption of new land management practices has been lacking in many parts of the world due to perverse incentive structures, difficulties in dealing with risk, and the lack of capital, inputs and/or knowledge needed for the implementation of the new practices.

These are institutional and economic problems that all farmers face, but commercial farmers tend to have better means to overcome some of these obstacles compared to subsistence farmers. Therefore, various examples exist where degraded lands could be reclaimed via the establishment of agroforestry systems for cocoa, or plantations for rubber, palm oil or teak. But regenerating organic soil matter and soil fertility is a slow process as it will take quite a few cropping cycles to replenish the soil, making the transition risky and sometimes also capital intensive. In addition, most of the practices are knowledge intensive and require a good understanding of the agro-ecology of the damaged lands.

Governments can help with achieving the reclamation of degraded lands. Specially designed lending schemes and other financial incentives can help bridge the transition time. Tax breaks for farmers putting degraded land into production is another way of making this practice more attractive. Funds to deal with the risks during transition can be designed to take effect if expected yields fail to achieve necessary output levels. Adaptive research to tailor new practices to the specific agro-ecological settings can help to reduce the knowledge gap for farmers, however, enhancing the extension and knowledge delivery system to familiarize farmers with the new practices also needs to be part of this scheme.

Figure 4: Agricultural Systems at risk of land degradation (FAO 2011)

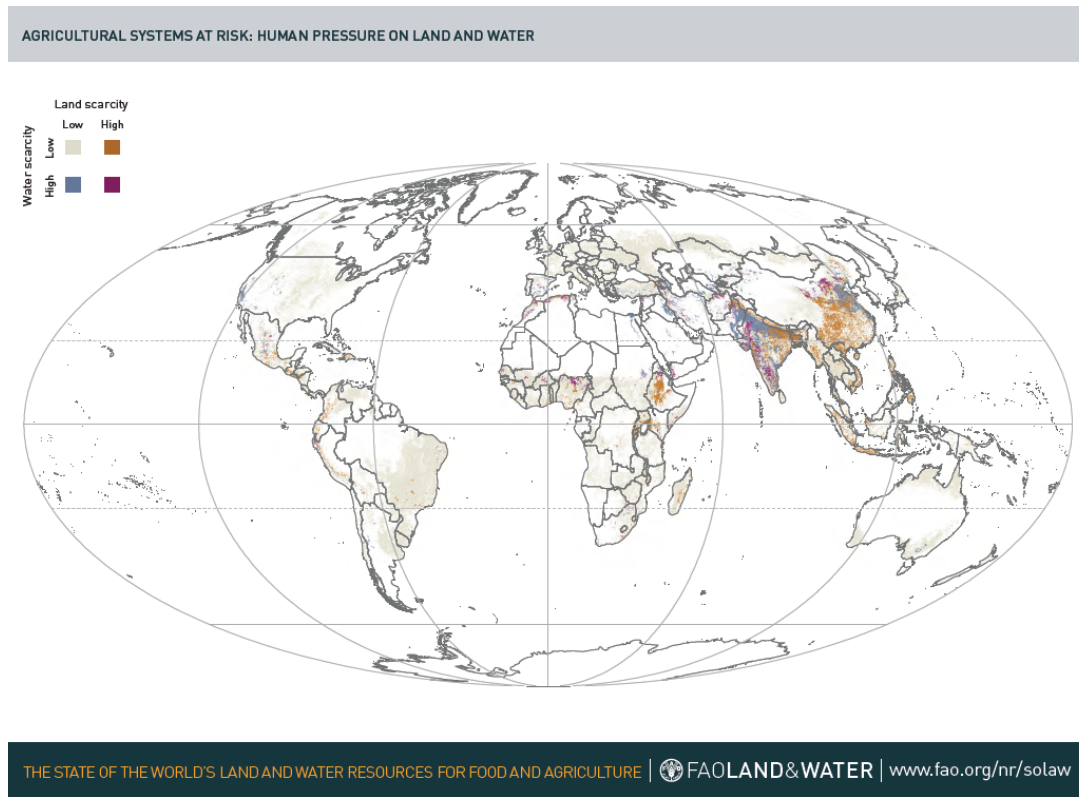
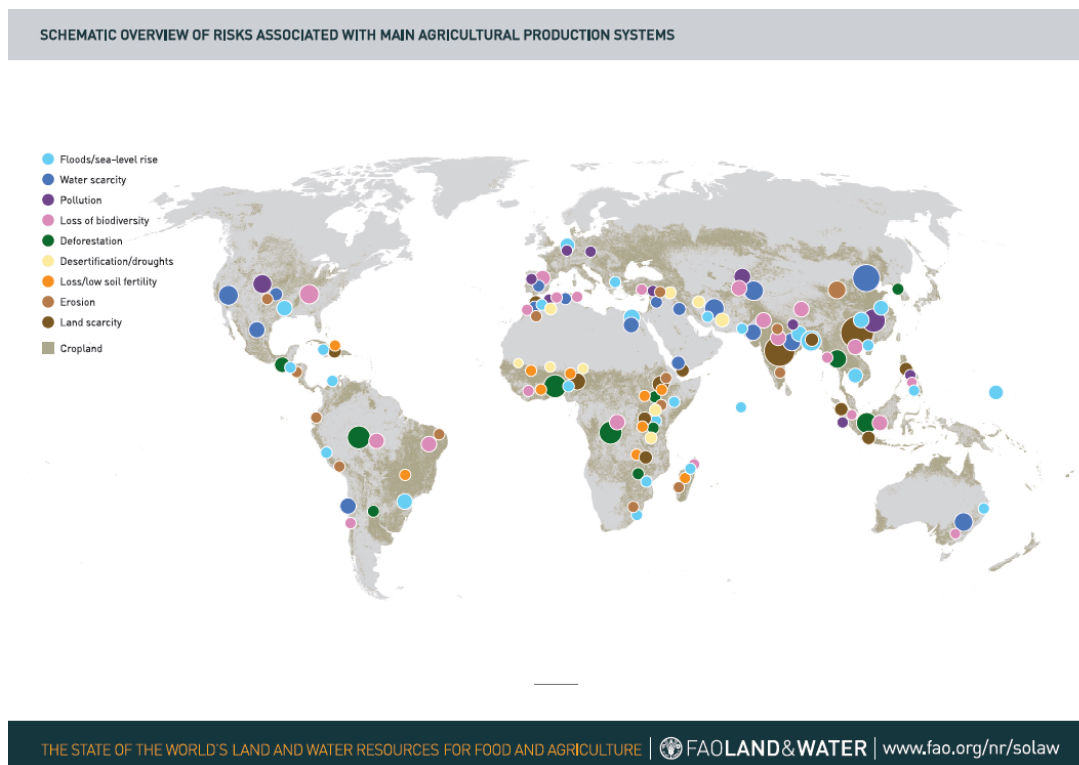


