Stimulating Smallholder Investment in Sustainable Land Management: Neglected Role of Markets, Institutions and Policies

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UN Expert Group Meeting on “Sustainable land management and agricultural practices in Africa: Bridging the gap between research and farmers”

Gothenburg, Sweden, April 16 - 17, 2009
Outline

1. The problem - persistence of the land degradation problem
2. Agric markets and institutions in Africa
3. Investment in SLM - conceptual framework
4. How markets, institutions & policies matter for SLM
   - Output markets
   - Input markets
   - Credit and insurance
   - Markets for ecosystem services
5. Summary and conclusions
The problem

• Land degradation deprives the poor of key resources that underpin livelihoods
• It diminishes the capacity of poor farmers and communities to escape poverty
• The potential nexus between poverty and land degradation exacerbates the problem
• Yet, SLM remains a major challenge in many developing countries
What We Know

• Despite efforts to promote SLM technologies, adoption has been very low and slow

• Studies identify several constraints to SLM:
  ▪ Biophysical/farm characteristics
  ▪ Technology characteristics
  ▪ Household characteristics
  ▪ Land user assets and poverty
  ▪ Property rights – land tenure

• However, the role of input and output markets in shaping farmer decisions is not adequately understood
Unproductive Conservation Technology and Imperfect Markets

- Technologies promoted – largely non-profitable, non-beneficial
  - Low-cost but largely unproductive structural and few agronomic practices
  - Soil erosion control rather than focus on water management and use
  - De-linked from income generation and livelihood options
- Better agricultural technologies, modern inputs and methods for SLM exists, but adoption is low and slow
- Market imperfections, policy and institutional failures – key constraints in delivering inputs and technologies
- New technology is critical to create incentives for SLM
Technology Diffusion and Markets

- Modern varieties and inputs (fertilizer) raise productivity of land
- Higher returns from new technology reduce the average costs of conservation (terracing, drainage, stone/soil bunds, etc)
- Higher returns with new technology make sustainability investments profitable
Market Access in Agricultural Areas (Africa, Asia and Latin America)
Fertilizer for SLM

Sources: Evenson and Gollin 2003; FAO 2006a.
Adoption of Improved Varieties

- Sub-Saharan Africa: 24%
- South Asia: 77%
- East Asia & Pacific: 85%
- Middle East & North Africa: 48%
- Latin America & Caribbean: 59%
Irrigation and Water Management
Agricultural Markets in Africa: Extended Supply Chains and Segmented Markets

- Farmer
- Farmers
- Brokers
- Rural assemblers
- Cleaners
- Retailers
- Processor
- Urban wholesaler
- Transporter
- Rural wholesaler
- Consumer

Segmented
High Marketing Costs: Low Producer Price and High Consumer Price

Ghana Maize Price Structure, US$/100 kg, 1998

- Farm gate: 17.3
- + Handling: 19.0
- + Transport: 19.6
- + Agent fees: 19.9
- + Storage: 21.0
- + Agent fee: 21.3
- Wholesale price: 22.8
- + Handling: 23.6
- + Transport: 25.3
- + Storage: 26.2
- City wholesale price: 27.0
- + Transport: 28.2
- + Storage: 29.1
- City retail price: 31.0
Smallholder Market Participation

Source: ICRISAT Data, 2005, Eastern Kenya (N=400)
Role of Collective Action Institutions

- Collective action crucial when:
  - Landscape-wide interventions
  - Resource use interdependence (reciprocal externalities)
  - Remedy market imperfections
- But producer organizations can be costly and difficult to organize
  - Elite capture
  - Conflicting interest groups
- External intervention and supportive policies may be needed to
  - Organize users
  - Define ‘rules of the game’
  - Ensure equity in benefit and cost sharing
Conceptual framework

• The framework we use is broad and holistic. It captures:
  ▪ Intertemporal investment decisions
  ▪ On-farm resource investment possibilities
  ▪ Consequences of different livelihood strategies on quality of resource base

• This framework expands the Livelihood Framework and recognizes the role of market and policy failures
Conceptual framework contd...

