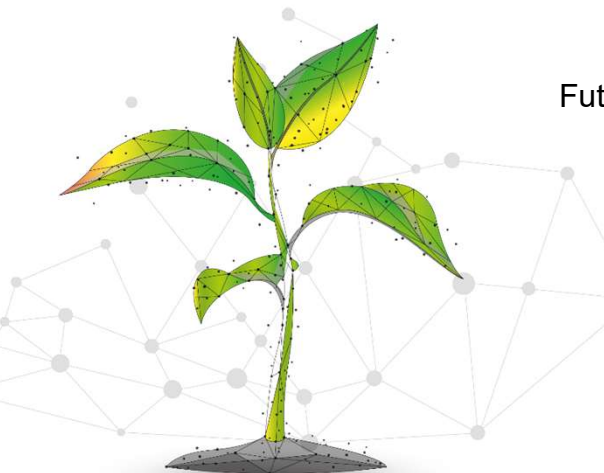


SCALE^{UP}
community-driven
bioeconomy development


Tuesday 16 January 2024





Future Farm - Digitalization in the agri-food sector

Manuel Pérez Ruiz
 Full Professor at University of Seville
 Director of the Corteva Catedra in Digital Agriculture and Sustainability
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AGR-278 SMART BIOSYSTEMS LABORATORY



1





FutureFarm

Vision: A place to demonstrate & validate ag-technology


Open Concept



FutureFarm Network

2

3


Smart Biosystem Laboratory
 Research Group AGR-278

Artificial vision

Big Data and AI

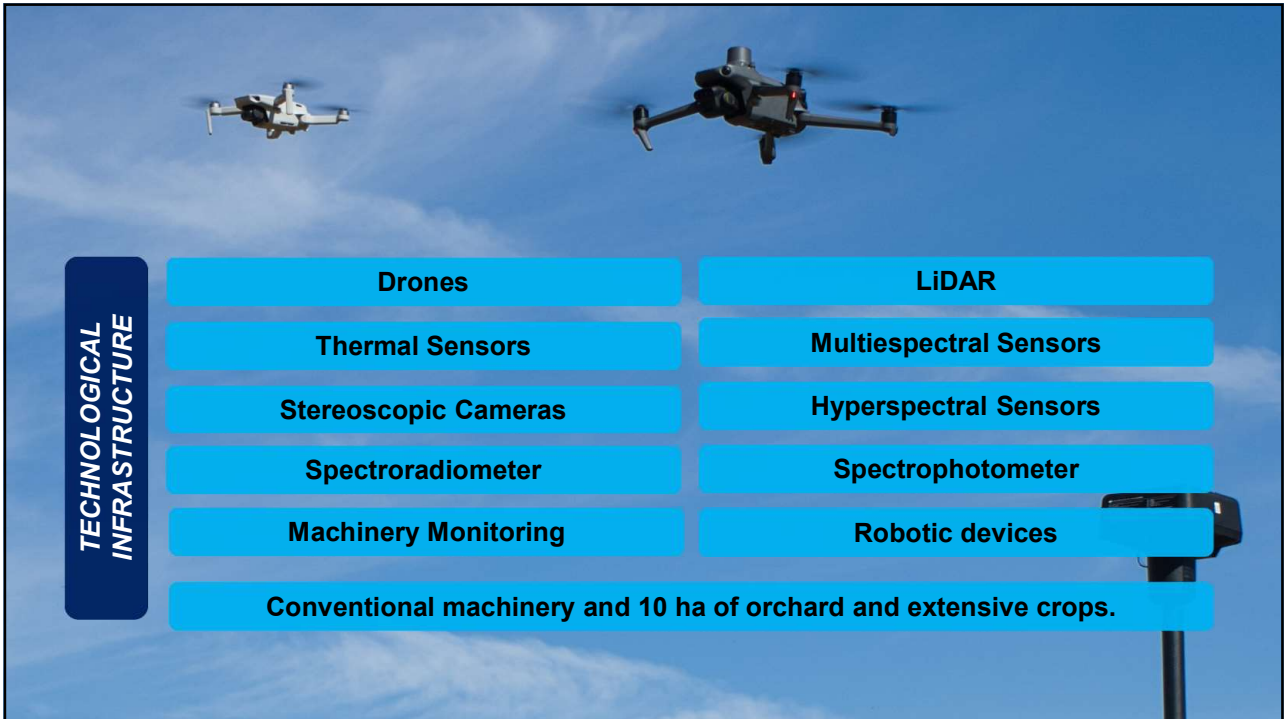
Sensors

Machinery

Main lines of research

- 1 Smart irrigation and sensors
- 2 Phenotyping and 3D reconstruction of crops
- 3 Advanced geomatics and drones
- 4 Automation and advanced machinery for crop protection
- 5 Big data and artificial intelligence

4



5



6

Integrating Agriculture and Technology

Tools and Equipment
Advanced Infrastructure

- Cutting-edge technological resources.
- Efficient collaboration with other teams, companies and organizations.