Figure 5: Risk factors associated with agricultural systems



2.1.3. Demand-side policies

Demand-side policy tools complement public funding schemes (e.g. grants, loans and tax credits) that tackle the 'supply-side' of deforestation. Demand for agricultural commodities is global and any attempt to reduce deforestation needs to be paired with a long-term market transformation towards sustainable agricultural supply chains. It is therefore important that demand-side policies go hand in hand with supply side attempts to change farmer behaviour. Relevant demand-side measures include:

- Market incentives (public procurement policies, labelling, consumer awareness campaigns)
- Supply chains and business-to-business links (private sector responsible sourcing policies, certification systems)
- Accountability and transparency (monitoring and reporting of commitments for sustainable sourcing and production, sharing of information on best practice)

One possibility for governments to help deal with indirect deforestation drivers is to facilitate commitments between suppliers of agricultural raw materials and food processors in their respective countries to source from deforestation free sources. The Dutch government for example wants to ensure that by 2015, only sustainably produced palm oil enters the Netherlands and is used in food processing. For that, the government works together with the Dutch Sustainable Trade Initiative and the Dutch Board for Margarine, Fats and Oils (Nathalie Walker, personal communication). The UK government has started a similar initiative and is also preparing collaboration with the Chinese government on this issue. As for soy, the Dutch government also directs its feed industry to only source sustainably produced soybeans. Other European governments, such as France, Spain, Portugal and Germany may start similar efforts (Kissinger et al. 2012). However, despite their need and advantages, it is important to acknowledge that demand-side measures are unlikely to result in many GHG emission reductions in the short term. Their success depends, among others, on consumption patterns in countries such as China and India that contribute a substantial proportion of the increasing demand.

2.2. Subsistence and smallholder farming

Smallholders are a large and spatially dispersed group with heterogeneous interests (Birner et al. 2010). Each farm has its own specific suite of characteristics based on variations in resource endowment and family circumstances. Individual farms are organized not only to produce food, but also to meet other household goals. Smallholder activities and related income often consist of a range of interdependent gathering, production and post-harvest processes. Besides cropping and livestock keeping, household livelihoods can encompass fishing, agroforestry, as well as hunting and gathering activities (Dixon et al. 2001).

Sustainable agricultural practices can increase smallholders' resilience to climate change, improve their food security and contribute to the global goal of reducing greenhouse gas emissions. However, changing common practices in smallholders systems is not an easy task. It requires smallholders to invest capital and labour in techniques that are often unfamiliar to them (Streck et al. 2012). Impediments to the dispersion of new technologies and improved practices can occur at different stages, from inception to uptake of agricultural innovations by resource-poor smallholders. The most binding constraints often occur at the adoption stage: poorly functioning input and output markets, weak local institutions and infrastructure, or inadequate extension systems. The lack of credit and insurance markets also often prevent smallholders from accessing and using new technologies and practices (Lybbert & Sumner 2010). These barriers, summarized in Table 4, may be exacerbated by a lack of savings or liquid assets, especially when coupled with weak land tenure security.

Table 4: Barriers to the adoption of improved agricultural practices among smallholders (Streck et al. 2012)

Investment Barriers	Social/Institutional Barriers	Technological Barriers
Lack of assets and savings	Poorly functioning markets	Lack of technical expertise
No or little access to credit or extension services	No or limited market access	Existing resource degradation (for example soil/water)
No or little access to insurance	Limited market information and understanding	Lack of baseline data (for example forest or soil carbon content)
Lack of infrastructure and equipment	Weak land tenure security	

Given the varied nature of farming systems across the world, incentives for a change in practices must be tailored to local realities and supported by a general set of enabling socioeconomic conditions. Effective policies must identify the most important and relevant barriers and address them. Such policies may, among others, clarify or create rights to land, or the benefits from its use; provide access to markets; or strengthen institutional arrangements, such as credit services and extension systems. Policies could also enhance access to resources, increase productivity, or build local capacities for implementing sustainable management techniques. In the following sub-sections, we will discuss strategies to reduce the carbon impact of smallholder farming systems on forest ecosystems.

2.2.1. Intensification in smallholder systems

To reduce pressure on the forest frontier, measures that support intensification in smallholder agricultural systems should be labor intensive to avoid increased pressure on the forest and negative social consequences in case other sectors cannot take up newly available workers.

Capital-saving technologies include measures that improve input efficiency by controlling nutrient losses and reducing pesticide use through crop-residue management strategies, erosion control measures and integrated pest management practices (Roebing & Ruben 2001). Labor-saving technologies involve better timing of operations and mechanization of soil preparation, sowing and fertilizer application. Since tropical soils often have low fertility, crop residuals like mulch can add organic matter and nutrients to tropical soils (Elias et al. 2011). Legume cover crops (which add nitrogen to the soil, improve tree fallows, and lengthen rotation times to allow nutrients to be regenerated) are good alternatives to pricey fertilizers. Government supported fertilizer programs could also be considered in combination with support for sedentary agricultural systems (Angelsen & Kaimowitz 2001). These technologies increase yields and hence the income of farmers who adopt them. They can be applied in areas already cleared and in areas located away from forests, but may not be appropriate at the agricultural frontier.

The key for smallholder intensification at the forest frontier is to define strategies that farmers are willing to adopt and at the same time avoid an inflow of migrants (Angelsen & Kaimowitz 2001). Smallholder farmers are normally both capital and labor constrained. Because of lack of available workers, they tend to prefer technologies that save labor. Nevertheless, under certain circumstances, farmers may adopt labor-intensive technologies, even on the agricultural frontier. The most common examples involve high-value crops and dairy products whose production is intrinsically labor-intensive, such as bananas, cheese, coffee, coca leaves, pineapple and vegetables (Angelsen & Kaimowitz 2001). Labor-intensive technologies also benefit the poor more than capital-intensive technologies that displace labor to the agricultural frontier.

In addition, research in tropical crops should be promoted in the context of REDD+. Yields of tropical crops are consistently much lower than those in the temperate zone, and only part of the difference is due to climate and soils (West et al. 2010). New research and development is needed to breed higher yielding varieties, and governments could develop policies (e.g., agricultural extension programs) to encourage their use. Increasing research and development and agricultural capitalization can also help direct intensification (Elias et al. 2011).

2.2.2. Agroforestry systems

The potential for synergies between REDD+ and strategies that promote food security is particularly high for agroforestry as it does not take significant amounts of land out of food production. Agroforestry systems that are an intermediate between natural forests and intensive food crop systems can conserve and sequester high amounts of carbon and generate moderate to high income for farmers compared to other land uses (ASB 2008). The mixed-use of multi-species systems provides a number of benefits. Trees produce shade for livestock, fuel-wood, fruits and nuts. Tree root systems can also move nutrients up from deeper soil layers, helping with restoration of degraded land (Elias et al. 2011). Agroforestry also has the additional advantage of doubling the mitigation benefit by potentially removing deforestation pressure from forests and increasing the storage capacity of the agricultural system (Montagnini & Nair 2004). Agroforestry systems are particularly appropriate for mosaic land-use systems with a variety of competing interests and shifting uses.

