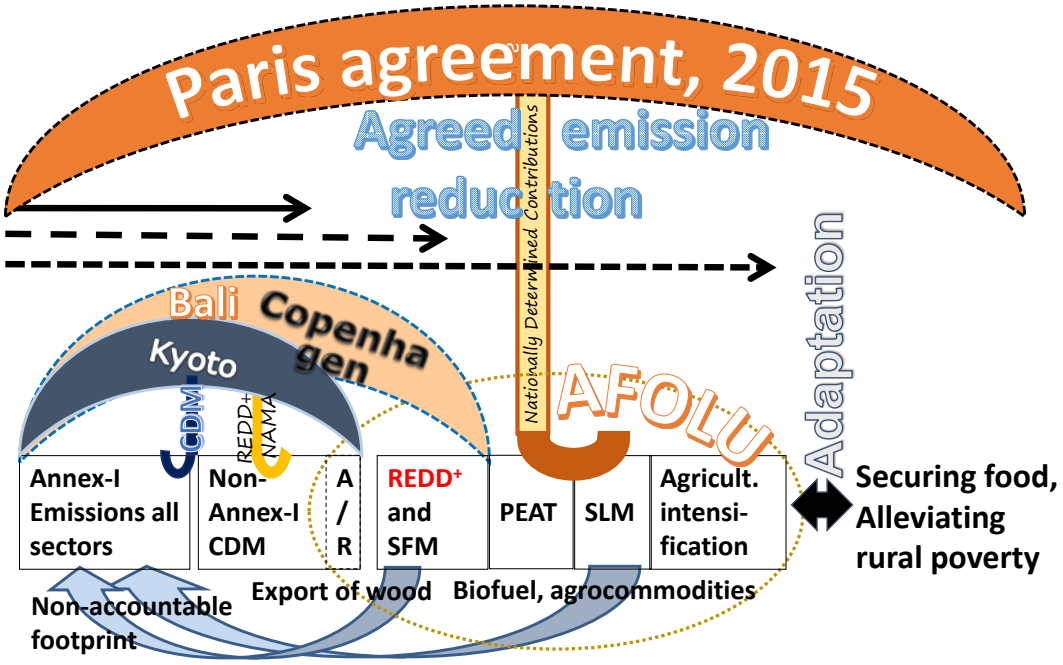
ASB Partnership for the Tropical Forest Margins

Policybrief 53

Minimizing the footprint of our food by reducing emissions from all land uses



It took twenty-four years after the formulation of the UN Framework Convention on Climate Change (UNFCCC), but by November 2016 the Paris Agreement will come into force and finally provide an umbrella for addressing fossil fuel as well as land-use aspects of the human impact on the global climate. Its preamble (as well as article 2) emphasizes the primary concern over continued food production. Will accounting systems and accountability further shift towards 'footprints' per unit product, aligned with emission accounting from all land uses, not 'just' forests?

Key findings

1. The Paris Agreement (2015) of the UNFCCC gives priority to food security concerns.
2. Within the Paris Agreement and its reliance on Nationally Determined Contributions (NDCs) the full spectrum of land-use-related emissions is now fair game for emission reduction efforts.
3. An integrated perspective on food systems and their primary feedback is gradually emerging in the still very siloed landscape of production sectors.
4. Current 'Agriculture, Forests, other Land Uses' (AFOLU) accounting systems emphasize 'supply side' relations; footprints the 'demand side' accountability for its drivers. These two can be reconciled.
5. Low predictive skill of site-specific emission factors for greenhouse gases other than carbon suggests continued reliance on global equations that predict emissions from fertilizer use.

Policy implications

- Implementation of the Paris Agreement can benefit from referring 'co-benefit' and 'safeguard' debates to the relevant SDGs beyond SDG 13.
- Climate change has finally been accepted as a common but differentiated responsibility, but international trade is yet to be satisfactorily handled.
- Local governance systems, formal and informal, are natural integrators of sector-defined policies, in interaction with a private sector that is increasingly responding to consumer concerns as an alternative route to global resources governance.
- Consumer-centric emission reduction efforts as voluntary 'Individually Determined Contributions' can support national NDCs.
- Current footprints are larger than necessary because of efficiency gaps in the production phase, plus dietary choices and (non-recycled) waste.