Proven Results
Great Success

Experience and track record
Years of Success

- Several years of experience in innovative projects.
- Successful implementation of transformative projects.

Specialized Knowledge
Multidisciplinary Team

• Agricultural engineers and artificial intelligence experts.
• Deep technical expertise.

Unique Synergy
Knowledge Fusion

• Unique synthesis of agricultural expertise and artificial intelligence.
• Capacity for innovation and adaptation.

7

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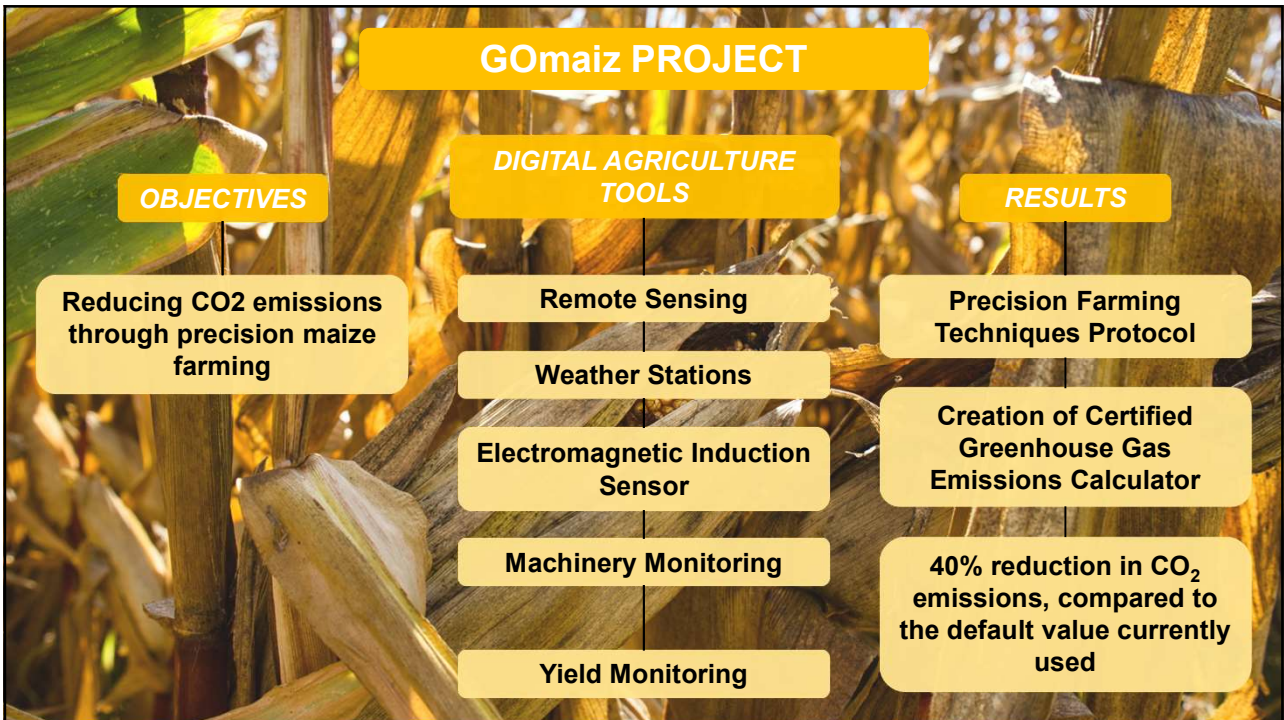
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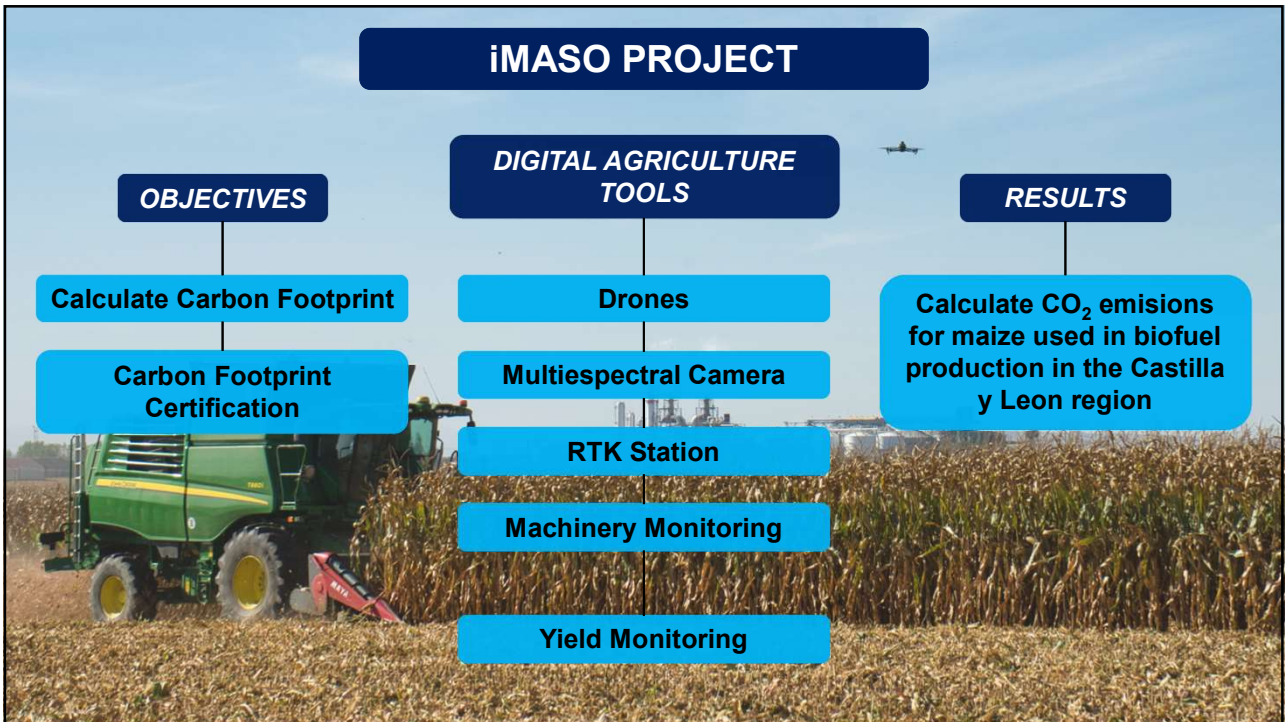