Agroforestry requires substantial extension and financing support that is often not available within the context of small scale farming systems. Specific financial incentives (e.g. payments for ecosystem services) could help low-carbon options to succeed whilst meeting the multiple objectives of carbon, biodiversity and poverty alleviation. Most high-carbon and high-profit systems though take 3-5 years to recoup initial investments compared to other food crop systems (ASB 2008). Such long waiting periods can be prohibitive for small-scale farmers. REDD+ payments can help to support the transition from the baseline agricultural system to the agroforestry system. However, to be able to access to such incentive mechanisms, farmers have to overcome potential financial, capacity and knowledge constraints. Eventual benefits related to the adoption of new practices have to outweigh the costs associated with the removal of associated barriers, both for the farmers and the policy makers in charge. The most prohibitive barriers that prevent smallholders from accessing new technologies and practices often occur at the adoption stage: poorly functioning input and output markets, weak local institutions and infrastructure, inadequate extension systems, and missing credit and insurance markets.

2.2.3. Enabling environment

The implementation of market-oriented and other policy incentives for direct investments into REDD+ and agriculture will depend on the availability of appropriate institutions and regulatory readiness (see Box 1). Readiness and capacity building funds may help to set up the various policies, while international, results-based climate finance may (co-)finance the implementation costs, in particular for payments for ecosystem services, loan or guarantee programs.

Box 1: Agro-REDD+ readiness activities

Formulate a national strategy on REDD+ and agriculture: Identify promising agricultural practices, technologies, food system innovations and policies that remove pressure from forests, and formulate a strategy that improves policy alignment across different ministries and planning processes.

Define data and capacity needs: Close knowledge and scientific gaps by designing capacity and technology support programs.

Establish institutional framework: Investment in institutional infrastructure that supports the adoption of new agricultural practices through extension, training, capacity building and the provision of inputs (e.g. seeds).

Support land-use planning and tenure reform: Investment in land use planning and tenure reform to support sustainable land management practices, enforcement, monitoring and improved governance.

It may be worth underlining the importance of land tenure and its relevance for REDD+ implementation. Land titles increase the value of land, which can be used as collateral. There is also a positive correlation between conservation and land title, both for individual farmers and communities, since better land stewardship tends to stem from secure land access.

3. Financing options and private-public partnerships in the context of REDD+

It is important to tailor and target REDD+ funding to where it can be most effective, while bearing in mind the multiple objectives the supported policy or measure is expected to fulfill. For instance, financial mechanisms capable of providing ex-ante funds to smallholders, such as transition cost subsidies, could be used to cover start-up transaction costs that might otherwise prevent poor smallholders from changing agricultural practices. However, to increase the effectiveness of the program, ex-post payments through payments for ecosystem services (PES) approaches could be prioritized where farmers can cover ex-ante costs. In both cases, climate finance can also support climate specific costs, such as costs associated with aggregation of farmers, measurement, reporting and verification (MRV) systems or training of extension systems, financial institutions or certification bodies (Streck et al. 2012).

Given that ex-ante funds are made available before performance can be measured or ensured, it is likely that they will come in the form of grants or loans from public climate funds. They can come from results-based or market payments if advance payments are considered or financing institutions accept future payment streams as satisfactory collateral. The private sector can also make up-front payments available to farmers with which they contract, for example, as a form of investment in anticipated future benefits. This might include farmers in the supply chain of a carbon label product, or in the establishment of a pilot project that might inform future market entry. Table 5 summarizes the financial instruments that can support REDD+ while addressing agricultural drivers.

Table 5: Potential financial instruments to support REDD+ (from Streck et al. 2012)

Instruments	Strategies	Advantages	Disadvantages	Application
Payments for Services	Payments for conservation efforts, tree planting, improved agricultural management, etc.	Increases financial attractiveness of alternative practices, results-based.	Relies on local institutions, implementation and enforcement capacities.	Policies Programs
Payments for GHG Emission Reductions and Removals	Market transactions for emission reductions credits; monetization of (future) emission reductions.	Increases financial attractiveness of projects that might not otherwise be feasible. Direct link to mitigation benefits.	Requires significant area as well as effective management and benefit-sharing.	Programs Projects
Debt	Preferential loans that subsidize particular inputs/ Practices	Sources of financing for technology, labor, and other investments.	Requires collateral and revenue stream; repayment risk; difficult to find local lenders.	Programs Projects
Tariffs, Taxes	Tax-incentives to support policy objectives; enhanced tax deductibility and tax rebates; removal of taxes that create perverse incentives.	Steers investment into activities that would otherwise be economically unrewarding.	Comparatively costly to set up; relies on tax discipline and collection, limited relevance for smallholders.	Policies

Grants	Financial support to projects that serve the public interest, often provided by governments or non-for-profit organizations.	Increases the financial attractiveness of projects that might otherwise not be economically feasible; comes at no cost for smallholders.	Availability is limited and continuity is uncertain; unlikely to cover entire investment cost.	Programs Projects
Insurance	Weather, political and crop insurance; other risks.	Shifts investment and adoption risk away from smallholders.	Inappropriate use distorts markets, excessive risk taking.	Policies Programs
Loan Guarantees	Mitigation of political or credit risks in public or private sector loans.	Effectively mobilizes co-financing from external sources; leverage potential for long-term debt finance for development.	Risk of principal loss for issuer of guarantee.	Policies Programs
Public-Private Partnerships	Financial and policy support for targeted investments.	Flexible model accommodates multiple instruments; proven in large-scale project investments.	Historically favored larger investment projects. Risk of benefits accruing to larger private players rather than smallholders.	Policies Programs
Labeling and certification	Voluntary initiatives, supply chain investments,	Pilots can inform public policy; can result in large investment if high market demands.	Transaction costs of verification and certification may be prohibitive for smallholders, price premiums uncertain.	Policies Programs

3.1. Reduce or redistribute risk

Achieving the adoption of more sustainable farm management practices on the ground has been difficult as the change in farming practices always carries a certain economic risk for farmers and the new practices are often knowledge intensive and more complex than some of the conventional practices and might require different inputs. Providing the incentives as well as the enabling environment for a shift to sustainable intensification to occur therefore calls for having a strong research and knowledge delivery/extension system that provides farmers with ecologically appropriate *and* economically sound farming methods and tailored financial schemes that allow for the needed investments in farm inputs (labor, technology, etc.), and mechanisms that help farmers deal with the risk of the transition. REDD+ payments could contribute to this overall transition and achieve strong leverage if they are to go hand in hand with the investment plans for the agricultural sector and vice versa.