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1. The Paris Agreement concerns about food security and other safeguards

The global discussion on reconciling development and environmental concerns started seriously with the 'Our Common Future' (a.k.a. the Brundtland report) in 1987. Aspects of this became segmented in separate Rio conventions in 1993 and the Millennium Development Goals. Implementation mechanisms for each of these conventions became burdened with safeguards and co-benefit requirements that referred to adjacent parts of the international agenda. Acceptance of the 2013 UN Agenda with its 17 Sustainable Development Goals (**SDGs,** of which climate change is SDG 13) made it possible to focus UNFCCC instruments on the climate goals, with other policy instruments for other goals (Figure 1). This way the Tinbergen rule that one needs as many policy instruments as there are independent policy goals can be respected.

In hindsight, the first round of UNFCCC implementation via the Kyoto protocol contained three important 'weaving errors': 1) its dichotomy of countries was too crude as implementation of the common-but-differentiated-responsibility principle, allowing a middle group of countries to lead a rapid increase of global emissions where stabilization and decline were intended; 2) it struggled with ways the land cover change could be handled, leading to a rapid increase of emissions embodied in the trade in (agro)commodities outside of accountability, in part to meet emission reduction commitments through biofuel use; 3) it finally included afforestation/reforestation forms of the Clean Development Mechanism (A/R-CDM), but burdened it with rules and definitions that proved to be unworkable and unattractive.

2. The Paris Agreement supports reducing emissions from all land use

Partly in response to the disappointment with A/R-CDM, proposals to include 'avoided deforestation' in the renewed language of Reducing Emissions from Deforestation (with later additions of a second D for degradation and a plus (+) for sustainable forest management, to become **REDD+**) started to get traction in the Montreal Conference of Parties (COP) of the UNFCCC in 2005, and became recognized as a formal part of the agenda in the Bali COP in 2007. After ten years of discussion, and a full set of safeguards and requirements of co-benefits, REDD+ is back to being a statement of objectives, rather than being an effective means of implementation with associated funding (Figure 2). Since 2007, many ASB Policy Briefs have argued that a broader framing of reducing emissions from all land use (REALU) was desirable. The Paris Agreement is finally on this track, by allowing all emission sources that are part of the national greenhouse gas emission reporting to be included in the Nationally Determined Contributions (NDC) that evolved from the Nationally Appropriate Mitigation Actions (NAMA) concept agreed in 2007 in Bali.

3. Landscape-level integration of agriculture and forest issues will be key to progress

While national policies tend to follow existing departmental and sectoral structures, the logical scale for making progress on integrated approaches is more local. Subnational units (districts, provinces or states depending on the terminology used but collectively described as 'jurisdictional' units, with legal roles and responsibilities) can combine formal and informal governance roles, while the 'landscape' is primarily a conceptual term.