• Elements of the extended conceptual model:
  ▪ Elements of theory of farm household behavior (de Janvry et al., 1991)
  ▪ Economics of rural organization (Hoff et al)
  ▪ The role of economic policies (Heath and Binswanger)
  ▪ Institutions and institutional change (North)

• Household SLM investment decisions conditioned by the context of evolving markets, policies and institutions
We assume the farmer makes investment decision each period so as to maximize livelihood benefits subject to:

- Existing technologies
- Existing resource assets
- Expected shocks
- Market conditions
- Policy and institutional environment
## Conceptual Framework

### Global Changes and Macro Policies ($t_0,...,t_n$)

### Conditioning Factors (Drivers) ($t_0,...,t_n$)

<table>
<thead>
<tr>
<th>Technological change</th>
<th>Market access</th>
<th>Policy reform</th>
<th>Institution change</th>
<th>Pop. growth</th>
<th>Urbanization</th>
<th>Infrastructure invest.</th>
<th>Climate change</th>
</tr>
</thead>
</table>

### Household Poverty and Vulnerability Context ($t_0,...,t_n$)
- Natural resource assets (land, soil, water, etc)
- Farm resource assets (livestock, equipment)
- Human resource assets
- Social capital
- Agro-ecosystems (rainfall, drought risk)
- Other shocks (HIV, malaria)

### Household Responses ($t_0,...,t_n$)

### State Policies and Responses ($t_0,...,t_n$)

### Community Responses (collective action) ($t_0,...,t_n$)

### Livelihood & Investment Strategies ($t_0,...,t_n$)

<table>
<thead>
<tr>
<th>Crop Production Choice</th>
<th>Livestock production choice</th>
<th>Consumption choices</th>
<th>Marketing (commercialization)</th>
<th>Non &amp; off-farm employment and migration</th>
<th>On-farm investment (irrigation, SWC, trees, etc)</th>
</tr>
</thead>
</table>

### Livelihood, Productivity & Natural Resource Outcomes ($t_0,...,t_n$)

<table>
<thead>
<tr>
<th>Livelihood conditions (income, vulnerability, distribution)</th>
<th>Productivity (land and labor)</th>
<th>Natural Resource conditions (Water, soil, forests &amp; biodiversity)</th>
</tr>
</thead>
</table>
This analysis shows that adoption and adaptation of SLM is driven by right mix of:

- Technologies
- Market access (input + output)
- Institutional arrangements
- Policy environment

Lack of such mix can push farmers to practice exploitative farming
Role of markets: output price

- Markets affect SLM technology adoption via
  - Relative input and output prices
  - Market access (transaction costs)
- Increase in output price has an ambiguous effect on adoption of SLM
- Ambiguity caused by the countervailing incentives of output price increase, i.e.,
  - Higher output prices raise returns to land and labor in the short run
  - Create incentives to use improved inputs
  - High prices for erosive crops may increase degradation
Output price contd...

• An increase in price of land-degrading crop:
  – Masks the costs of land degradation
  – Promotes use of erosive production practices

• But output price increase can also lead to SLM
  – Common where conservation leads to productivity gains – beneficial conservation
Role of markets: Input price

- Affects SLM via price farmers pay for inputs that constitute SLM (e.g., labor, fertilizer, water, seed)
- High prices for labor input increase the cost of labor-intensive SLM adoption
- High costs for fertilizer may encourage soil mining but could also create incentives for adoption of FYM and other conservation
- High prices for irrigation water could create incentives for adoption of water saving innovations
Role of markets: Access

- Transaction costs (TCs) of reaching markets with outputs
  - The lower the TCs the more likely farmers will adopt SLM

- Transaction costs in input markets (seed, fertilizer, etc)
  - Increase input prices
  - Reduce profitability of inputs
  - Labor-intensive intensification