The coverage of risk associated with changing practices is particularly important for smallholder farmers. Reducing transition costs (e.g., the private sector paying for new technologies) and risks (e.g., the private sector

insuring farmers against potential yield reductions as a result of participation) would facilitate the engagement of farmers. National and local governments can work with private companies to create insurance mechanisms that cover the risk of reduced yields or a fund for transition costs to cover the extra costs associated with the new practice. This would incentivize smallholders to increase production intensity or, depending on the modalities of the fund, cover costs of certification of deforestation-free products.

Governments can also use funds to support the participation of smaller farmers in initiatives that seek to formulate sustainable production standards. In partnership with local farmer organizations and agricultural companies, governments may also set up funds that cover the costs of certification through grants or concessional loans. Where premium payments reward certification and improved practices, smallholders could repay the investment received (or part of it), replenishing the original fund so that it can continue support new entrants.

3.2. Direct financial support

REDD+ can also be supported through direct financial incentives for forest and habitat protection. Such payments include subsidies or incentive payments. Subsidies can be paid, for example, to support the rehabilitation of degraded land. Incentive payments are “payments for ecosystem services” (PES) that support particular practices. Carbon payments are a special form of PES payments that reward emission reductions or carbon sequestration. There are many ways to implement PES programs, and some include (Wunder 2007): (i) Government payments for services that benefit entire regions; (ii) Premiums on “greener” products, such as those that do not use fertilizers or pesticides; (iii) Natural-asset-building payments for environmental restoration of degraded land; (iii) Use-restriction programs that generate payment for direct conservation of forests and soils. In countries as diverse as Costa Rica, Mexico, Vietnam and China, PES schemes are integrated into public policies where the government pays on behalf of service users or in defense of a national or international environmental good. Sometimes public payments are cross-financed through contributions from selected industries or other beneficiaries of the environmental services (Wunder 2007).

Governments can set up funds or credit lines that support small projects and aggregate risk. Such credits can be made available for specific investments and be linked to a change in practice. They can facilitate the acquisition of new technologies, cover increased labor costs, or provide smallholder farmers with credit and capital to make investments needed to adopt improved agricultural practices. This is particularly relevant when PES or other results-based payment schemes would fail since farmers do not have the financial resources to make ex-ante investment to implement new practices and improved farming techniques that could be rewarded with ex-post payments.

3.3. Integrated Investment Packages

Agriculture attracts billions of dollars in new private investments. The private sector contributes about two thirds of global investment and financial flows, both through local investments and through foreign direct investment.³ A 2010 survey conducted for the Organization for Economic Co-operation and Development (OECD) estimates about USD14 billion of private capital has been committed to farmland and agricultural infrastructure investment globally among more than 50 firms active in this area. UN statistics show foreign direct investment in global agricultural production tripled between 1990 and 2007 to USD3 billion annually from less than USD1 billion (HighQuest Partners 2010).

³ The most recent FAO estimates are that about 30 percent of the total agricultural investments come from the public sector, while private investment accounts for 70 percent (Schmidhuber et al. 2009).

Few farmers in developing countries benefit from these investment flows. They are often the sole investors into their operations. However, public policies can stimulate outside investments into agricultural production that benefit smallholders, such as financial concessions, including tax incentives, co-financing of critical infrastructure and training and capacity building programs, as well as funds to help with environmental and social-impact assessments (Hebebrand 2011). Developing country governments may start by analyzing the role of external investment into domestic farming systems and developing a strategy to encourage investments that benefit smallholders and are in line with the public policy objective of the country.⁴

Public-private partnerships (PPP) can encourage sustainable investments through sharing risks and rewards, providing loans and credit, or providing needed training. PPPs are based on agreements between a public agency and one or several companies to share skills and finance in delivering a service for the general public. They are also a tool to encourage the private sector to undertake an activity that it would not do otherwise, either because of high risk or low returns on investment. Public agencies in the agricultural sector generally see PPPs as a means to attract investment, while private entities often benefit from a reduced investment risk. Farmers benefit through training, higher quality seeds, or access to capital.

While there is clear benefit to enhancing dialogue between private sector companies and governments around shared needs, goals, and objectives, it is important that each party identifies what it can bring to the table for a given geographic scale. For instance, a local government may not have the necessary financial resources to extend credit to smallholders, while a private sector company may not have sufficient contacts or standing in a community to build capacity. In this case, the company could provide the finances for credit, while the government could work with the company to build capacity. Coordinated efforts at the landscape-level can leverage significant and scaled-up investment.

Forest protection has to be combined with development opportunities and increased income at the farm level. An integrated REDD+ strategy should direct local communities and farmers away from the forest frontier (support for changed agricultural practices, intensification, ecotourism) or reward them for serving as stewards of the forest (payment for ecosystem services and conservation), with the appropriate choice being dependent on the local institutional and economic conditions. Both activities can go along with the creation of protected areas. In the context of REDD+, the concept of integrated conservation and development projects has been moved from the project to the regional level. Landscape-level approaches seek to integrate various activities and objectives at the landscape scale. This includes economic development, market access, decentralization, and food security, but also the protection of watersheds, forests, and biodiversity. No matter how successful individual projects may be, the overall economic and environmental context will define the sustainability of individual community initiatives. It is therefore necessary to address potentially conflicting resource and economic objectives at a broader level. The most crucial trade-offs at the landscape level relate to the proportion of the landscape which is devoted to different land-uses (such as agriculture, enriched secondary forests, short-rotation plantations, etc) and the spatial location of each of these different land-uses (ITTO 2005). Once the trade-offs have been established, integrated investment packages combining sources of funds can help to achieve a coordinated set of goals. Coordinated policy-packages hold also the potential to leverage significant private sector resources.

So far, no examples for strategic investment packages around REDD+ exist. However, early projects that seek to promote rural development in the context of public private partnerships hold lessons for REDD+. Two pilot growth corridor investments that have undergone multiple feasibility studies and investment plans since 2010 – the Beira Agricultural Growth Corridor in Mozambique and the Southern Agricultural Corridor of Tanzania–

⁴ Since not all investments may actually benefit smallholders, national interests, or supported global goods, the FAO, IFAD, UNCTAD, and the World Bank are collaborating with governments to develop an international code of conduct for responsible agricultural investment (Hebebrand 2011).

include smallholders in their target group and are calling for several billion dollars of private and public investment, involving many large transnational corporations, small and medium businesses, multilateral institutions, NGOs/universities and government agencies (see Box 2). The challenge will be to integrate investment projects into resource management plans. The additional environmental considerations should be supported with REDD+ and other environmental (biodiversity) funds. Integrated investment packages can include PES or subsidy incentives to support the shifting of agricultural expansion to degraded lands by creating targeted investment incentives. The REDD+ spatial zoning plans (integrated land-use planning) can support the decisions for allocation of investments in agricultural practices per different geographical areas.

