

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Ingeniería Empresarial

Tesis

**Comprehensive Technological Model for Monitoring Personnel
Performance in Coffee Plantations through Harvest Container
Tracking and User ID: Optimizing harvest efficiency through
real-time performance tracking in agricultural operations**

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Comprehensive Technological Model for Monitoring Personnel Performance in Coffee Plantations through Harvest Container Tracking and User ID

Optimizing harvest efficiency through real-time performance tracking in agricultural operations

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Abstract

In the agricultural sector, where operational efficiency and effective human resource management are crucial, an innovative technological tracking model is presented to enhance staff performance during harvest operations, specifically in the coffee agricultural field. By integrating advanced global positioning systems (GPS) and tracking technologies, the approach seeks to monitor work activities in real time, comprehensively analyzing the collected data to optimize task assignment and improve productivity. This model incorporates tracking practices into staff performance, evaluating and improving work performance, essential in dynamic agricultural environments such as coffee plantations. Tracking in the harvest involves controlling the collection and distribution of agricultural products through technologies such as beacons and tags, contributing to optimize service. The results show that there is a significant improvement in staff efficiency after the implementation of the model. In summary, the proposed model constitutes a comprehensive and technologically advanced approach, seeking to continuously

CCS Concepts

• **Computing methodologies** → Artificial intelligence; Computer vision; Computer vision problems; Tracking; Machine learning; • **Applied computing** → Computers in other domains; Agriculture.

Keywords

Coffee harvesting, agricultural technologies, GPS tracking, workforce performance, harvest container tracking, real-time monitoring

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1 Introduction

The term "harvest operations" refers to the operations involved in the harvesting process in agriculture. These operations include various tasks such as obtaining equipment and machinery, organizing work, identifying the product to be harvested for marketing, harvesting itself and transporting it from the field [1]. In coffee plantations, harvesting by the picking method (manual collection of coffee beans) is of utmost importance, since it guarantees a higher quality harvest due to the uniformity of the harvest [2]. It is also noted that coffee is a fairly prevalent crop worldwide; for example, Colombia is one of the most recognized countries for coffee production [2], it is also estimated that Mexico contributes 2% of the world coffee production [3], and Peru also stands out as an important exporter, being the main supplier of coffee to the United States for the 25% of the market it occupies in the agro-exports of said country [4]; however, there are currently problems that must be addressed for the benefit of Peruvian coffee producers. These problems include the lack of efficient management of production processes and their resources, as well as the lack of use of technological tools capable of measuring indicators and evaluating production processes to make improvements [4]. Traditional harvesting practices contribute to these problems, causing bottlenecks and loss of resources [5], which affects the quality of coffee and consequently the producers, hence

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