Food loss reduction leading to promising business cases and climate smart solutions for smallholder rice farmers

A case study on the impact of mechanization on Food Losses and Greenhouse Gas Emissions in Nigeria

Wageningen University and Research (WUR), in cooperation with Olam Rice Nigeria, conducted a controlled experiment in Nigeria in which mechanized rice harvesting and threshing were introduced on smallholder farms. Local youth was trained by Olam to work with the machinery, and the yield from mechanically harvested and threshed sample plots of rice was compared with the yield from sample plots harvested and threshed manually. WUR used these experimental findings to evaluate the yields and losses under different technologies, calculate greenhouse gas emissions for these scenarios, and evaluate the economic feasibility of various options for mechanization of smallholder farms. Last, we reflect on socioeconomic impacts of mechanization (division of labor, role of women and youth) as observed by the field experts conducting the experiment, based on a food system perspective.

The result of the study shows that mechanization considerably reduces losses, has a positive impact on farmers' income, and the climate. **Introducing mechanized harvesting and mechanized threshing prevents as much as 479kg food loss per ha and is increasing farmers income by approximately US$200 per ha. Moreover, the introduction of mechanization can avoid per ha 1.7-ton CO2-eq. production-related Greenhouse Gas Emissions**. This already accounts for fuel use of the reaper and thresher, making a strong case for farm mechanization as a climate positive intervention.

Based on this work done the following policy advice can be given:

1. Mechanization should be part of agricultural development strategies for reducing losses, improving food security and improving farmers' incomes. In the context of these strategies, mechanization should be approached from a broader value chain perspective, with early involvement from all relevant stakeholders.
2. Supporting policy should focus on increasing awareness of the benefits of mechanization of smallholder farms, focusing on reduced losses, increased yield, the positive business case for farmers, and food loss-induced greenhouse gas emissions avoided. Demonstrations and education on efficient practices and technology should be a part of this towards farmers.
3. Improving access to mechanized systems is essential. Reapers and threshers have a relatively high up-front cost, but access schemes through for example farmer cooperatives and rental service providers allow farmers to reap a nearly immediate benefit at a relatively low cost. Policy should support these activities, if necessary, with subsidies, and enable the development of a market for affordable credit provision.
4. In parallel to facilitating and stimulating adoption of mechanized rice farming, policy should contribute to building and dissemination of technical know-how and capabilities. This includes training of farmers and operators on effective machine use, as well as development of technical skills in rural communities.
5. As a labor-saving intervention, mechanization can have the undesired side-effect of increasing rural unemployment. To mitigate this effect and possible resulting backlash, there need to be opportunities to use the time saved. This includes education for children and youth, and opportunities for other economic activities for adults. Therefore,

mechanization strategies should go hand in hand with a more general rural development strategy, aiming for diversification of rural economies.

6. Policy in this domain should take a value chain approach, involving all stakeholders in the chain, and leverage and cooperate with existing initiatives for improved practices in rice farming, such as Olam's Rice Outgrowers Initiative.
7. Accelerated mechanization of smallholder rice farms increases demand for machinery and increases farmer income. The private sector, governments, and supporting agencies should respond to these opportunities, with policy enabling the development of equipment supply chains. This can extend beyond machinery and complementary services to for example other agricultural inputs which farmers can now more easily afford.

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