Box 2: Developing agricultural growth corridors

The investment blueprint for the Beira Agricultural Growth Corridor (BAGC) was launched in 2010. The Beira corridor is the gateway to South East Africa, linking inland areas of Zambia, Malawi, Zimbabwe, and Mozambique by road and rail networks to shipping facilities at the Indian Ocean at Beira. The project aims to boost agricultural productivity in Mozambique and the wider region through significant investments in agriculture-supporting infrastructure, particularly irrigation. The plan aims to increase farmer revenue to more than USD 1 billion per year through vastly improved agricultural practices, lower operating costs, and better access to domestic and global markets. The BAGC report shows that USD 250 million of patient capital could induce private investment in Mozambique of more than USD 1 billion, while creating more than 350,000 new jobs over a 20 year period. This would benefit more than 200,000 smallholder households, many of which would gain access to affordable irrigation.

The investment blueprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) was launched in January 2011, and aims at harnessing the agricultural potential of Tanzania through links to the port of Dar es Salaam, and to the neighboring countries of Malawi, Zambia, and the Democratic Republic of Congo. The project calls for developing six clusters of profitable, small-, medium- and large-scale farms and associated agribusinesses, centered on areas of particularly high agricultural potential. Among other objectives, the SAGCOT blueprint seeks to commercialize smallholder production by incentivizing stronger connections between smallholders and commercial agribusiness. To accomplish this, the blueprint calls for “hub and outgrower” schemes, in which smallholders in the vicinity of large-scale farms will be able to access inputs, extension services, value adding facilities and markets. The blueprint aims to convert tens of thousands of smallholders into commercial farmers with access to irrigation and weather insurance, while lifting more than two million people permanently out of poverty by 2030.

3.4. Supply chain measures

Over the last few years, a number of food processing companies have started to develop private commitments to source more or only sustainably produced agricultural raw materials, thus greening their supply chains. A good example of this is the Consumer Goods Forum which brings together over 400 manufacturers and retailers who have committed to reducing their environmental impacts and want to source deforestation free beef, palm oil, soy and paper products by 2020.⁵ Forward-looking companies, such as Unilever, have made special commitments and pledges to increase the sustainability of their supply chain.⁶ That said, most companies seem to be mainly

⁵ <http://www.theconsumergoodsforum.com/index.aspx>

⁶ Unilever has committed to 100% sustainable sourcing in 2020.

interested in working within their own supply chains and have limited interest to expand their activities to cover broader environmental concerns (such as REDD+). To meet these commitments, it is essential to increase the transparency and traceability through out the supply chain. Governments can play an important role here in providing public goods, such as information and monitoring systems or reliable certification schemes that can enable the private sector to fulfil their commitments.

Commodity roundtables bring together food manufacturers, purchasers of agricultural commodities, producers and other actors along the supply chain for a particular product, such as palm oil, cotton, sugar, biofuels or beef/livestock. They aim at developing joint sustainability principles, production standards or certification schemes around the particular commodity in order to reduce deforestation pressures and other environmental production impacts. A number of countries are seeking to include zero deforestation as a criterion for certification. The challenge with certification schemes is how to increase the scale of these schemes to cover more than just project sites (Kissinger et al. 2012).

3.5. Support the enabling environment

Although there is widespread recognition that the success of REDD+ is closely linked with the agriculture sector, too often policy, institutional arrangements, and funding channels for climate change, REDD+, food security and rural development are poorly coordinated. It is important that in parallel with creating investment incentives, REDD+ funds are used to build an enabling environment for long-term sustainable land uses. Tenure security, strong institutions and reliable legal systems attract investors, whereas the lack of these conditions keeps monies away. While institution building is long and cumbersome, it should be supported in parallel with concrete REDD+ measures. Other, more concrete and short-term activities include data collection, policy development, and the support of demonstration activities. In addition, REDD+ finance can play an important role in supporting initiatives to build capacity and train farmers and local organizations.

Pursuing demonstration activities will result in country-specific data and knowledge as well as experience with agricultural practices and policies that could inform long-term national strategies. A strategy that brings together prioritized action, financial incentives, investment policies, institutional arrangements, tenure security, and aggregating mechanisms constitutes an important step in the transition to sustainable agriculture (Meridian 2011).

4. Decision criteria for public REDD+ co-investments

Deciding on the appropriate strategies to address REDD+ drivers requires a set of criteria and a process that can help to discern the measures that can be most effective within the context of national REDD+ implementation. Agricultural and forestry sector drivers of deforestation work at different geographical scales. Therefore one important consideration is to decide on the appropriate intervention level. This also needs to include consideration of the targeted actors and the appropriate institutional arrangements to support particular policy interventions.

4.1. The appropriate intervention level

Table 6: Examples of incentive, dis-incentive and enabling environment measures at various scales

Instruments	Incentives	Dis-incentives	Enabling Environment
International Scale	<ul style="list-style-type: none"> • Certification schemes for deforestation free products • Support credit lines and programs that create access to finance for smallholders • Create direct financial incentives through carbon payments • Research and development of appropriate technologies • Technology transfer and support • Support for protected areas 	<ul style="list-style-type: none"> • Import moratoria • Mandatory labeling and import restrictions (with potential trade implications) 	<ul style="list-style-type: none"> • Effective information systems • Transition costs support (covering the costs and risks of certification and change in practice) • Capacity building and institutional strengthening at the national and local level
National Scale	<ul style="list-style-type: none"> • Revision of subsidies and establishment of incentive systems • Declaration of protected areas • Land zoning and planning • Strengthening and training of extension services • Certification schemes for deforestation free products • Research in crops important at country level • Technology support 	<ul style="list-style-type: none"> • Moratoria (on products from deforested land) • Land-use regulations • Land zoning and planning 	<ul style="list-style-type: none"> • Land tenure security • Institutional capacity and reform • 'Good governance' (transparent and accountable governance systems) • Building of stakeholder support
Local Scale	<ul style="list-style-type: none"> • Payments for environmental services • Adaptive research into specific farming systems • Targeted training of incentive services 	<ul style="list-style-type: none"> • Zoning • Taxes • Fines for forest clearing 	<ul style="list-style-type: none"> • Participatory landscape and forest management • Enhancing governance performance • Resolving land tenure issues

Interventions will need to occur at three scales - international, national and local - where the driving factors operate. Actors in these different scales are diverse, though their decisions can be interrelated and influence each other. As international drivers of deforestation are difficult to control by national or sub-national actors, such as national governments or local authorities, it is easier for these actors to concentrate on the sphere they can

influence most. This is currently the case with the majority of the REDD+ strategies and interventions proposed by countries that have to deal with tropical deforestation issues (for an in-depth analysis of these strategies see Kissinger et al. 2012). That said, for REDD+ strategies to be successful, actors at all three geographical scales will have to be reached. This is when donor governments, together with other actors such as national governments in deforestation countries, local communities that depend on forests, national and international NGOs and the private sector operating on all three scales, have an important role to play and often also need to coordinate their actions. In each of the scales policy makers, in particular national governments, can consider three kinds of interventions to induce behavioral change: incentives, dis-incentives and creating the enabling environment for changes to take place (Börner et al. 2012). See Table 6 for policy incentives at various scales.