- Improved market access is good for SLM
  - Improve supply of inputs at competitive prices
  - Reduces self-sufficiency
  - Creates incentives for use of commercial inputs

- Powerful case is the Machakos “miracle”
- Proximity to markets and availability of new technology has:
  - Led to commercialization
  - Increased returns to land and labor
  - Greater investment in SLM

- Reversal or control of land degradation
Markets and SLM: two-way link

- Fertilizer use, improved seeds and irrigation increase production and enhance profitability of SLM
- Water use reduces risks and enhances productivity
  - Productivity growth and generation of marketed surplus
  - Stability of supply - reduced prod risk
  - Stability of prices - reduced market risk
- Incentives to invest in productive inputs and intensification of production
- Shift towards high-value products
- Incentives for market development and private sector participation ➔ Commercialization
Example: Effect of watershed management on commercialization of production in India

- **Cash crops**: Watershed project village (56.5%) and adjoining non-project village (66.2%)
- **Oil crops**: Watershed project village (3.9%) and adjoining non-project village (2.7%)
- **Pulses**: Watershed project village (30.9%) and adjoining non-project village (32.5%)
- **High value cereals**: Watershed project village (29.4%) and adjoining non-project village (22.2%)
- **Low value cereals**: Watershed project village (33.3%) and adjoining non-project village (26.4%)

Total No. of crop growers (%)
### Effect of IWM on Agricultural-commercialization

<table>
<thead>
<tr>
<th>Variables</th>
<th>Est. coeff</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: value of marketed surplus (Rs 1000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought year (2002)</td>
<td>-7.264</td>
<td>0.003</td>
</tr>
<tr>
<td>Male household head (=1)</td>
<td>2.757</td>
<td>0.524</td>
</tr>
<tr>
<td><strong>Watershed village</strong></td>
<td>3.551</td>
<td>0.062</td>
</tr>
<tr>
<td>Variable costs (Rs 1000/ha)</td>
<td>1.687</td>
<td>0.077</td>
</tr>
<tr>
<td>Owned irrigable land (ha)</td>
<td>11.245</td>
<td>0.000</td>
</tr>
<tr>
<td>Owned rainfed land</td>
<td>5.421</td>
<td>0.000</td>
</tr>
<tr>
<td>Hhousehold education (yrs)</td>
<td>0.361</td>
<td>0.000</td>
</tr>
<tr>
<td>Family male workforce</td>
<td>-3.311</td>
<td>0.010</td>
</tr>
<tr>
<td>Family female workforce</td>
<td>-1.751</td>
<td>0.200</td>
</tr>
<tr>
<td>Livestock wealth (Rs 1000)</td>
<td>0.245</td>
<td>0.038</td>
</tr>
<tr>
<td>Value of motorized hh assets (Rs 1000)</td>
<td>-0.345</td>
<td>0.719</td>
</tr>
<tr>
<td>Value of other hh assets (Rs 1000)</td>
<td>0.008</td>
<td>0.620</td>
</tr>
<tr>
<td>Inverse Mills Ratio</td>
<td>3.387</td>
<td>0.110</td>
</tr>
<tr>
<td>Constant</td>
<td>-5.904</td>
<td>0.166</td>
</tr>
</tbody>
</table>

N=240:  F( 13, 226)=42.24 Prob > F = 0.0000, Adj R^2 = 0.688
Role of Non-Agric Diversification and Off-farm Employment

- Mixed evidence on effect of off-farm labor markets on SLM

- Availability of off-farm employment competes with SLM for household labor
  - Off-farm employment overlaps with slack season conservation activities
  - High opportunity costs of labor used in SLM

- Off-farm income can be used in SLM investments
  - Finance SLM investments (fertilizer, seeds, conser agric)
  - Reduce land use pressure – allow land to recuperate
Role of Credit and Insurance Markets