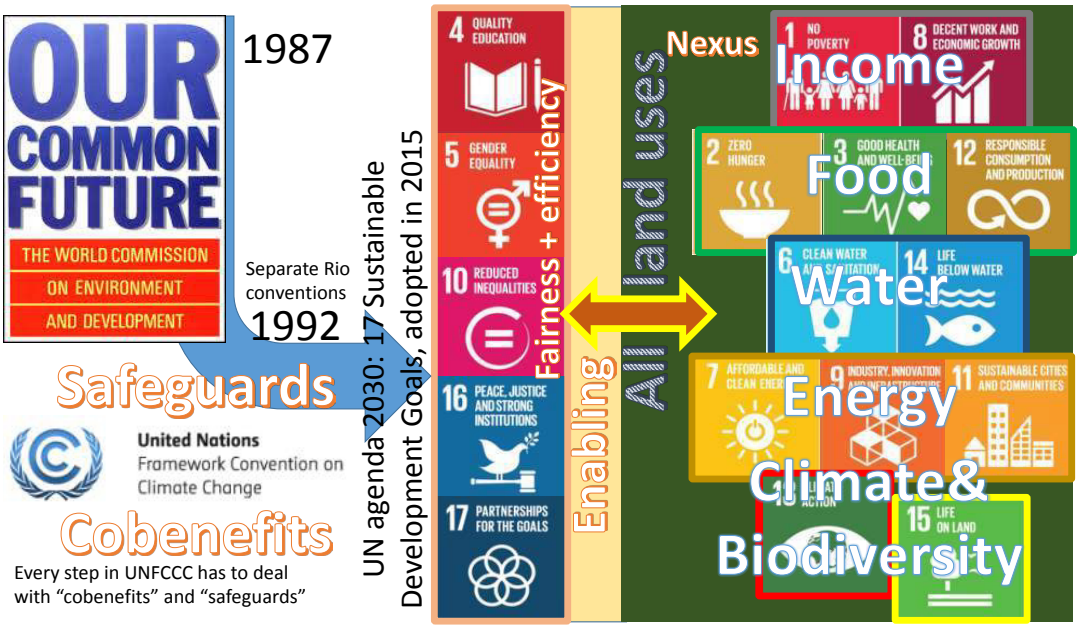


Figure 1. Timeline of global policy on reconciling development and environmental issues

REDD+ evolved from a "fast track" financial incentive system,

- 2005: COP 11 Montreal, Canada
- 2006: COP 12 Nairobi, Kenya
- 2007: COP 13 Bali, Indonesia

bound by increasingly complex "safeguards" and emphasis on

- 2008: COP 14 Poznań, Poland
- 2009: COP 15 Copenhagen, Denmark
- 2010: COP 16 Cancún, Mexico

"cobenefits" to a widely accepted set of objectives that has to find its own

- 2011: COP 17 Durban, South Africa
- 2012: COP 18 Doha, Qatar
- 2013: COP 19 Warsaw, Poland

"means of implementation" within "Nationally Determined Contribu-tions" (NDC's)

- 2014: COP 20 Lima, Peru
- 2015: COP 21 Paris, France

Figure 2. Very brief history of REDD+ as part of the UNFCCC agenda, focussed on forests

At the landscape (or jurisdictional) scale, the primarily area-based way of accounting for changes in carbon stocks and recurrent emissions of greenhouse gases, interacts with the global trade in (agro)commodities and forest products (Figure 3). Partly because the nation-based UNFCCC rules were so slow to evolve under the requirement of consensus, the private sector went ahead and started to respond to consumer concerns over the emission responsibility of traded products. 'Carbon-neutral', 'Deforestation-free' or 'Climate Smart' became slogans with public appeal, not supported by clear operational rules of the game.

4. Reconciling supply- and demand-side aspects of global land-use change

If the productivity of land, measured in harvestable products per unit area per year, is combined with the attributable changes in C-stock ('carbon debt' incurred when converting land with higher C-stocks) and recurrent emissions (especially methane (CH_4) and nitrous oxide (N_2O)), an emission footprint per unit product can be derived. Add to that additional emissions from manufacturing inputs, processing the product and transporting it, and a reduction in volume due to losses

