Tropentag, September 10-12, 2025, hybrid conference

"Reconcile land system changes
with planetary health"

Adopt or dis-adopt push-pull technology? Insights from discrete-time proportional hazard models and machine learning-based survival analysis in East Africa

Denis Waiswa[1], Beatrice Muriithi[1], Fahri Yavuz[2], Alice Murage [3], Dave Mwangi Ireri[3], Fredah Maina[3]

[1]*International Centre of Insect Physiology and Ecology (icipe), Social Science and Impact Assessment Unit, Kenya*

[2]*Ataturk University, Department of Agricultural Economics, Türkiye*

[3]*Kenya Agricultural Livestock and Agricultural Organization, Research Methods and Analytics, Kenya*

Abstract

This study examines the determinants of adopting and dis-adopting Push-Pull Technology (PPT) in East Africa using household-level panel data from comprehensive surveys in Ethiopia, Kenya, Rwanda, Uganda, and Tanzania. We specifically focus on two distinct models: Model 1, the adoption/entry model, evaluates the speed of adoption by considering the timeframe from when the farmer first learned about PPT to when they began using the technology. Model 2, the dis-adoption/exit model, assesses the speed of dis-adoption by measuring the duration from the start date, when the farmer first adopted PPT, to the end date, when they ceased using the technology. Employing discrete-time proportional hazard models, we estimate the hazard functions for PPT adoption and dis-adoption. Additionally, we explore the potential of machine learning-based survival analysis, specifically Extreme Gradient Boosting (XGBoost), to improve prediction accuracy. Results from both approaches underscore the crucial role of social interaction variables in the adoption and sustained use of PPT. Key factors include the size of a farmer's social network with other PPT adopters, frequent contact with extension services, and group membership. Positive perceptions of PPT's effectiveness also significantly accelerate adoption while delaying dis-adoption. Moreover, diverse information sources expedite adoption, while participation in PPT training programmes and the frequency of training sessions attended are also essential for the continued use of PPT. These insights suggest that, beyond ensuring the availability of inputs, enhancing farmers' perceptions through targeted education, demonstrations, and evidence-based communication, along with strengthening peer learning, and extension services, can address barriers to adoption and promote the sustained use of PPT.

Keywords: Agricultural innovation, discrete-time proportional hazard model, duration analysis, extreme gradient boosting, machine learning survival analysis, social interaction

Contact Address: Denis Waiswa, International Centre of Insect Physiology and Ecology (icipe), Social Science and Impact Assessment Unit, Nairobi, 30772-00100 Nairobi, Kenya, e-mail: dwaiswa@icipe.org