- Investment in modern inputs and technologies for SLM and agriculture require credit
  - Seasonal, medium and long-term finance
  - Classic problems of asymmetric information & high transaction costs
  - Credit markets largely missing for SLM (except for fertilizer use)
  - Producer organizations – peer monitoring and collective action
  - Inventory credit or warehouse receipt systems
  - Loan guarantee schemes

- Pervasive risk – but limited opportunities for managing risk
  - Land degradation
  - Climatic variability
  - Insecure tenure
  - Poor market access

- Markets for risk management
  - Crop insurance – e.g. weather-indexed crop insurance
  - Interlinking credit insurance markets
  - Mobile and flexible saving programs (MPESA – Safaricom in Kenya)
### Table 7

<table>
<thead>
<tr>
<th>Component</th>
<th>Good access to (market) services</th>
<th>Market proximity</th>
<th>Entrepreneurship</th>
<th>Commercial orientation on VR</th>
<th>Noncoop link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy</td>
<td>0.53</td>
<td>0.21</td>
<td>0.04</td>
<td>0.14</td>
<td>0.27</td>
</tr>
<tr>
<td>GO</td>
<td>0.71</td>
<td>-0.31</td>
<td>0.16</td>
<td>-0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>NGO</td>
<td>0.75</td>
<td>-0.17</td>
<td>-0.01</td>
<td>-0.31</td>
<td>0.04</td>
</tr>
<tr>
<td>Distance</td>
<td>-0.33</td>
<td>-0.75</td>
<td>0.04</td>
<td>0.29</td>
<td>0.01</td>
</tr>
<tr>
<td>Road access</td>
<td>0.32</td>
<td>0.80</td>
<td>-0.29</td>
<td>-0.10</td>
<td>-0.12</td>
</tr>
<tr>
<td>Market orientation</td>
<td>0.20</td>
<td>0.20</td>
<td>0.68</td>
<td>-0.23</td>
<td>-0.10</td>
</tr>
<tr>
<td>Market information</td>
<td>0.19</td>
<td>-0.31</td>
<td>-0.69</td>
<td>0.38</td>
<td>0.36</td>
</tr>
<tr>
<td>Commercial orientation</td>
<td>0.06</td>
<td>0.03</td>
<td>0.27</td>
<td>0.67</td>
<td>-0.13</td>
</tr>
<tr>
<td>Cooperative link</td>
<td>0.32</td>
<td>-0.08</td>
<td>0.08</td>
<td>-0.14</td>
<td>-0.90</td>
</tr>
<tr>
<td>Vertical integration</td>
<td>0.43</td>
<td>0.25</td>
<td>-0.15</td>
<td>0.51</td>
<td>0.07</td>
</tr>
<tr>
<td>Sales to starch processors</td>
<td>0.06</td>
<td>-0.35</td>
<td>-0.10</td>
<td>-0.56</td>
<td>0.11</td>
</tr>
<tr>
<td>Services by institutions</td>
<td>0.62</td>
<td>-0.07</td>
<td>0.06</td>
<td>0.11</td>
<td>0.08</td>
</tr>
<tr>
<td>Links to any institutions</td>
<td>0.79</td>
<td>-0.39</td>
<td>0.05</td>
<td>-0.07</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Component loadings larger than 0.50 in absolute value are written in bold, since they are used for the interpretation of that component (see, e.g., Hair et al., 1995).
### Evidence on Role of Markets for SLM (Castano et al., Ag Econ 2005)

<table>
<thead>
<tr>
<th></th>
<th>Soil disturbance control</th>
<th>Soil protection</th>
<th>Runoff control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good access to marketing services</td>
<td>-0.09 (0.13)</td>
<td>0.32 (0.00)</td>
<td>-0.09(0.2)</td>
</tr>
<tr>
<td>Market proximity</td>
<td>-</td>
<td>0.1 (0.15)</td>
<td>-</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>-0.12 (0.02)</td>
<td>0.16 (0.01)</td>
<td>-</td>
</tr>
<tr>
<td>Vertical integration</td>
<td>0.13 (0.02)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lacking coop link</td>
<td>-</td>
<td>-0.16 (0.01)</td>
<td></td>
</tr>
<tr>
<td>Adj R²</td>
<td>0.53</td>
<td>0.28</td>
<td>0.06</td>
</tr>
</tbody>
</table>
Payment for environmental services (PES)

