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Can Farmer-to-Farmer Mechanisation Enterprises Contribute to Filling the Technology Adoption Gap in Zambia?

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Abstract

Zambia is a relatively land-abundant country; 58 % of its territory has a medium-high potential for agricultural production, but less than 14 % is currently under cultivation. This inefficient use of land resources can be explained, among others, by the low adoption of improved technology, inappropriate use of inputs and vulnerability to weather conditions.

In northern Ghana, mechanisation has contributed to cropland expansion during the last 15 years as a growing share of medium and large scale farmers have acquired agricultural machinery. These technology adopters have increased the supply of Mechanisation Hire Services (MHS) improving tractors accessibility to those farmers who are unable to buy their own. Similarly, medium scale farmers started offering MHS in Zambia since 2011, yet at a lower rate of technology adoption when compared to northern Ghana.

The objective of this study is to assess the financial viability and sustainability of farmer-to-farmer MHS enterprises in Zambia as a means to reduce the technology adoption gap among smallholders. To achieve this goal, 30 interviews were conducted with Tractor Service Providers (TSPs) across the country to collect data related to farming activities and machinery services. The information of one representative TSP was used, to parameterise a single agent mathematical programming model using the agent-based software package MPMAS. The TSP agent considered a 15-year-period planning horizon corresponding to a tractor's estimated lifetime, including crop production, farm, and off-farm income, labour, and machinery management. Results showed that MHS provision increases the TSP's average discounted cash surplus by 47 % suggesting that it is a profitable activity with high potential to promote mechanisation. However, the supply chain has to overcome some deficiencies like a demand with low purchasing power, high transaction costs and expensive maintenance and breakdown repairs that discourage the expansion of services. Mechanical training, mechanisms that reduce logistic costs and education on business management can contribute to reducing bottlenecks in the supply of MHS. The public sector should focus on improving the agribusiness environment and access to land and credit for smallholders to provide the demand side with enough liquidity to guarantee the sustainability of the business.

Keywords: Mathematical programming, mechanisation enterprises, sustainability