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Beyond forestry: why agriculture is key to the success of REDD+

When it comes to deforestation, the task of reconciling climate and development goals poses a daunting challenge. Forest clearing is both the source of significant greenhouse gas emissions that fuel climate change and, for some farmers, the most practical means for expanding agricultural production to meet rising food demands. 'REDD' or 'REDD+' mechanisms for reducing emissions from deforestation and forest degradation, by providing developing countries with incentives to conserve their forests, are rapidly gaining credence as effective tools for mitigating climate change. But if they are to work, they must pay more attention to the role of agriculture in deforestation and the implications for food security of reducing deforestation. Improving agricultural productivity will be key. But productivity gains must not undermine REDD+ efforts. This means nurturing low-emission alternatives to forest clearing. It means supporting poor farmers to adapt to climate change. Above all, it means climate, forest and agriculture policy communities must work together.

Policy pointers

- **Effectively implementing** REDD+ requires continued increases in agricultural productivity.
- **This will require investment** to improve the use of agricultural inputs, increase extension services, bolster storage and distribution systems and support agricultural research.
- **Low-emission options to** increase yields are essential to prevent agricultural productivity gains from undermining REDD+ activities.
- **REDD+ must support** farmers to adapt to climate change, which is already reducing yields and fuelling forest clearing.
- **A joined up approach to** REDD+ is needed with pilot projects exploring the coordination of agricultural improvement measures and forest mitigation and national dialogues on land use planning.

Linking REDD+ and agriculture

There is now considerable momentum behind schemes that reward developing countries for reducing emissions from deforestation and forest degradation (REDD). REDD+ goes one step further to also consider the role of conservation, sustainable forest management and the enhancement of forest carbon stocks. REDD+ is likely to be a key element of any agreement reached at the UN climate talks in Cancún, Mexico, in November and many countries are already developing national REDD+ strategies.

According to the Intergovernmental Panel on Climate Change (IPCC), land use change and forestry account for 17 per cent of global emissions. One of the biggest drivers of land use change is agriculture, in particular timber harvesting and forest clearing for farmland.

The big question for negotiators in Cancún is to what extent REDD+ will be able to effectively constrain deforestation for agricultural expansion without compromising food security. The world's population is growing, demand for non-food agricultural products — in particular, biofuels — is rising, and climate change looks set to reduce yields in seasonally dry and tropical regions. All this will add pressure on forests and could undermine the ability of REDD+ to protect them.

REDD+ advocates argue that providing incentives can make conserving forests pay more than clearing them.[1] As the financial gains of agriculture in forest frontier areas are often quite low, the incentives that REDD+ needs to provide for effective conservation could be relatively cheap compared with other mitigation options.[2,3]

Payments for environmental services (PES) schemes — which can be considered as precursors to REDD+ — became popular in the late 1990s during a long period of depressed commodity prices. As a result, and given their limited scale, there was little concern about their impact on food prices. But the sharp increase in commodity prices in 2007–2008 changed perceptions, and prompted concerns that REDD+ (effectively PES on a large scale) could force up food prices by constraining agricultural expansion through forest clearing. This would increase the financial returns to agriculture through forest clearing, increasing the level of incentives needed to keep forests out of production and raising the unit cost of REDD+. Alternatively, it could lead to

'leakage', where a ban on deforestation in one area or country simply increases deforestation in another.[4]

Although world food prices have fallen with the global economic recession, there are still concerns about the increasing volatility of prices and the persistence of high domestic food prices in some countries, particularly in West Africa.[5] Food prices will remain a crucial issue for REDD+.

Effectively implementing REDD+ requires continued increases in agricultural productivity

Food security concerns

Rising food prices usually hit the urban poor hardest, but REDD+ also raises food security concerns for subsistence farmers and poor communities that rely on forest resources for their food and livelihoods. Given weak land rights, unless appropriate safeguards are built in to REDD+ strategies and projects, these communities could see their access to forest resources restricted without recompense, or with payments that are too low to make up the shortfall in their food supply.

This could prove a major threat to food security. Globally, food security has deteriorated since 1995 — this year, the Food and Agriculture Organization of the UN (FAO) estimated that nearly 1 billion people are undernourished. And reductions in child malnutrition are proceeding too slowly to meet the Millennium Development Goal target to halve hunger by 2015.[6]

Over the next four decades, as populations grow, incomes rise and more people shift to meat-based diets, the challenge of meeting these development goals will become ever-greater. The FAO predicts that a 70 per cent increase in food production (in value terms) will be needed worldwide by 2050 to meet the rise in demand. This translates into a 49 per cent rise in the volume of cereals produced and an 85 per cent increase in the volume of meat produced.[7] Or, in absolute terms, nearly a billion extra tonnes of cereals and 200 million extra tonnes of meat.

