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Assessing Technological Innovations for Smallholder Agriculture in the Eastern Amazon Region — Implications for Technology Adoption and Dissemination

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Abstract

Over the last four decades smallholder agriculture in the Amazon region continuously adapted to changing economic conditions. This had environmental implications on a local and global scale. In order to reduce pressure on the environment as well as poverty through sustainable production, technological innovations need to be ecologically sound, economically viable, and socially acceptable at the same time. Various research activities currently conducted in the Amazon region investigate the potential of alternative technologies for smallholder agriculture.

The session presents selected findings of a research project carried out by the Center for Development Research (ZEF), University of Bonn, and its Brazilian partners (Embrapa Amazônia Oriental and Federal University of Pará — NAEA, Belém) during the past twelve years. The project developed, tested, and economically evaluated fire-free alternatives to slash-and-burn practices in the eastern Amazon region. The fire-free technologies aim at maintaining the existing fallow system while integrating “modern”, productivity increasing inputs like fertiliser and mechanisation. Fallowing provides important economic and ecological services, such as temporary carbon sequestration and biodiversity conservation, which most technologies for continuous cropping do not accomplish. The presentations first introduce various technologies for smallholders that are currently under investigation. Secondly, a cost-benefit analysis of on-farm trial data highlights the private and social determinants of technology profitability.

Moreover, results of a profit function analysis based on representative farm household data reveal the quantitative importance of fallow as a production factor and the role of fertiliser and product prices in production decisions. Finally, the impact of technology adoption on land use and household welfare is assessed in a set of technology and policy simulations using a bio-economic farm-household model including uncertainty.

The results indicate that the economic impact of environmental degradation is still too low for many farmers to switch from traditional technologies to more sustainable — but cost and / or labour intensive — technologies without substantial government support. Moreover, institutional frame conditions and infrastructure at the municipal level favour technological innovation in some districts, while holding it back in others. Especially, in the latter areas, cash and liquidity constraints represent the main obstacle to technological innovation among smallholders.

Concluding remarks reflect on:

1. the research design and the methodological approaches employed in the project,

2. interdisciplinary research that combines ecological as well as socio-economic aspects,
3. and the need to adopt a broader perspective including technological and institutional innovations to stimulate farmers' adoption behaviour.

Finally, a discussion of implications for policy action that arise from the project findings will open the session to a broader debate.

Keywords: Bio-economic model, cost-benefit analysis, interdisciplinary research, profit function, technology assessment