Pesticide Overuse, Exposure Risks, and Safe Pesticide Management among Vegetable Farmers in Assam, India

Abstract

Commercial vegetable production has become increasingly reliant on chemical pesticides. This intensification helps protect yields but also raises exposure risks and environmental externalities. In practice, decisions about chemical pesticide use are often influenced by asymmetric information, advice from retailers, and limited access to safer alternatives. As a result, overuse, unsafe handling, and preventable health effects can persist despite farmers being aware of basic safety recommendations. The research design of this thesis responds to these gaps with the following objectives: (i) to assess the extent and determinants of chemical pesticide overuse in commercial vegetable farming; (ii) to assess farmers' preventive measures and associated acute health symptoms of pesticide exposure; (iii) to analyze the sociopsychological determinants of pesticide safety behavior; (iv) to analyze farmers' willingness and ability to pay for Safe Pesticide Management (SPM) and the factors influencing participation and contribution level. The study is based on primary data collected from 390 pesticide applicators involved in commercial vegetable cultivation across four districts in the state of Assam, India. The determinants of pesticide overuse are analyzed using a logit model. Exposure-related preventive practices and acute symptoms are modeled in symptom-specific multivariable logistic regressions. Sociopsychological pathways are tested using structural equation modeling. The demand for an integrated package of SPM is measured using the Heckman two-stage model. Findings show that pesticide overuse is common and intensive in commercial vegetable production. Acute symptoms were frequently reported, indicating notable short-term health concerns associated with pesticide exposure. Perceived behavioral control is not statistically decisive, implying that there are structural constraints on translating intention into practice. A majority of applicators are willing to contribute to SPM, but contribution levels range substantially based on heterogeneity in information access, perceived risk, and liquidity conditions. Overall, the thesis supports an integrated policy approach. It focuses more on extension and risk communication, as well as better access to proper PPE and accountability in pesticide advisory channels. It also supports cost-sharing SPM designs, which are calibrated to seasonal cash flow constraints with targeted support for liquidity-constrained households.

Keywords: Pesticide overuse; Vegetable farming; Preventive measures; Acute health symptoms; Safe Pesticide Management; Assam