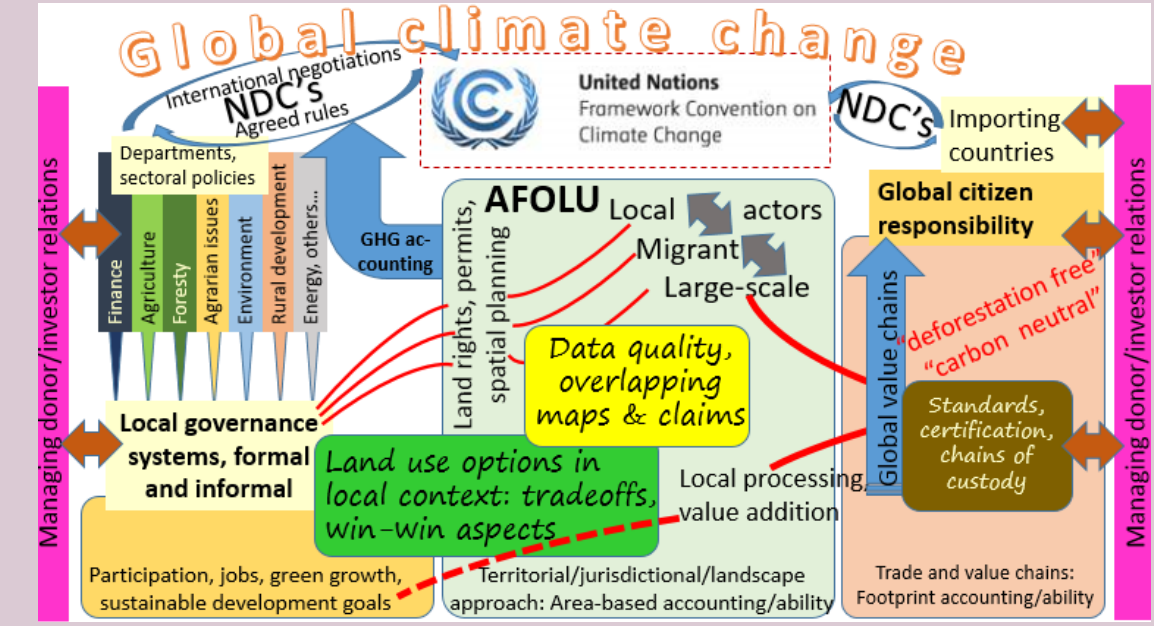


Figure 3. Cross-scale interactions between a global to local governance hierarchy, actual land use, and the global trade and value chains that link global citizens as consumers to any part of the globe