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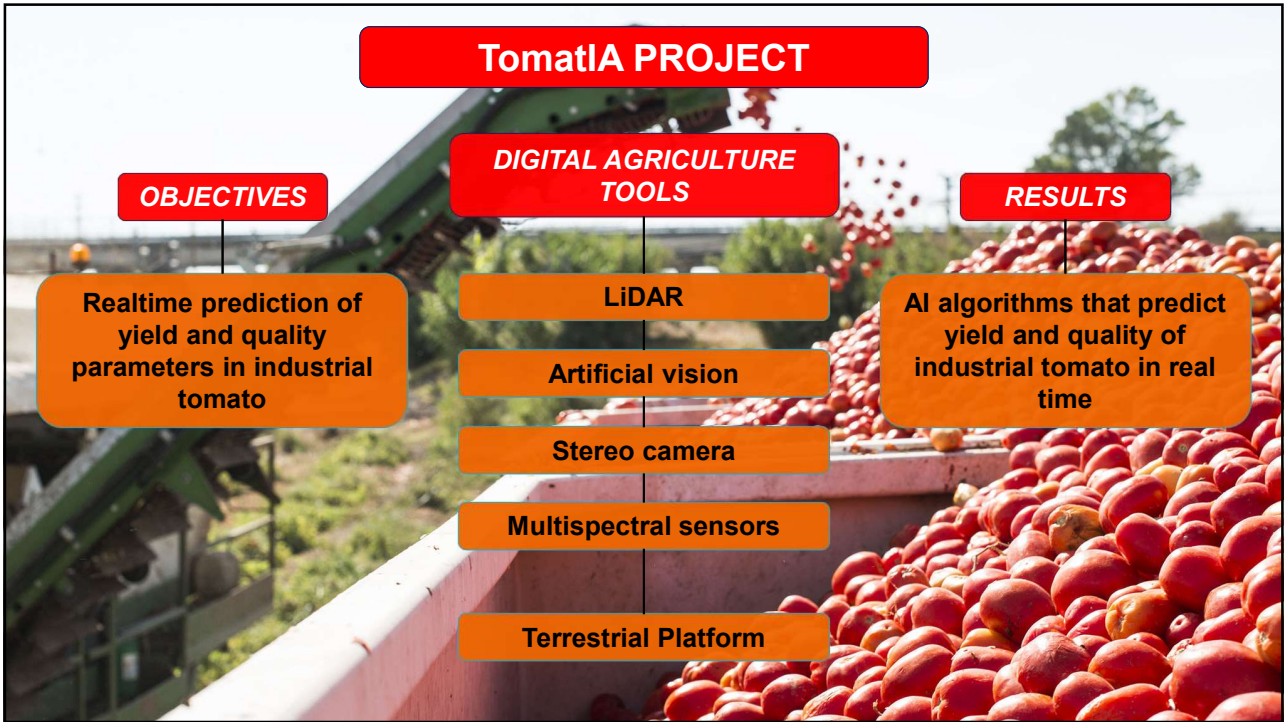
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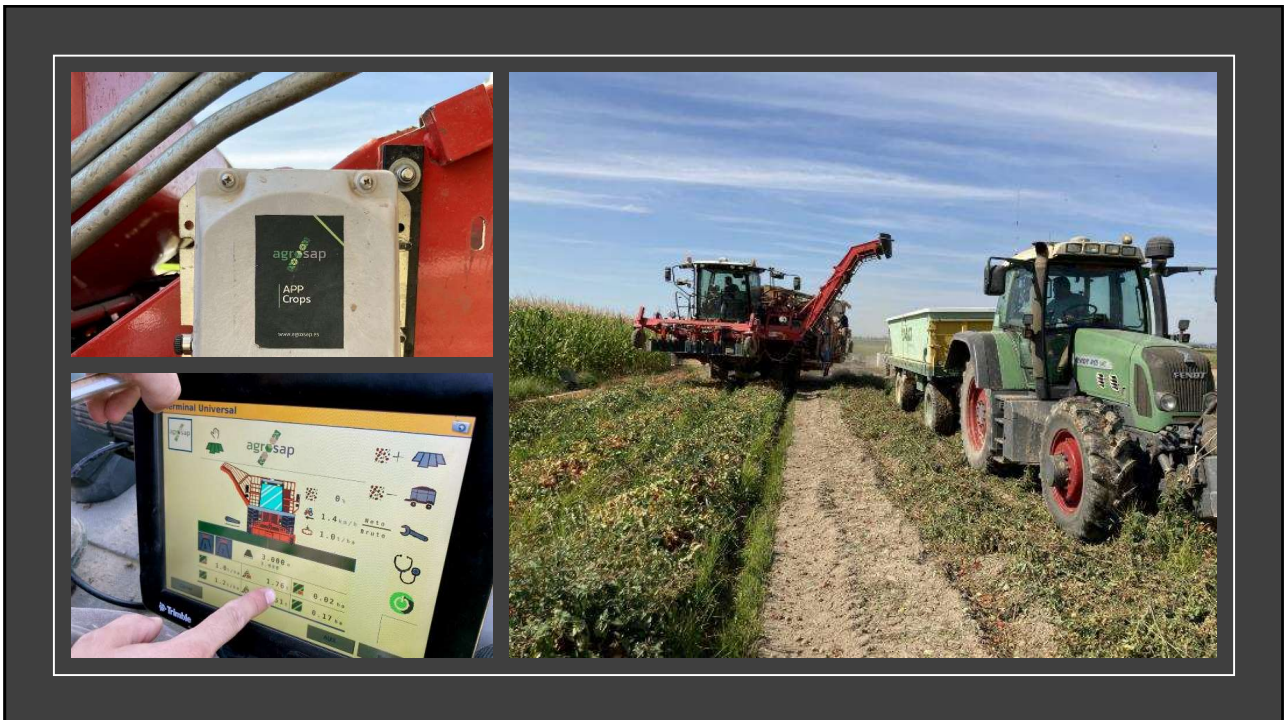
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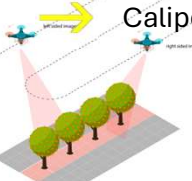
17

