

# Managing Agricultural Greenhouse Gas Emissions in Latin America:

## Assessing the national, regional, and global effects of halting deforestation in the tropics

A collaborative project involving:



### The Issues Addressed

The world demand for food and feed will increase by between 50% and 85% from 2009 to 2030, and a substantial part of the growth in demand is expected to be met by farmers in LAC. One challenge for LAC is to increase aggregate agricultural production to meet this growing demand for food, fiber and energy without proportionally increasing greenhouse gas emissions. The effectiveness of policy actions to reduce agricultural GHG emissions, and the implications for food production, food prices, agricultural employment or agricultural income, are not known.

### The Tool Used

We use an enhanced version of the IFPRI IMPACT model to examine agriculture-GHG links in LAC under baseline conditions and under one policy scenario. The model's 32 Food Production Units (FPUs) in LAC allow us to examine the effects of current trends and of alternative policy scenarios on agriculture and on GHG emissions at the FPU level, nationally, regionally and globally.

### The Baseline View

The IMPACT model's baseline scenario (run to the year 2030) reminds us that world food situation has recently departed from its very long-term trend of declining real food prices to one of slowly increasing real prices for major grains and livestock products, especially beef products.

The IMPACT model's baseline scenario also highlights the very significant contribution of agriculture in LAC to GHG emissions –

approximately 980 million tons of CO<sub>2</sub> equivalent were emitted in 2010; that total is expected to decline to approximately 871 million tons by 2030. Sub-sectoral GHG emissions varied substantially by country, e.g., the cattle herd in Brazil contributed 54% of that country's total agricultural GHG emissions in 2010.

Per-hectare GHG emissions associated with land clearing are large and spatially varied (see Figure 1).

Land clearing's contributions to total agricultural GHG emissions varied by country (e.g., for 2010, 26% of total agricultural GHG emissions for Colombia was from land clearing, but for Central America and the Caribbean that number was 59%).

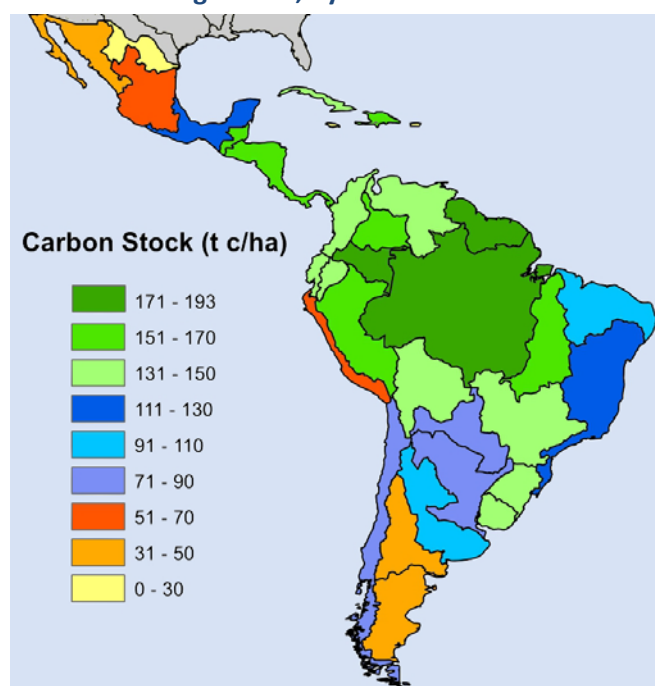
### No-Area-Expansion Scenario

The IMPACT model was used to examine the effects of a hypothetical *ban on the clearing of native vegetation for agriculture in tropical areas* within LAC.

### Results – GHG Emissions

A complete ban on land clearing for agriculture in the tropics would significantly reduce GHG emissions associated with the clearing of forests and other forms of natural vegetation vis-à-vis what would have occurred in the absence of the ban. The *land 'saved'* (approximately 3.3 million

Figure 1: Above-Ground Carbon Stocks in Native Vegetation, by IMPACT Model's FPUs



hectares) would be approximately equally distributed across the Amazon, northern South America and the Central America & Caribbean sub-regions that comprise the LAC tropics. The total volume of *GHG emissions avoided* due to land *not* being cleared (about 2.2 billion tons of CO<sub>2</sub> equivalent) would be concentrated in the forested areas of the Amazon and Central America & Caribbean sub-regions.

