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"Development on the margin"

Adoption and Productivity Impacts of Biotechnology for Orphan Crops: The Case of Tissue Culture Bananas in Kenya

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Abstract

The benefits of relatively knowledge-intensive technologies that require supplemental inputs are not well known in literature. Moreover, there are no known studies investigating technology impacts on perennial crops. Using the case of tissue culture (TC) bananas in Kenya, we assess whether there are differences in banana production functions between TC adopters and non-adopters using a simultaneous equations model with endogenous switching. We account for heterogeneity in adoption decisions and for unobservable characteristics of farmer households and their farms and then compare the expected banana yield under the actual and counterfactual scenarios. Because of banana's perennial nature, we also assess technology impacts over time by considering plantation age characteristics, a method not used before. We find that adopters and non-adopters are systematically different with regard to personal and farming attributes. Agricultural information access matters for adoption but also for productivity benefits. TC banana yield effects are well achieved within supporting institutional frameworks and when supplemented substantially by irrigation water. We find that TC technology has only helped reclaim lost yields of smallholder farmers but there are no sufficient yield improvements above the expected average. TC productivity effects peak in middle-aged TC plantations but may remain relatively higher in later crop-cycles. This implies that traditional impact assessment methods, as would be appropriate to annual crops, may not be applicable for perennial crops and could cause incorrect conclusions. We recommend that such knowledge-intensive technologies should not be promoted as stand-alone technologies but rather should be complemented with infrastructural and institutional development if they are to achieve their intended primary objective of improving enterprise productivity.

Keywords: Adoption, endogenous switching regression, impact, Kenya, productivity, tissue culture banana

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