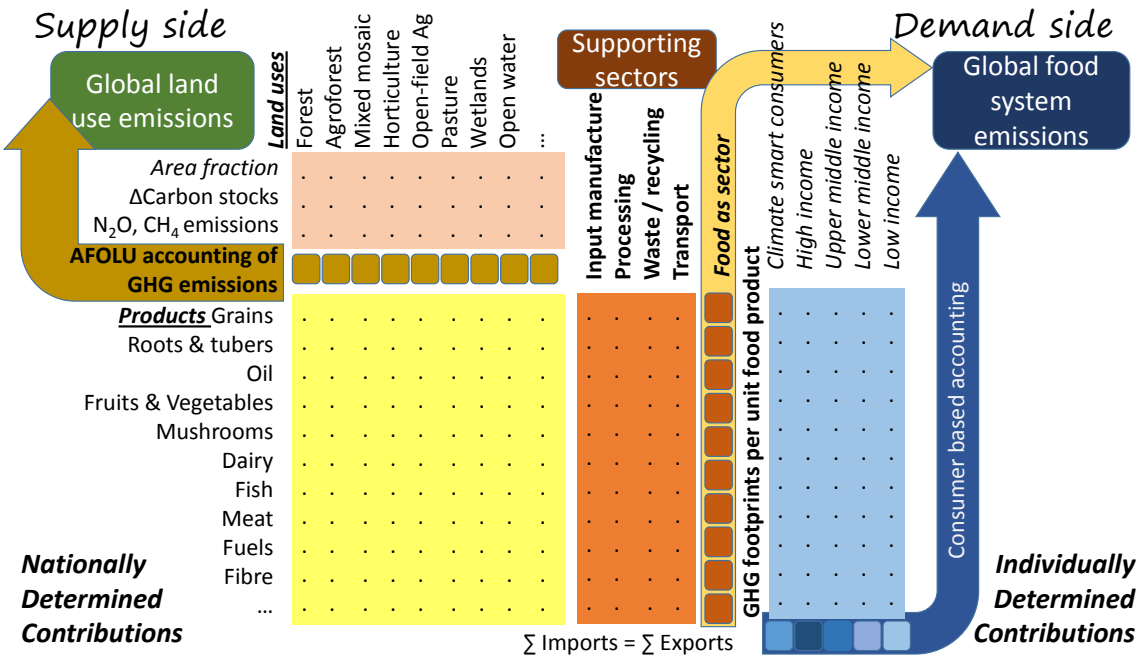


Figure 4. Reconciling different ways of accounting for the emissions in the various stages of the food system and its value chains

('waste') along the way, and a footprint per unit product at consumer level can be calculated (Figure 4). Depending on the dietary choices of groups of consumers (which tend to differ between low- and high-income strata), and a footprint per capita from the food system as a whole can be calculated.

Where the sum of all land cover should be consistent with the total area of a country, the sum of the emission footprints of all its consumers (citizens) may lead to a different number if export and/or import of food items are important parts of the overall picture—as is the case in nearly every country. When summed at a global scale, however, the two sums (area- and people-based accounting) should be consistent. All UNFCCC-countries now have to declare their NDCs. In the meantime, many global citizens have started to take responsibility for their footprints. This may be called 'individually determined contributions'. Emissions embodied in trade account for the differences between NDCs and IDCs. Further negotiations will be needed to have the national and citizen-based accountability approaches match (Figure 5).

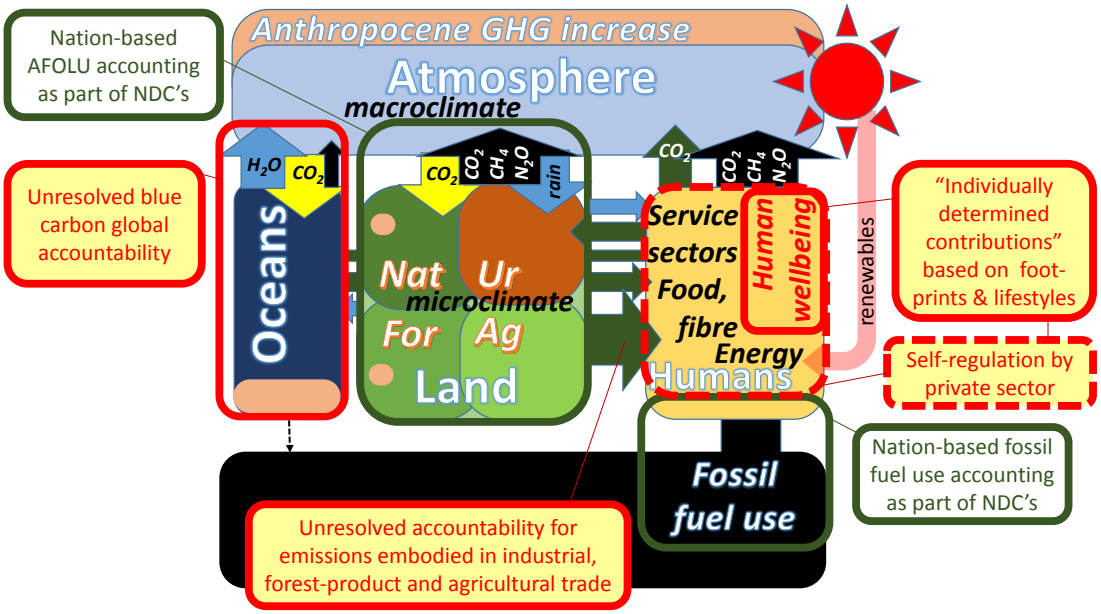
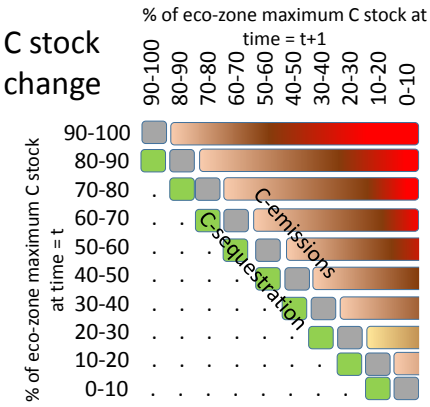