Although this is lower than the growth seen over the past 40 years (139 per cent and 165 per cent, respectively)[7], the next 40 years will face the added pressures of climate change impacts and increasing competition for land to grow non-food crops, in particular biofuels (see Biofuels add to forest pressure).

Boosting yields

Increasing food production has traditionally been achieved through a combination of two options: expanding agricultural land areas (in particular, through forest clearing) and improving agricultural productivity — in terms of yields per hectare — on existing farmland.

The key issue for REDD+ — which essentially aims to constrain the first of these options — is how this balance will be struck moving forward.

Building on FAO projections[7], we can consider two extreme scenarios: one with no productivity increase at all, and one with no further expansion of cultivated land.

In the first scenario, an additional 600 million hectares of arable land in developing countries will be needed by 2050 to produce cereals — a 600-fold increase on the land available in 2005, and equivalent to an expansion of 13 million hectares per year. This is comparable to past official rates of land expansion and deforestation and far outstrips the deforestation allowed under a REDD+ regime.

At the other extreme, in the REDD+ 'ideal' scenario of no further agricultural land expansion, the productivity of farmland devoted to cereal crops in developing countries would need to grow at 1.07 per cent per year. This may seem fairly modest compared with past records, which show a 2.2 per cent annual growth from 1961–2007.[7] But across the world, yield increases have been slowing down.

In practice, neither of these scenarios is likely — the reality will lie somewhere between the two. But what is clear is that effectively implementing REDD+ requires continued increases in agricultural productivity. And, to achieve that, substantial investment will be required in increasing agricultural inputs such as fertiliser or irrigation water, expanding extension services, improving storage and distribution systems to reduce post-harvest losses, and supporting agricultural research.

There are big regional differences in yields — for example, in sub-Saharan Africa, average cereal yields

Biofuels add to forest pressure

Rapidly rising demand for biofuels, and the land needed to grow them, is likely to add pressure to the world's forests. For example, it is thought to have contributed significantly to the surge in food prices in 2008, when large areas of land cultivated for food crops were shifted into production of biofuels.[8]

Predicting demand for biofuels over the next 40 years is difficult as it will depend on policies, technologies — in particular, so-called 'second generation' technologies that convert woody or grassy materials, including agricultural waste, into biofuels — and oil prices.

Available estimates[9] suggest that the additional land requirements will range from 0.5 to 1.1 million hectares per year. This may seem small relative to the land constraints likely to be imposed by REDD+ but it will add to the challenge of meeting competing demands for food, fuel and carbon storage.

per hectare are less than half those achieved in developed countries.

But some poor countries have shown that increasing productivity is possible. For example, Malawi's fertiliser subsidy scheme — which gives farmers two-thirds off the market price of mineral fertilisers — was accompanied by an increase in maize production from 0.8 to 2.2 tonnes per hectare between 2005 and 2007. In just two years, the country went from being a receiver of food aid to a food exporter and donor.[10] The story shows that productivity gains can be made — even if they also ultimately rely on other factors, such as reliable rainfall. But emulating Malawi's success poses significant governance challenges and would not be cheap — the programme cost US$217 million in 2008–2009.[11]

Simply improving the quantity and quality of crops by increasing agricultural inputs such as fertiliser or water can also contribute to climate change by increasing greenhouse gas emissions: soil microbes convert surplus nitrate from nitrogen fertilisers into nitrous oxide; fertiliser manufacturing generates carbon dioxide emissions; and expanding irrigation can cause carbon dioxide emissions if fossil fuel based energy is used to deliver the water.

Such increases in agricultural emissions would undermine the overall effectiveness of REDD+. It is therefore important to find and promote ways of increasing yields that do not involve major emissions, or other adverse environmental effects. Some options for the task, identified by the IPCC[12] and others, are outlined in the Table opposite.

If a change in productivity is likely to impact emissions and contribute to climate change, the reverse is also true — climate change will undoubtedly affect productivity, potentially fuelling forest clearance and undermining REDD+ activities (see Climate change impacts on agricultural yields).

Table. Low-emission strategies for improving agricultural productivity

Strategy	Example methods
Restore cultivated organic soils	Increased vegetation cover, reduced tillage, use of crop residues or amendments such as manure or compost
Improve cropland management	Agronomy, nutrient management, reduced tillage, water management (including irrigation and drainage), set-aside land, agroforestry
Improve grazing land management	Increased cover of high-productivity grasses and overall grazing intensity, nutrient management, fire management and species introduction
Restore degraded lands	Erosion control, and organic and nutrient changes
Improve rice cultivation	Techniques to reduce methane emissions such as periodic draining, intermittent irrigation and shallow flooding
Improve livestock management	Better feeding practices, dietary additives, breeding and other structural changes, and improved manure management (in particular, improved storage and handling, and anaerobic digestion).

