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Examining the adoption of agricultural drones among Pakistani farmers: A modified technology acceptance model

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Abstract

Farmers who operate on small scales across Pakistan predominantly depend on traditional agricultural practices for their agricultural sector. Modern agricultural drones are being progressively adopted to advance precision farming practices that will satisfy future food requirements. This study addresses two primary inquiries: first, regarding factors that drive agricultural drone adoption and the economic benefits for farmers, and second, whether drone adoption is economically viable for farmers. The analysis combined the 130 farmer responses from the Rahim Yar Khan district into a statistical assessment via Structural Equation Modelling (SEM) through SmartPLS.

The data indicates that farmers' behavioural intention to adopt drones increases based on their perceptions of usefulness (= 0.537, t-stat = 4.580), results demonstrability (= 0.106, t-stat = 1.684), and subjective norms (= 0.435, t-stat = 3.626) but decreases when the perceived cost (= -0.141, t-stat = 1.339) is higher. Perceived usefulness receives significant influence from subjective norms (= 0.686, t-stat = 13.080) and results demonstrability (= 0.197, t-stat = 1.977) and uses perceived usefulness as a mediator to explain the whole path model.

The benefit-cost analysis demonstrates that drone deployment is practical since the total advantages surpass the total expenses by a wide margin. Across all farm areas surveyed, farmers achieved an average of 5,728 PKR (28 USD) in per-acre input cost savings, increased their yields by 131 Maunds (5.24 metric tons), and cut their fertiliser costs along with pesticide costs and labour expenses. The expenses related to seed, sowing, land preparation, irrigation, and harvesting kept their regular amounts unchanged. Drone adoption became profitable based on a calculated benefit-cost ratio (BCR), which equaled 1.64.

Smartphones were the main channel for collecting information, and better crop quality ranked as the most beneficial aspect, while maintenance expenses proved the most challenging. Still, farmers found cost-effectiveness the most compelling reason to adopt. According to these research findings, drone companies should lower prices, implement membership schemes, and conduct demonstration programmes to increase drone adoption rates in rural Pakistan.

Keywords: Agricultural drones, behavioural intention, benefit-cost analysis, precision farming, structural equation modelling, technology adoption

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