Figure 5. Components of the climate-ocean-land-human system with in green the parts for which supply-side accounting and accountability has been established and in red boxes some unresolved issues on the demand side of lifestyles and footprints

5. Efficiency gaps in production make the footprints larger than necessary

The commitment of the Paris Agreement to keep global warming below the 1.5oC threshold as much as possible, alongside ways to provide food and nutrition security for all as part of the SDGs, means that the inefficiencies of current production systems need to be identified and become the target of policy interventions. Such inefficiencies stem from three parts of the footprint calculation: 1) high carbon debts due to conversion of high C-stock vegetation (Figure 6); 2) yield levels that don't achieve what is feasible; and 3) excessive or insufficient use of inputs in the production process that cause recurrent emissions per unit product. Steps 2 and 3 are combined in the concept of 'optimal intensification'.



Challenges in application:

- Point source losses more easily recognized than gradual gains
- Many data sources are "land use" rather than "land cover" and combine multiple C-stock density classes
- Insufficient differentiation within "forest" categories
- "Agriculture with trees" often ignored
- Higher C stock: higher fire risk with issues of accountability rather than accounting

Figure 6. Land cover transition matrix (from time t to time t+1) expressed in terms of C-stock density (rather than the 'names' of land cover classes, as these tend to be less precise), and the consequences for C-emissions (potentially in large steps down) and C-sequestration (small steps upwards)

An example of this 'optimal intensification' concept can be seen in Figure 7 that represents the emission footprint due to palm oil production (here expressed as the potential emission savings if it is used as biofuel, replacing fossil fuels), as a function of the level of N-fertilizer (increasing yields as well as direct emissions of N_2O) and the C-debt due to initial land conversion.

As part of these calculations, the details of N_2O-emissions matter. Unfortunately, despite considerable research effort, the current ways of calculating these emissions for any specific combination of soil, climate and management are still not very good. Technically speaking, the 'predictive skill' of current models is so low that we may as well use global defaults that are calibrated on the atmospheric increase in N_2O-concentrations and the sum total of known sources.

The basic principles for a holistic approach to land-based emissions, combining forests, agriculture and all their intermediate stages and interactions, are clear (Figure 8). In implementing this as part of NDCs and ways

