Introduction

- Reducing greenhouse gas (GHG) emissions from the agriculture sector—especially livestock—through low-emission development (LED) has attracted global attention due to their high emission potential.

- However, producers rarely prioritize emission reduction in their day-to-day practices, resulting in a mismatch between global and national environmental policies and local development interests.

- Most technocentric LED interventions take a "one-size-fits-all" approach and tend to be designed around the assumption that intensification and productivity gains produce socio-economic co-benefits for all producers.

- The objective of this study is to identify pathways for scaling LED that better account for divergent smallholder capabilities, strategies, and interests.

Methodology

- 1200 households were interviewed across 4 districts in Tanzania. Across extensive, semi-intensive and intensive production systems.

- Multivariate cluster analysis was employed using the DAISY package in R (3.5.1).

Pathways toward inclusive low-emission dairy development in Tanzania: Producer heterogeneity and implications for intervention design

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Results

Our analysis reveals six distinct farmer types as shown below.

<table>
<thead>
<tr>
<th>Wealthy</th>
<th>Farm specialist</th>
<th>Diversified</th>
<th>Livestock dependent</th>
<th>Marginalised entrepreneurs</th>
<th>Subsistant farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Engage in milk sales mostly through formal channels</td>
<td>• Most farmers sell milk through formal channels</td>
<td>• Sell milk mainly through informal channels</td>
<td>• Sell milk through formal and informal channels</td>
<td>• Do not sell milk</td>
<td>• Do not sell milk</td>
</tr>
<tr>
<td>• Score highest on income and assets</td>
<td>• Score moderately on assets income</td>
<td>• Average income and assets</td>
<td>• Score high on TLUs</td>
<td>• Score lowest on incomes and assets</td>
<td>• Sell milk</td>
</tr>
<tr>
<td>• Low TLUS</td>
<td>• Diversified income sources</td>
<td>• Diversified income sources</td>
<td>• Depend more on livestock income</td>
<td>• Comparatively poor and vulnerable</td>
<td>• Diversified sales mostly meeting the consumptive needs</td>
</tr>
<tr>
<td>• Multiple income sources including off farm income</td>
<td>• Not in farmer groups</td>
<td>• None have off-farm income</td>
<td>• All respondents derive income from off-farm business</td>
<td>• Livestock sales</td>
<td></td>
</tr>
</tbody>
</table>

The six farm typologies displayed three levels of uptake of LED practices (low, medium and high uptake).

- Wealthy and Farm specialist farmers scored highest on uptake of LED practices.

- Diversified and Livestock-dependent households scored moderately in uptake of LED.

- While the Subsistence farmers and Marginalized Entrepreneurs scored lowest in the uptake of LED practices.

Discussion

First variants of technological packages plus market-based interventions will appeal to Wealthy and Farm specialist groups. While this group represents a "quick-wins" group, GHG reductions from targeting this group are likely to be modest.

Second, a mix of both market incentives, value chain development, and (concessionary) access to better quality inputs and extension services could serve to catalyze the adoption of LED practices for Diversified and Livestock dependent groups. These groups will deliver greater benefits with respect to GHG reductions and inclusive development.

Finally, a conceptualization of pathways that are grounded within a food system approach rather than as a technological package would be required for households that keep more indigenous breeds and are currently not adopting (many) LED practices.

Using a bottom-up approach accounting for the real needs of dairy farmers would lead to more inclusive rural development.

Conclusion

- Results point to the need to conceptualize LED not only as a top-down technological package but to also allow bottom-up approaches.

- A food-systems perspective allows for bottom-up approaches which can more explicitly account for local needs and interests in intervention design for LED.

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