

# Food Security Through Machine Learning, Sustainable Precision Farming, and New Arable Land Creation

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## Abstract

As the global population approaches 10 billion by 2050, ensuring food security has become one of humanity's most pressing challenges. This talk presents ongoing research at the Area X.O Smart Farm in Ottawa, Canada, focusing on data-driven and sustainable solutions to increase agricultural productivity. Leveraging machine learning and unmanned aerial vehicles (UAVs), the research explores yield prediction, early pest infestation detection, and seed-placed banding as sustainable precision farming techniques for enhancing yield and improving nutrient efficiency. Beyond improving existing farmland, the presentation also highlights the potential of transforming underutilized savanna ecosystems into productive farmland. As global arable land becomes increasingly scarce, the African savannas have emerged as a new frontier for sustainable agricultural development. The initiative aims to transform these regions using innovative precision planters and roller/crimper equipment that enable herbicide-free soil management and regenerative crop systems. Results from pilot operations covering 10,000-100,000 hectares near Kinshasa, Democratic Republic of the Congo (DRC) will be discussed, demonstrating how technological innovation and sustainable practices can work together to secure the world's future food supply.

## Keywords

Precision Agriculture, Machine Learning in Agriculture, Unmanned Aerial Vehicles (UAVs), Yield Prediction, Pest Detection, Sustainable Farming, Seed-Placed Banding, Savanna Agricultural Development