Service provider

• SLM generates positive externalities (ecosystem services)
  – Reduced runoff and siltation of dams
  – Enhanced water flow
  – C-sequestration
  – Watershed protection
  – Wildlife habitat
  – Biodiversity
  – Aesthetic topography

Service taker/buyer

• Theoretically beneficiaries could pay for such services
  – Hydro-power
  – Domestic water supply
  – Irrigators
  – Eco-tourism operators
  – Biofuels processors
  – CDM – carbon financing
PES – Experiences

• Widely used in Central America (Costa Rica, Mexico) on forest conservation
• Food-for-work and cash-for-work used in Africa
• FFW and CFW did not lead to SLM and cannot provide sustainable markets
  – Used in low potential areas to promote SLM but top-down and command-and-control approaches limit its effectiveness
  – Viewed by poor farmers as government subsidy to improve livelihoods (safety-net)
  – Degrading high potential areas often neglected
  – If the support (‘market’) is linked with proper management of resources that ensures flow of ecosystem services, government and other agencies can be potential ‘buyers’ of SLM
PES - Challenges

• Lack of clearly defined service providers
• Lack of clear property rights
• Dispersed providers and users – high transaction costs
• Poor measurability and attribution of service to SLM
• Sustainable flow of ecosystem services requires long-term contracts – difficult to enforce
• Lack of successful pilots in Africa
• Marginal social benefits of ecosystem services should be higher than marginal cost of provision
PES – Best practices

• Exploit local markets (hydropower, drinking water, bottling factory, etc)
• Mutually beneficial and self-enforcing contracts (market based)
• Leverage local institutions for collective action (producer/community organizations) to reduce costs and enhance compliance
• Capacity enhancement for farmers (technology, production, measurement, pricing, etc)
• Support eco-labeling and certification programs to stimulate markets for ecosystem services
Agricultural policy: subsidies

• The major policy issues in SLM: output pricing and input subsidies (e.g., water, fertilizer, seed, credit, etc)

• Subsidies can have 3 major drawbacks:
  – Cause illusive unsustainable increase on returns
  – Distort investment incentives for land users
  – May shift cropping to erosive crops or land use

• Bur targeted subsidies that offer higher social benefits than costs can induce SLM

• Cross-compliance of input subsidies with SLM to enhance efficiency
Making policies work for small farmers

- Removal of subsidies for resource-degrading and low value crops
- Marketing and price support for water-saving and land-augmenting technologies (e.g. tree crops, drip irrigation)
- Diversification out of staples to high value and eco-friendly production systems
- Credit services for SLM investments
Summary

- Smallholders face major challenge in adopting and adapting SLM
- They are constrained by:
  - Lack of profitable (beneficial) conservation options
  - Inadequate policy support for diversification into high value and eco-friendly crop-tree-livestock systems
  - High opportunity costs of conservation labor
  - Poverty and lack of investment credit for SLM
  - Inadequate property rights systems
  - Weak institutional and organizational arrangements

- Role of input and output markets for SLM is under recognized
  - Markets facilitates access to new technology and profitable inputs that motivate SLM
  - Markets access is necessary but not sufficient for SLM
• When property rights are clearly defined to reflect the user costs, market access generally promotes adoption of land-augmenting technologies and spurs commercialization that reduces poverty

• Strong synergies between SLM and market development

• Payment for environmental services and targeted subsidies can be leveraged to enhance SLM investments

• Inter-linked policies to reduce undesirable tradeoffs from market-led intensification

• Investments in SLM by smallholders require improved market, policy and institutional arrangements
Thank You