## Results – Economic Consequences *within* LAC

The ban would reduce agricultural production within tropical areas in LAC. However, these *economic losses* (US\$ 12.7 billion) would not be distributed uniformly across the three sub-regions within tropical LAC (see Table 1) – e.g., the northern South American ‘rim’ around the Amazon would suffer approximately 32% of all losses in value of agricultural output attributable to the ban.

The ban would also induce some increases in area expansion and some product mix adjustments that increase agricultural production and GHG emissions in *non-tropical* areas in LAC; the agricultural gains of the *non-tropical* ‘winners’ *within* LAC would total approximately US\$ 3.4 billion (see Table 2).

**Table 1: Gross Value of Agriculture, Baseline and Effects of No Expansion Policy**

| FPUs                        | Total Gross Value of Agriculture (Billions of USD) |                 |        |
|-----------------------------|--|-----------------|--------|
|                             | Baseline 2030                                      | Simulation 2030 | Change |
| Argentina                   | 55   | 56              | 0.5    |
| Brazil                      | 160  | 161             | 0.91   |
| Central America & Caribbean | 32   | 28              | -3.89  |
| Central South America       | 12   | 11              | -0.54  |
| Chile                       | 18   | 18              | 0.14   |
| Colombia                    | 20   | 19              | -1.53  |
| Ecuador                     | 13   | 12              | -1.49  |
| Mexico                      | 20   | 19              | -1.38  |
| Northern South America      | 11   | 9               | -1.59  |
| Peru                        | 13   | 12              | -1.04  |
| Uruguay                     | 4  | 4               | 0.04   |

## Results – Value of Avoided GHG Emissions

Economic losses could potentially be offset by compensating the appropriate stakeholders for the tons CO<sub>2</sub> equivalent retained in the native vegetation. However, there is great uncertainty regarding the value of avoided GHG emissions. At the average price of CO<sub>2</sub> equivalent Over-

**Table 2: Cultivated Area & Gross Value of Agriculture in 2030, Baseline & Policy Simulation**

| FPUs                          | Total Agricultural Area (Thousands of Hectares) |                 |        | Total Gross Value of Agriculture (Billions of 2000 USD) |                 |        |
|-------------------------------|---|-----------------|--------|---|-----------------|--------|
|                               | Baseline 2030                                   | Simulation 2030 | Change | Baseline 2030   | Simulation 2030 | Change |
| Total Amazon                  | 10,187  | 9,185           | -1,002 | 30.85   | 27.5            | -3.35  |
| Total Tropical Non-Amazon LAC | 23,602  | 21,267          | -2,337 | 92.14   | 82.77           | -9.36  |
| Total Non-Tropical LAC        | 110,500   | 110,589         | 88     | 283   | 286             | 3.369  |

the-Counter transactions in LAC in 2009 (roughly US\$ 4.30/t CO<sub>2</sub> eq.), such compensation schemes would cover over 1/2 of the value of the losses in agricultural output in the tropics affected by the ban.

## Results – Consequences *Outside* of LAC

The ban would also promote agricultural expansion and change *outside* of the LAC region as farmers in other producing areas compensate for reductions in supply from LAC. Such ‘leakages,’ which play fundamental ‘shock-absorbing’ roles in maintaining global food supplies, will likely be important in the design and implementation of policies for managing agricultural GHG emissions worldwide.

## Results – Poverty Consequences

Our results reinforce conventional wisdom that the ban on area expansion would reduce employment and incomes in affected rural areas – this would increase *local* poverty and complementary policies may be needed. The *national* consequences of the area expansion ban will depend

on circumstances; smaller countries with fewer economic alternatives within and outside of agriculture would suffer the most (e.g., Central America and the Caribbean, see Table 1), while poverty in larger and more diverse countries (e.g., Brazil) may eventually be reduced by the ban. *Globally*, which includes the very large urban populations in LAC, the effects of the area expansion ban on poverty would be very small; producers and consumers worldwide adjust to the absence of food supplied by hypothetically protected areas, thereby keeping food prices essentially on their long-term baseline trend. Halting LAC agricultural area expansion would not cause world food prices or poverty to increase substantially outside the region.

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