4.2. Deciding on REDD+ interventions

Planning interventions to reduce the pressure of agriculture needs to be based on an analysis of the main direct and indirect drivers in the particular country or location and their interactions. This analysis should also include a mapping of the main actors associated with the specific drivers to help decide on the best intervention points. For example, if deforestation is more driven by the expansion of smallholder agriculture rather than by new commercial plantations, the scale as well as the type of interventions that a government could pursue would change. In this case of smallholder agricultural expansion, interventions may include: promoting the labor-intensive sustainable intensification of important staple crops and rural development policies addressing income generation, land use rights and the protection of forest lands. These are all measures that lie within the possibilities of a national government in a developing country. In contrast, halting deforestation due to commercial agricultural expansion requires not only the promotion of sustainable agricultural practices but also needs strong legal mandates. Here, demand side measures can support policy efforts in developing countries.

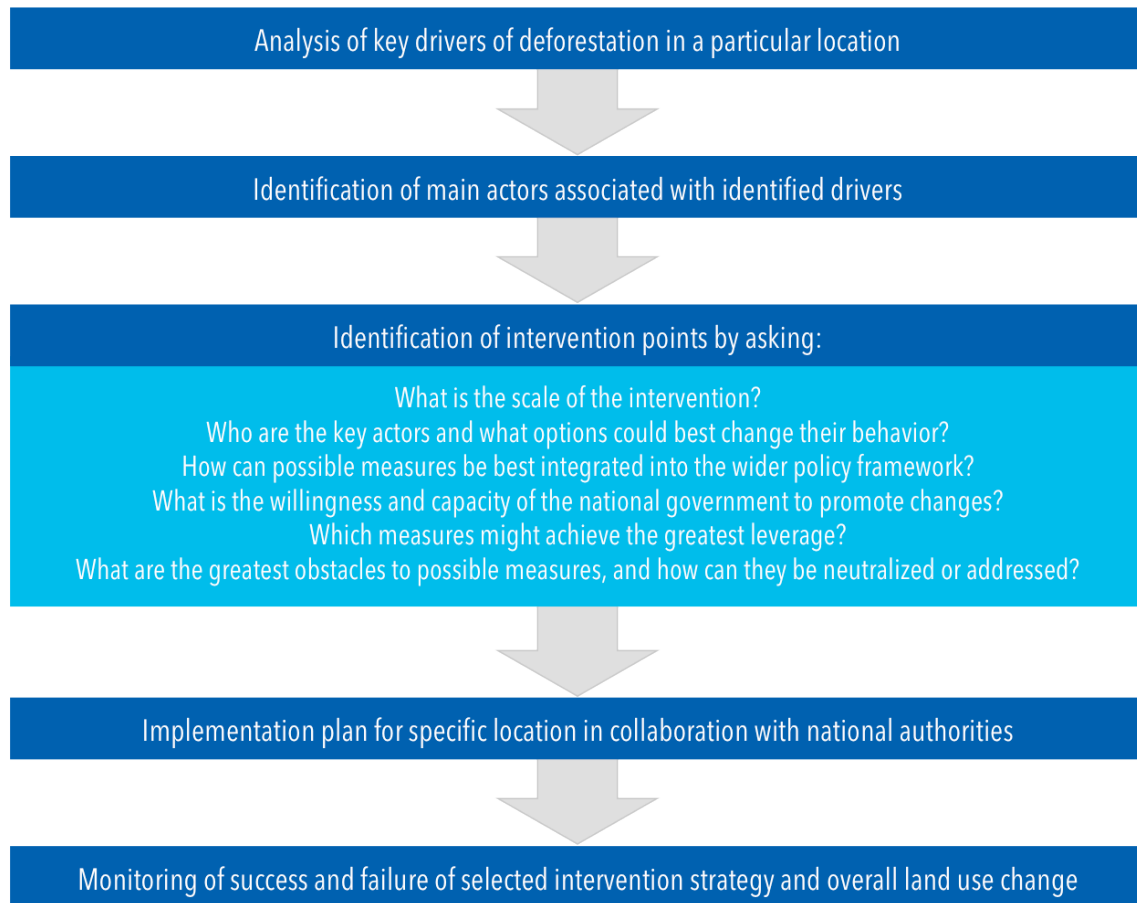
A step by step process could therefore help design interventions that can best leverage the available funding (see Figure 6). After a basic analysis of the key drivers for the expansion of agriculture and their associated actors, a set of intervention points can be identified. Here are some questions that may help guide the course of action: what is the scale of the intervention (international, national or local scale, also see Table 3);

- who are the key actors and what options could best change their behavior (incentives, dis-incentives and creating the right enabling environment);
- how can possible measures be best integrated into the wider policy framework governing the agricultural sector and rural development plans in a specific country;
- what is the willingness and capacity of the national government to promote changes and integrate possible measures to change the performance of the relevant sector;
- which institutional arrangements would best support the identified policy or measure;
- which measures might achieve the greatest leverage as they overlap with other national or international initiatives with similar goals;
- what are the greatest obstacles to possible measures, and how can they be neutralized or addressed; and
- which training and capacity building needs exist.

Once a set of associated measures have been identified through these questions, an implementation plan can be created in collaboration with the respective national and local authorities. In dialogue with private and public sector partners, governments can then decide what strategic investments could help reduce a specific combination of drivers. Monitoring successes and failures of the specific interventions needs to be a part of the setup of any wider strategy in order to learn and adjust to new circumstances. This includes carbon specific MRV as well as the monitoring of other policy indicators depending on the identified policy goals and co-benefits. Having a good monitoring and data collection system (for both environmental and socio-economic criteria) is very important to see changes on the ground and adjust the selected strategy. Key to reducing the targeted

drivers in the long run are: the continuous commitment of all actors, transparency in devising possible changes in policies, and the enforcement of regulations.

Figure 4: Steps to help decide on course of action to address drivers of deforestation and forest degradation



5. Recommendations for public support

For international donors to the REDD+ process, a number of intervention options can be considered that will help to reduce pressure from agriculture as a driver of deforestation and forest degradation. Donors could consider five broad strategies within which different measures are available:

1. Catalyze co-investment into REDD+ through financial incentives;
2. Enhancing the demand for deforestation free products;
3. Fostering the participation of the private sector through a mix of well-tailored incentive measures and regulative measures in the context of specific investment packages;
4. Decoupling agricultural production increases from area expansion via the sustainable intensification of agriculture; and
5. Enhancing the integration of the different land use sectors in policy and planning.

