



Tropentag, September 16-18, 2026, hybrid conference

“Towards multi-functional agro-ecosystems
promoting climate resilient futures”

Exploration of use cases for an ai-based coffee yield estimation tool

CAROLAY PEREA¹, CHRISTIAN BUNN²

¹*The Alliance of Bioversity International & CIAT, Food Environment & Consumer Behavior*,

²*The Alliance of Bioversity International & CIAT, Climate Action, Colombia*

Abstract

AI-based computer vision in handheld devices has been postulated to be transformational for agriculture. Yet, scaled applications for smallholder agriculture are sparse. Yield estimation is a fundamental practice in the coffee value chain, with applications ranging from the agronomic assessment of plantations to the financial planning of regional organisations and compliance with certification requirements. However, conventional methods based on manual cherry counts are costly, require skilled labour, and are prone to errors, limiting the ability of stakeholders in the chain to make informed and timely decisions.

We piloted a mobile app that uses artificial intelligence to automatically count coffee cherries from images captured with a smartphone, generating yield estimates quickly, in a documented and reproducible manner. However, understanding who its potential users are, what their needs are, and in what contexts it can generate real value is a necessary condition for its scalability

This study presents an initial exploration of Croppie’s use cases, based on the perspectives of stakeholders in the coffee supply chain and the early experiences of pilot users. The study employed a qualitative methodology in two complementary phases, including an exploratory survey and semi-structured interviews with different types of actors in Colombia, Peru, and Ecuador. The study began with prior hypotheses regarding use cases, with the dual purpose of validating them and identifying unanticipated emerging applications.

The findings reveal a diversity of needs that suggests the relevance of differentiated solutions depending on the type of stakeholder. Cooperatives represent the segment with the greatest willingness to adopt the technology, valuing cost reduction, speed, and accuracy exceeding 80 %. They also identified data centralisation and technical interoperability with external producer management platforms as priorities. Another cross-cutting requirement identified was flexibility in the sampling protocol, given that some stakeholders use different methods for tree selection. National trade associations, having their own digital infrastructure, require API integration rather than a standalone application. Pilot projects with farmers, cooperatives, research and development and national extension partners illustrate concrete applications ranging from decision-making at the farm level to national harvest forecasts and genetic improvement processes, demonstrating a broader scope than initially anticipated for the tool.

Keywords: Coffee value chain, computer vision, decision-making, use cases, yield estimation