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The Declining Profitability of Litchi Fruit Orchards in Northern Thailand: Can Agricultural Innovations Reverse the Trend?

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Abstract

The profitability of litchi growing in northern Thailand has declined during the last 15 years. The potential substitution of seasonal field crops for litchi trees has created concerns about increased levels of erosion, pesticide use, and irrigation water demands. In response, researchers have been developing various technical innovations that could make litchi growing more profitable again.

The objective of this paper is to ex-ante evaluate four of these innovations: artificial flower induction to produce off-season fruits, village level fruit drying, improved shelf-life and fruit quality, and greater irrigation efficiency. These innovations were evaluated in terms of five indicators: profitability of litchi growing, farm household incomes, area under litchi orchards, irrigation water use, and the environmental impact of pesticides as based on the environmental impact quotient of pesticides (EIQ method). As some innovations (artificial flowering and improved self-life) are only at a research stage, assumptions were made about their likely costs and benefits.

The profitability of litchi growing and the four innovations was assessed through financial analysis. Although the results show that each innovation could increase profits of litchi growing, this is no guarantee for farm level adoption. For this, opportunity costs, resource constraints, risk aversion, and knowledge need to be taken into account. To do this, an integrated land use model was developed that used an agent-based modelling approach to capture the heterogeneity in opportunity costs between households and to capture the dynamics of innovation diffusion.

The model was calibrated to the Mae Sa watershed area in Chiang Mai province. Located about 40 km northwest of the rapidly expanding town of Chiang Mai, the watershed has seen rapid economic development which has created various farm and non-farm alternatives to litchi growing. Farmers have increasingly left their litchi orchards unmanaged or have cut down trees to replace them with more profitable crops. The watershed is hence not representative for northern Thailand but could be a prospect for other areas in northern Thailand.

Using scenario analysis, each innovation is separately introduced into the model allowing a comparison of their effects. In addition, the innovations are introduced simultaneously to analyse their combined effect.

Keywords: Agent-based modelling, agricultural economics, ex-ante technology assessment, pesticides

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