As mentioned in the previous section, the concrete measures will have to be devised based on a thorough analysis of drivers working in a particular setting and the key actors to be reached.

5.1. Facilitating co-investments into REDD+

Forest protection has to be combined with development opportunities and appropriate incentives at the farm level to keep forests standing. An integrated REDD+ strategy should direct local communities and farmers away from the forest frontier (support for changed agricultural practices, intensification, ecotourism) or reward them for serving as stewards of the forest (payment for ecosystem services and conservation), with the appropriate choice being dependent on the local institutional and economic conditions. Both activities can go along with the creation of protected areas and the promotion of sustainable management of forests. For the long-term success of REDD+, different policies and measures have to be coordinated at the landscape level. Through active planning, such coordination can be combined with the creation of investment incentives.

An important way to mobilize private sector funding for REDD+ is to direct finance into activities that protect and enhance the forest by creating incentives and helping private actors to overcome investment barriers. Such barriers can be addressed through incentive schemes (PES, carbon markets), through regulatory measures (tax breaks and disincentives), lowering investment risks (guarantees, insurance), or direct financial support (credit lines, investment funds). Table 7 below synthesizes some such public policies that can both be supported by international REDD+ funds facilitate local or international investment and address drivers of deforestation.

Table 7: REDD+ finance strategies in the agricultural sector (adapted from Streck et al. 2012)

Policy	Financing Source	Financing Mechanism	MRV
PES	Domestic budget	Results or activity-based disbursements. Facilitates local and possibly international investment. Strategy could be to expand current programmes in countries that already have initiatives to incentivize investments in environmentally sound practices (as for example the Mexican PES program for hydrological services or the Ecuadorian Socio Bosque program).	Results- or activity-based MRV, System needs to be carefully designed to target farmers (or forest investors) at the forest frontier.
	International climate finance, public sector.	Supported by performance-based international finance for REDD+	For international REDD+, carbon baseline has to be established and MRV has to assess carbon fluxes.
Carbon Markets	Private resources, national markets: voluntary	Direct payments to beneficiaries by carbon market buyers or aggregators. Agricultural mitigation as part of private REDD+ investments.	Based on existing voluntary carbon standards.
	Private resources, international markets: regulated and voluntary	Direct payments to beneficiaries, possibly as part of benefit-sharing agreements. Supported by buyers that want to invest in corporate sustainability or that have a compliance target.	Approved MRV protocols based on compliance or voluntary carbon standards.
Loans	Domestic budget	Disbursements to smallholders via intermediaries. Provision of concessional loans from the government to smallholder farmers that implement sustainable agricultural practices.	MRV can be linked to the terms that regulate the debt service. MRV can also be a condition or covenant to the loan. The MRV system depends on the funded activity. REDD+ baseline has to be established and program targeted towards the forest frontier.
	International loans	Disbursement via government agencies or private intermediaries (e.g. local banks).	
Grants	Domestic budget	Disbursements to farmers or intermediaries. Covering transition to sustainable and low-carbon activities. Supporting the development of local capacities for implementing a change in agricultural practices. Support of enabling environment.	No carbon accounting. Building of investment conditions and frameworks.
	International loans	Support of extension services, public services of private activities that create an enabling environment.	Readiness support.

Fiscal Incentives and Disincentives	National budgets	Taxes and tariffs. Removal of taxes that favor activities with a high carbon foot print. Tax breaks for low-carbon mitigation activities.	MRV is unlikely to be linked to carbon at the farm level. Activity based accounting and eventual capturing of carbon benefits in national REDD+ accounting.
		Subsidies for sustainable agricultural practices by the national government with the aims of reducing sector emissions. Cancellation of credit for activities linked to deforestation.	
Insurance or Guarantees	Public budgets (national or international)	Provision of guarantees or insurance against loss of harvest related to the changed practices; guarantees that allow the access to finance.	MRV at the level of the beneficiary of the insurance or guarantee; as condition to access the risk mitigation tool.
	Private resources		Where private initiatives are cross-financed and supported with public carbon finance, MRV of REDD+ will be a requirement.
PPPs in Supply Chains	Public and private resources	Transition cost subsidies by private or public partners.	Life-cycle-analysis, MRV of carbon through the use of simplified carbon accounting methods.

5.2. Enhancing the demand for deforestation free products

To enhance the demand for deforestation free products donors could review their procurement procedures for timber as well as agricultural products. Similar to the Netherlands or the UK, governments could set standards and create procedures to ensure that within a certain time frame food and timber are procured only from deforestation-free sources. Governments could also advocate similar standards across the EU, the G8 or G20. Bringing the various efforts to scale is essential to create tangible demand-side pressure. At the same time it is important to consider trade implications and define solutions here that overcome trade dispute obstacles.

Donor institutions can also support the work of the existing roundtables for the different supply chains. A number of the roundtables have started work on certification and standard setting schemes, but need the support of governments to enforce and implement these schemes with companies. Various incentives exist that seek to combine jurisdictional REDD+ with support for certification schemes (e.g. supported by IPAM⁷). There is a strong need to develop targeted schemes to aggregate small holder production to comply with certification and quality standards for food production, which allows them to better access international markets. Donors could think of ways to enhance the work that is currently going on in various countries on certification and standard setting schemes to include 'green' criteria that help to harmonize between their food production and quality aspects and wider sustainability goals.

⁷ IPAM and various partner organizations have received a three-year NORAD grant (Feb 2013) to develop the link between REDD+ and commodity roundtables further. The grant includes a research and an operational component. An initial assessment will determine which of the measures the roundtables work on are most effectively saving forests, and foster learning from these experiences across various roundtables. See: http://www.rightsandresources.org/documents/files/doc_2698.pdf.

Finally, donors could consider the set up of facilities that extend credit to agricultural suppliers of companies that have committed to increase the sustainability of their supply chains (including making them deforestation free). International agricultural companies are dependent on their suppliers. By rationalizing their supply chains during the recession, many companies have inadvertently become more reliant on fewer suppliers (Bryn & Denton 2010). A review of their supply chains and an increased focus on sustainability often strengthens a company's performance and lowers their risk towards supplier bankruptcy. At the same time, suppliers are well advised to work with companies that support sustainability measures as they are likely to be the more robust and reliable partners in the long term. Governments could set up credit support schemes that target agricultural suppliers of companies that are firmly committed and have started to take measures to lower the detrimental and increase the positive environmental and social impact of their supply chains.

