Local Landscape Solutions: An Agriculture and Food Security Perspective

Lini Wollenberg, CCAFS at University of Vermont

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Land sparing: important technical option in agriculture

Total anthropogenic GHG emissions

- 18% from land-use change (includes deforestation)
- 10-12% from all agricultural sources (or 6.8 Gt of CO2-eq)

Technical mitigation potential of agriculture is :

5.5-6 Gt CO2-eq. yr-1 by 2030

Economic potential

1.5-4.3 Gt

BUT Limited success of interventions

"Green revolution to shifting cultivation" Greenland 1975

Agroforestry and Alternatives to Slash and Burn, Sanchez et al. 2005; Swallow, Boffa and Scherr 1996

Protected area management: ICDPS, buffer zones (Hughes and Flintan 2001)

- Incentive to intensify not linked to forest conservation
- Conversion linked to multiple local and macro causes of (migration, infrastructure, fire, drought, markets, wood extraction, technology) (Hirsch and Fisher 2007)
- Past projects limited by focus on local technical interventions
- Efficiencies encourage expansion

Limited land reserves

-Only 445 Mha arable, non protected land left (10%)

-If current demands for food and energy met with no clearing of natural forest, leaves balance of 71 to –347 Mha

(Lambin 2011)

Increased vulnerability from intensification (Lin et al. 2008)

- High-yielding, input-intensive varieties increase demand for nutrients and water
- Nutrients and water often lost from the system and external inputs required
- Outside infrastructure required to maintain resources for crop production (petrochemicals)
- In Sweden and Tanzania found higher management intensity (fewer wild varieties, less temporal and spatial diversity), associated with less resilience to ENSO events/drought.

Importance of context

Palm et al 2010:

(1) Tanzania
Population density –low
Land availability – high
Intensification under each scenario leads to surplus crop area for reforestation.

(2) W. Kenya
Population density – high
Land availability – low
Need mineral fertilizers to make land available for reforestation.
- green manure or improved tree fallows not enough increase in yields to permit reforestation.
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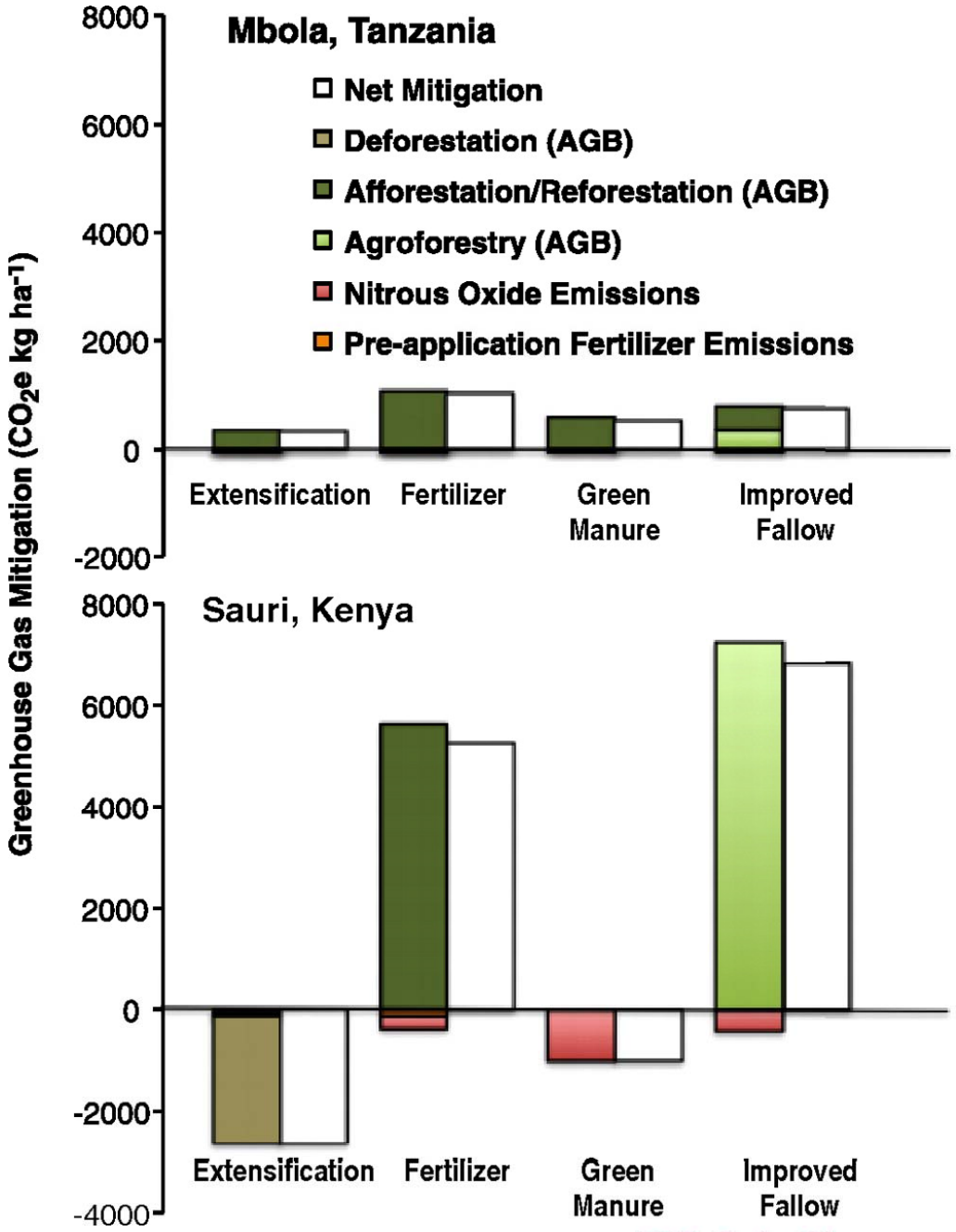

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Time limit to benefits of intensification

Northern Mountain Region of Vietnam (Leisz et al. 2009)

- Current swidden systems contribute significant GHG emissions

- If the NMR farming systems change according to government policies and programs, net C sequestration occurs in first 20 years

- But, over the longer term, increased GHG emissions from changes in the farming systems (e.g. increased paddy and increased confinement pig raising due to government policies) will overtake the C in vegetation

Need for institutional arrangements

- Regional NRM bodies adaptively manage, collaborative frameworks negotiated between Federal and State levels (Australia- Oosterzee et al. 2011)
- Integrated sustainable development for smallholders and REDD+ (Brazil, Stella et al. 2011)
- Land tenure, zoning (Kissinger, 2011)
- Enforcement, project efficacy (Agrawal 2011)

Local Landscape Solutions

1. Better understanding of local intensification and trade-offs dynamics in different contexts and scales
2. Develop multi-scale institutions that address drivers, food needs local economic needs of smallholders
3. Improve *sustainability* of intensification:

   - innovation in efficiencies, coupling, integration and multifunctionality,

   -reduce emissions in agriculture and land use change
4. Ask what are the limits to intensification?