Climate change impacts on agricultural yields

In the coming decades, many regions will almost certainly suffer from more frequent and intense droughts and floods, which will reduce yields and potentially fuel forest clearance. Although there are many uncertainties, the general consensus is that agricultural productivity will fall in developing countries as temperatures rise and rainfall patterns change, but will rise in countries in temperate latitudes.[13]

Impacts will also vary considerably by crop. In Tanzania for example, climate change up to 2030 could boost barley and wheat yields, but is expected to adversely affect maize.[14]

Some modellers predict that, for most regions, the major adverse effects will not be felt until the second half of this century,[11,15] provided that farmers can adapt to climate change. Climate change impacts are therefore unlikely to undermine REDD+ in the near to medium future.

But it is essential that REDD+ contributes to resilience and increases — rather than closes off — farmers' options. Payments for forest conservation must be accompanied by support for other income generation activities and improvement of agriculture as well as agroforestry.

New technology: help or hindrance?

Whichever route is taken to improve productivity, REDD+ efforts could be damaged because higher yields means higher profits, which increases the returns of converting forest into farmland. This will either reduce the effectiveness of REDD+ strategies or increase the cost of REDD+ payments.

How farmers respond to higher yields will depend on many factors, including the type of technology and whether it is labour- or capital-intensive, the type of agricultural system, the policy context, the extent of off-farm opportunities, access to capital and the timeframe involved.[16]

In some cases, new technologies could inadvertently damage REDD+. The expansion of the soybean industry in Brazil since the 1970s could not have occurred without substantial technology developments, including new crop varieties, pest control agents, seed treatments and improved post-harvest technologies.

But although this technology-driven expansion did not take place on forest land initially, it led indirectly to deforestation. Small farmers without access to capital could not invest in the new technologies so many migrated to the Amazon and added to forest pressure there, as did many agricultural workers that lost their jobs to new mechanised production technologies.[16]

In other cases, new technologies will produce positive outcomes for REDD+: a project in the Philippines to introduce irrigation into lowland farming has both boosted forest conservation and reduced poverty by providing farmers in forested uplands with new labour opportunities that reduce forest pressure.[17]

A joined-up approach

Policymakers in general, and negotiators at Cancún in particular, must pay more attention to the role of

agriculture in REDD+. Even if the scope of REDD+ is not extended to make other land uses eligible for payments, REDD+ strategies and projects will have to look beyond the forestry sector and incorporate measures to improve agricultural productivity and safeguard food security.

REDD+ actions must be coherent with agricultural development goals and with agricultural mitigation and adaptation efforts. And this means working together. Some REDD Readiness Preparation Proposals (RPPs) — which lay out what needs to be done to implement widespread REDD activities — already acknowledge the need to coordinate with other sectors. The RPP of the Democratic Republic of Congo, for example, recommends a multi-stakeholder national REDD committee and an interministerial committee, both including representatives from the ministry of agriculture.[18]

But coordinating across sectors in practice will be a huge challenge. Tanzania's RPP proposes agriculture-focused strategic options such as revitalising extension services to ensure more productive farming systems. At the same time a government campaign, Kilimo Kwanza, aims to revolutionise agriculture by intensifying farming, using inputs more efficiently, marketing more effectively and using natural resources more sustainably. The RPP suggests that this campaign will take a long time to affect the productivity of the small farmers most dependent on forest resources and so will have limited impact on smallholder-driven deforestation.[19]

Cross-sectoral coordination must lie at the centre of REDD+ strategies. The readiness activities set out in existing RPPs for the initial phase of REDD+ provide an opportunity for learning how to address this challenge:

At the local level: REDD+ pilot portfolios should include some cross-sectoral projects, explicitly funded to explore the effective coordination of forest mitigation and smallholder agricultural improvement activities in practice. These would experiment with measures for improving agriculture in existing cleared land, together with forest mitigation measures such as restricting forest clearing. They could then assess the gains against the losses — improved livelihoods and reduced emissions versus the loss of access to forest resources and land expansion potential. These projects could also involve measures to improve wood supply and energy services.

At the national level: Considering future food needs, readiness activities should include a national dialogue on land use governance to debate views of different stakeholders on how much forest can be conserved or sustainably managed to provide different ecosystem services such as fuel, carbon storage, recreation; how much may need to be converted to agriculture; and where different types of agriculture — from input-intensive to organic — are needed. Such a dialogue should be informed by a thorough analysis of the different options available for meeting future food needs, whether they be increases in agricultural productivity, expansion of agricultural land or changes in trade patterns. Each of these will have implications for livelihoods, food security, adaptive capacity, mitigation costs, forest-related emissions and agricultural emissions.

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Notes

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