5.3. Supporting REDD+ relevant investments into the agricultural sector

International public support can play an important role in focusing attention on agricultural investments that are compatible with REDD+ and low-carbon development pathways. Development finance institutions already provide 'soft' finance (finance with below-market interest rates) and grants to agriculture and land use development, which is critical for attracting commercial debt and equity. For inducing investments by the private sector, be it either by commercial farmers or the smallholder sector, a clear regulatory environment with a set of transparent policies is very important in REDD+ countries in order to reduce investment risk. Thus, donor governments could encourage work in this area by national governments, by convening international and domestic investors and national governments around specific opportunities in REDD+ countries related to agriculture, and identifying what a clear enabling environment for the private sector should look like and agreed outcomes. This can also inform more targeted opportunities for REDD+ investments in the forestry sector.

There is also a strong need for the innovative set up of schemes and collaboration with the investment programs of the agricultural sector over the last few years in many developing countries due to new donor support. There is a serious need to better link the investments within the agriculture sector with investments in other land use sectors and harmonize investment goals across sectors. International cooperation could eventually help to create multi-stakeholder platforms to discuss investment plans as well as wider policies to foster collaboration. In addition, there is a need to develop feasibility studies for these investment packages and prepare the road for eventually piloting these investments in targeted areas, of course with devising methods to best include the private sector – small and large scale farmers, plantation companies or food companies - in these schemes.

Public-private partnerships may also be interesting in the context of landscape-level investment packages. In a strategic dialogue between private sector companies and governments, both parties can identify their respective advantages and constraints. A local government may not have the necessary financial resources to extend credit to smallholders, while a private sector company may not have sufficient contacts or standing in a community to build capacity. In this case, the company could provide the finances for credit, while the government could work with the company to build capacity and de-risk investment opportunities. PPPs can also support sustainable intensification projects and the shift from the forest frontier to degraded lands (see following section). They can also support sustainable supply chains (see previous section).

It is important to share progress in implementing REDD+ among national and subnational entities. Information on progress in implementing REDD+ could also be combined with indicators specific to particular policies, which would assist investors to identify activities that are planned in consideration of REDD+ goals. Donors could support the creation of a platform for the sharing of best practices in implementing REDD+ and lessons learned from successful REDD+ partnerships (e.g. Acre and Germany's REM Program). To facilitate private investment, a

set of indicators could be developed that helps to assess the progress different jurisdictions make in implementing REDD+ policies. In the agricultural sector, an appropriate set of investment indicators could help identify areas designated by governments for agricultural intensification schemes that incorporate REDD+ goals. Such areas may also be the most suitable candidates for areas in which investment opportunities for REDD+ are being developed and offered in the context of public-private investment packages.

5.4. Decoupling agricultural production increases from area expansion

Encouraging farmers, either commercial or subsistence, to change production practices requires dealing with transition costs and risks. In addition, farmers need the appropriate knowledge on economically sound and ecologically appropriate production measures and access to the specific inputs to implement these measures. Donors could help increase the access of farmers to financial schemes that aim at bringing about the change to more sustainable farming practices and reduce the risk of the transition (see table 7). International REDD+ funding could support existing schemes or help create new initiatives within organizations that focus specifically on farming communities. KfW's support for the Socio Bosque program in Ecuador is one example where existing PES systems can be scaled up with REDD+ funding. However, donors could also consider cooperating with organizations and programs that extend financial and capacity support to farmers, such as the Grameen Foundation⁸ or the One Acre Fund.⁹ This program focuses on subsistence farmers and could be supported to enhance their sustainable land management portfolio and include REDD+ relevant goals. These organizations, among others, offer a combination of knowledge on farming practices, access to capital and inputs and facilitate market access. There could be programs that specifically reward the use of the specific sustainable agricultural practices, such as better soil management, via payments to help with the costs of the transition and support decreases in yields in transition periods. Such programs would have to be supported by REDD+ relevant MRV systems to ensure targeted support where pressure on forests is highest. Such interventions could happen via existing PES schemes that reward sustainable farming or involve the support for 'green' credit and input programs similar to what is already done for the preservation of other natural resources, such as water or biodiversity.

Sustainable intensification could also be promoted through PPPs within the context of integrated investment packages described in the previous section. Areas with good infrastructure and access to markets may be appropriate areas for agricultural investments and piloting PPPs. Sustainable intensification of such areas could be prioritized and favorable credits be used to mobilize private investment in the short term. Extending credit on this basis would facilitate private engagement, since bringing product to market is a major component of its final cost and a big source of uncertainty.

Finally, there is also more research needed on how to halt the expansion of the agricultural frontier via the sustainable intensification of smallholder farming system, on related economic costs, and institutional arrangements needed to achieve the increase in output while avoiding incentives to convert new land into production. It is already clear that land use zoning and conservation areas are needed together with incentives for more sustainable land use practices. Public support could help to create the specific knowledge needed for national governments for example on what regulatory measure are needed under what circumstances to set the right incentives for sustainable agricultural intensification while curbing the incentives for taking more land into production.

⁸ The Grameen foundation developed a Community Knowledge Worker program for small holders, connecting them to information and knowledge via mobile phones while also helping with receiving micro-credits, see <http://www.grameenfoundation.org/what-we-do/empowering-poor>

⁹ The One Acre Fund is a young organization focusing on giving small holder farmers in Africa access to better inputs (seeds and fertilizer), knowledge on farming practices and market access (<http://www.oneacrefund.org>).

5.5. Enhanced integration of the different land uses in policy and planning

International REDD+ funding could also support measures that better integrate and anchor REDD+ goals within the incentive structures existing in the agricultural sector of developing countries. Such incentive structures for farmers and food processors alike need to be aligned and combine food security goals with environmental outcomes and REDD+ goals. On the ground, this approach often requires the adoption of a landscape approach to land management which seeks to harmonize the various objectives to land use that the different sectors (agriculture, forestry, industry, cities) might have. Such landscape-based approaches would take the linkages between forests and agricultural land into account in planning and policy-making processes.¹⁰

Donors could support national governments to identify key drivers outside the forestry sector and ways to mitigate them, i.e. reduce perverse incentives in the agricultural sectors, such as subsidies or land use laws and regulations, which rather encourage the expansion of commercial agriculture. Within the negotiations of individual country programs donors could support the creation of integrated land-use strategies and encourage the dialogue between the forestry and the other land use sectors, in particular agriculture. Currently measures to encourage agricultural intensification are often not coordinated enough with other land use sectors and strengthening collaboration would definitely help to ensure the environmental sustainability of the new agricultural investment schemes.

¹⁰ For examples see CIFOR's latest work in this area (<http://blog.cifor.org/9829/landscape-approaches-can-end-the-debate-that-pits-agriculture-against-forests-say-experts/#.ULuFW5NeunY>) as well the work of EcoAgriculture Partners (http://landscapes.ecoagriculture.org/global_review/)

The authors thank the following interview partners for their time and insights:

Jose Carlos Fernandez, CONAFOR, Mexico

Nathalie Parker, National Wildlife Federation, USA

Dan Nepstad, IPAM, Brazil

Gabrielle Kissinger, Lexeme Consulting, Canada

Lou Munden, The Munden Project, USA

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