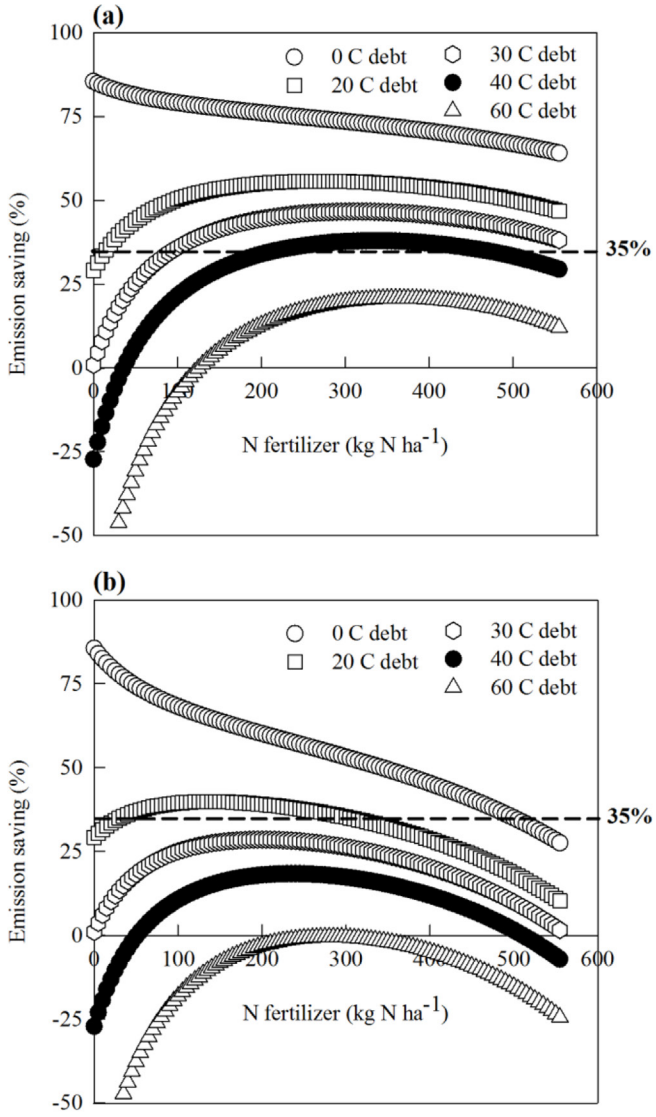


Figure 7. Emission savings (relative to fossil fuel use) if palm oil is used as biofuel feedstock, as a function of the N-fertilizer rates used in oil palm plantations, the C-debt from initial land conversion, and two (left and right) current defaults of N_2O emissions per unit of fertilizer use

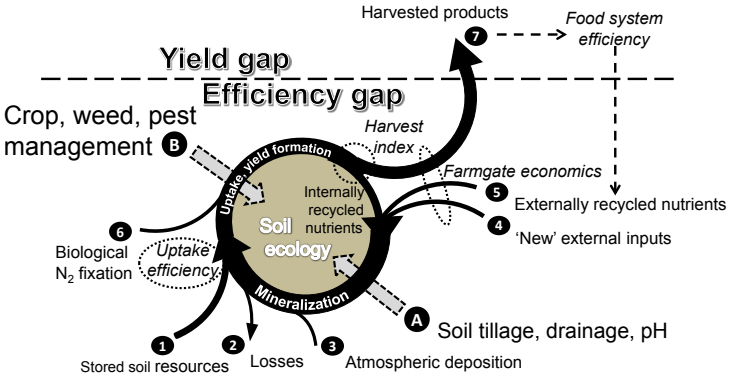


Figure 8. Current understanding of the way the carbon and nutrient cycles in a soil interact with crops and harvested products entering food systems (van Noordwijk and Brussaard, 2014)

of accounting for emissions embodied in global trade, however, further steps are needed to combine existing information in a number of global databases. Such efforts can be expected to provide clear insights into priorities for targeted land-based (AFOLU) emission reduction in ways that don't shift the burden to other parts of the account, as has happened so often with previous policies based on partial accounting.

Way Forward

The current optimism that climate policies can finally catch up with the science, public concerns and political will to address these issues is a major step forward. The devil is the details, however, in the way the next steps of accountability are based on, and consistent with, existing accounting rules, so that transparency can be achieved, along with fairness and efficiency.

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Authors

Meine van Noordwijk, Sonya Dewi and Peter A Minang

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The ASB Partnership for the Tropical Forest Margins is working to raise productivity and incomes of rural households in the humid tropics without increasing deforestation or undermining essential environmental services.

ASB is a consortium of over 90 international and national partners with an eco-regional focus on the forest–agriculture margins in the humid tropics, with benchmark sites in the western Amazon Basin of Brazil and Peru, the Congo Basin forest in Cameroon and DRC Congo, southern Philippines, northern Thailand, and the island of Sumatra in Indonesia.

The ASB Policybriefs aim to deliver relevant, concise reading to key people whose decisions will make a difference to poverty reduction and environmental protection in the humid tropics.

Contact us at:

ASB Partnership for the Tropical Forest Margins,
P.O. Box 30677 - 00100 Nairobi, Kenya
Tel. +254 20 7224000
Email: asb@cgiar.org
http://www.asb.cgiar.org

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