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Integrated Pest Management Synergy Programmes for Coffee Farmers in Rwanda's Highlands: Healthier Crops with Reduced Pesticide Use

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Abstract

Integrated Pest Management (IPM) programmes have been implemented globally to reduce pesticide use while maintaining crop yields and quality. In Rwanda's coffee-growing highlands, IPM has shown promise in enhancing sustainability by reducing chemical inputs without compromising productivity. A mixed-methods approach combining qualitative interviews with quantitative assessments of pest management practices and crop yields. Data were collected from 50 randomly selected coffee farms across three districts in Rwanda's central highlands. The analysis revealed that the integrated pest management programmes led to a significant reduction ($p < 0.01$, CI: -25% to -18%) in pesticide application rates compared to conventional practices, without compromising crop health or yield stability. The findings suggest that IPM can effectively reduce pesticide use on coffee farms while maintaining high-quality yields and environmental sustainability. Farmers should be provided with training and support for sustainable pest management techniques. Government agencies are encouraged to promote and subsidize these programmes to facilitate wider adoption in the region. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Rwandan Highlands, IPM, Synergistic Approaches, Beneficial Insects, Cultural Practices, Pest Monitoring, Biological Control*

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