Institutional Innovations for R&D

AHI brief

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# Searching for Solutions: Technology-Policy Synergies in Participatory NRM

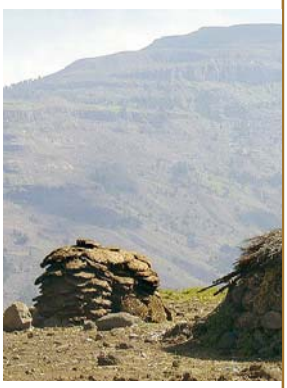

*Plate 1. Open access to dung in Ethiopian outfields creates a disincentive for investing in an alternative fuel source, since any dung left in the fields will be collected by others. Solutions must be collectively negotiated.*

***Technologies are the means, not the end. They are also only a partial means; locally agreed rules and regulations are also required to solve many NRM problems facing highland communities.***

## Moving Beyond Mandates to Solutions

Technologies are generally delivered for the sake of the technology—or the organizational mandate of the development institution, not the problem that needs to be solved. When a problem focus is taken, technologies become a means to address felt community needs. Other complementary interventions may also be needed to address the identified problem. Prior to intervention, all angles of the problem must be looked at to identify more holistic—and therefore more effective—solutions. Many livelihood problems require collective solutions, given the deficiencies of individualized approaches in solving the problem. The following scenarios define areas in which collective approaches are required:

*Scenario 1:* The natural resource management problem cannot be fully solved without collective action (for example, pest control—given contamination from neighbors' plots).

*Scenario 2*: Land users emphasize individual economic returns over collective goods or collective impacts (for example, trees yielding high and quick economic returns over water conservation in springs).

Such problems require rules and regulations to regulate individual behavior, as well as technologies.

## Case Studies: Technology-Governance Synergies in Highland Watersheds

*Free Grazing.* Communities throughout the eastern African highlands complain of free grazing due to destruction of crops, conservation structures and trees, and consequences to soil and vegetation cover. At household level, valuable nutrient resources are also lost due to the scattering of dung throughout the landscape. The conventional approach is to distribute fodder to farmers and encourage zero grazing through improved livestock structures and breeds. The problem with this approach is that zero grazing is labor intensive and risky, making many households opt out. These "free riders" undermine incentives for others to engage in zero grazing because the problem persists. Therefore, these technological innovations must be integrated with locally negotiated by-laws that balance the needs of livestock owners and households negatively affected by free grazing.

*Soil Erosion and Excess Run-Off.* Among highland communities, excess run-off and soil erosion are rated highly as problems due to the destruction of crops, homesteads and infrastructure, and losses to agricultural productivity. The standard approach used by development actors is to encourage individual households to adopt soil and water conservation technologies. Decisions of which technologies, if any, to adopt are therefore made at individual or household level. Yet adopted technologies, as well as decisions to not adopt, have direct consequence to neighbors. Therefore, collective approaches are required to address landscape-level processes. One must first recognize that there are different interest groups in soil and water management. Farmers residing on lower slopes either benefit from the deposition of fertile soil on their lands or are harmed through excess run-off and deposition of infertile soil and sediment. Those residing on upper slopes may either have a greater incentive to conserve because erosion is most severe, or have no incentive to reduce run-off because they are less affected. Therefore, negotiation between farmers residing in different

**Table 1. By-laws and Technologies Proposed by Farmers in Lushoto, Tanzania to Enhance Niche Compatibility**

| NICHE | PROPOSED BY-LAWS | PROPOSED TECHNOLOGIES |
|---|---|---|
| **Farm Boundaries** | Eucalyptus shall not be planted on farm boundaries.<br>Acrocarpus trees on farm boundaries shall be planted at a minimum distance of 15 meters between trees.<br>Anyone caught planting harmful trees on farm boundaries will pay a fine of 5,000 Tanzania shillings. | Plant crop-compatible trees that substitute and supplement the functions of Eucalyptus:<br>• Timber and firewood—Mfufu (*Carissa edulis*), Msongoma (*Gravillea robusta*), Mtarawanda (*Markhamia obtusifolia*)<br>• Securing boundary—Ving'wee (*Dracaena usambarensis*)<br>• Income—Msongoma (*Gravillea robusta*), Mtarawanda (*Markhamia obtusifolia*)<br>• Food—Msongoma (*Gravillea robusta*), Mlobe (*Morus* spp.)<br>• Fodder—Mlobe (*Morus* spp.) |
| **Springs and Waterways** | A 3 meter buffer zone shall be established on either side of waterways.<br>Anyone caught cultivating in the buffer zone will pay a fine of 10,000 shillings.<br>Cultivation shall be banned within an agreed upon radius around springs (the proposed distance varying by number of spring users and spring discharge). | Plant water-friendly grasses and perennials (*Plectranthus laxiflorus, Ensete ventricosa, Leucaena leucocephala*) in buffer zone.<br>Plant water-friendly trees (*Albizia harveyi, Ficus benjamina*) and grasses near springs. |

landscape locations to select technologies and by-laws to minimize soil and water management problems is essential.

*System Incompatibility of Trees.* Another complaint of highland communities resulting from very small landholdings is the compatibility of different technologies in the farming system. Trees often compete with crops for nutrients and water. When planted on farm boundaries, they influence not only the landowner's livelihood but also adjacent households. Certain species also dry up water sources, affecting the entire community. Solutions are therefore not found in technologies alone (system-compatible species that nevertheless provide key economic and other benefits), but in negotiations between the tree owners and affected parties to establish rules to minimize these negative effects (Table 1). Without livelihood alternatives in the form of technologies *and* local by-laws, current problems will persist.

*Limited Energy Resources.* Shortage of fuel for household consumption is a widespread problem facing communities in eastern Africa. Problems emanating from this shortage include heavy labor demands on women and children, conflict from illegal collection of wood products in neighboring land or protected areas, resource mining from public or communal lands for wood and charcoal, and use of dung and crop residues for fuel (Plate 1)—undermining crop production. The solution to this problem generally comes in the form of technologies, many of these fast-growing exotic trees which further exacerbate negative effects on crops and water. The challenge lies in getting all households to both invest in alternative fuel to reduce pressure on other fuel resources, and to negotiate solutions that do not carry high costs to the environment or to other stakeholders. This requires, once again, both technologies and locally negotiated rules and regulations.

## Recommendations

Given these widespread scenarios, and the institutional and methodological disconnect between environmental policy and technology dissemination, it is important to foster collaboration between diverse local stakeholders, government agencies involved in policy formulation and enforcement, and extension agencies. Importantly, proposed by-laws should not be enforced until livelihood alternatives are in place to provide for the basic needs of households. This requires awareness raising on the new by-laws and their proposed date of enforcement, to give households the opportunity to invest in technologies designed to minimize any cost of new regulations to livelihood.

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