Main objective

To develop a tool for yield estimation in fruit trees using drones and artificial vision

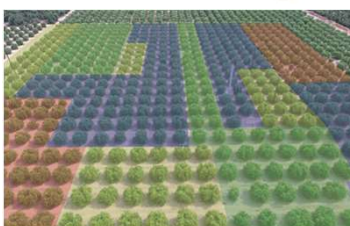
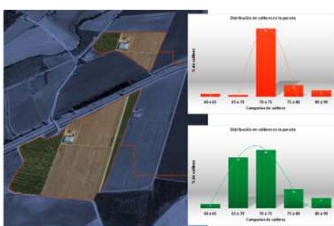
Digital Agriculture Tools

- ➔ Multicopter UAVs. Phantom 4
- ➔ RGB camera
- ➔ Cloud programming tools and environments
- ➔ Photogrammetry software
- ➔ Caliper or Caliper gauge



Results

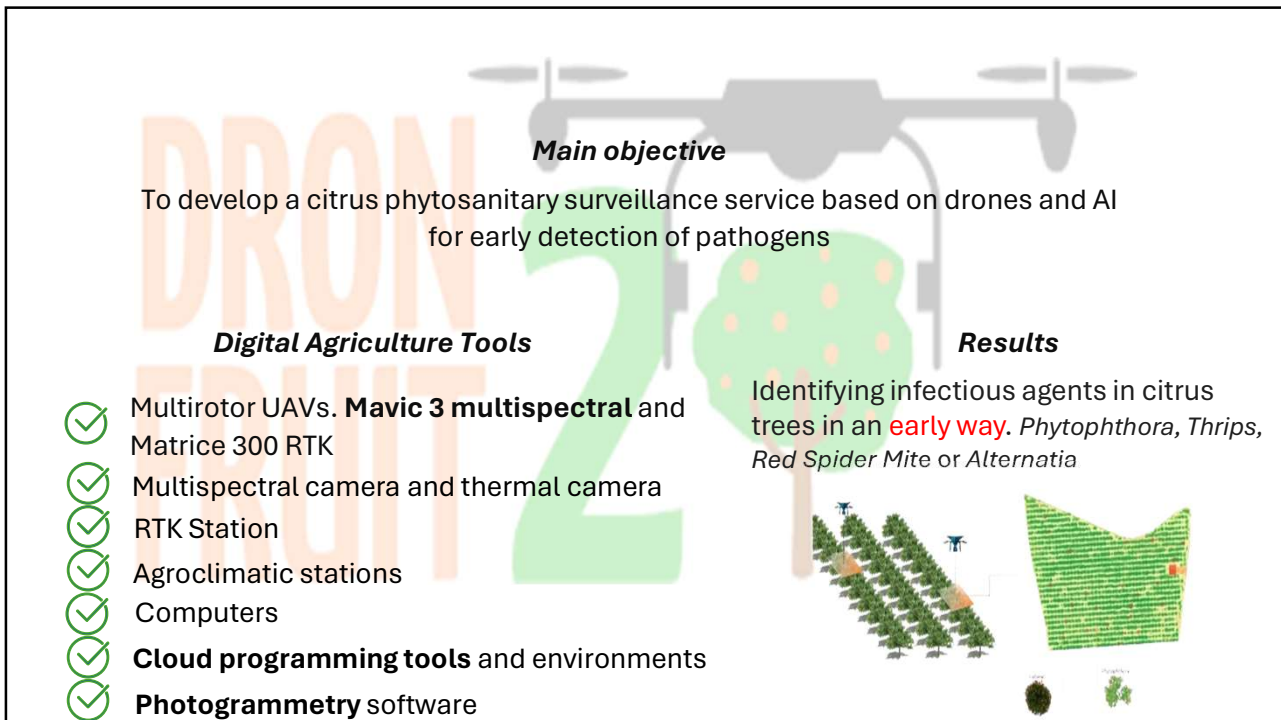
Actual production: **217,000** Kg
 Estimated production by gauger: **200,000** Kg
 Production estimated by the algorithm: **219,909** kg
Error of 1,54 % IA compared to 7,83% human

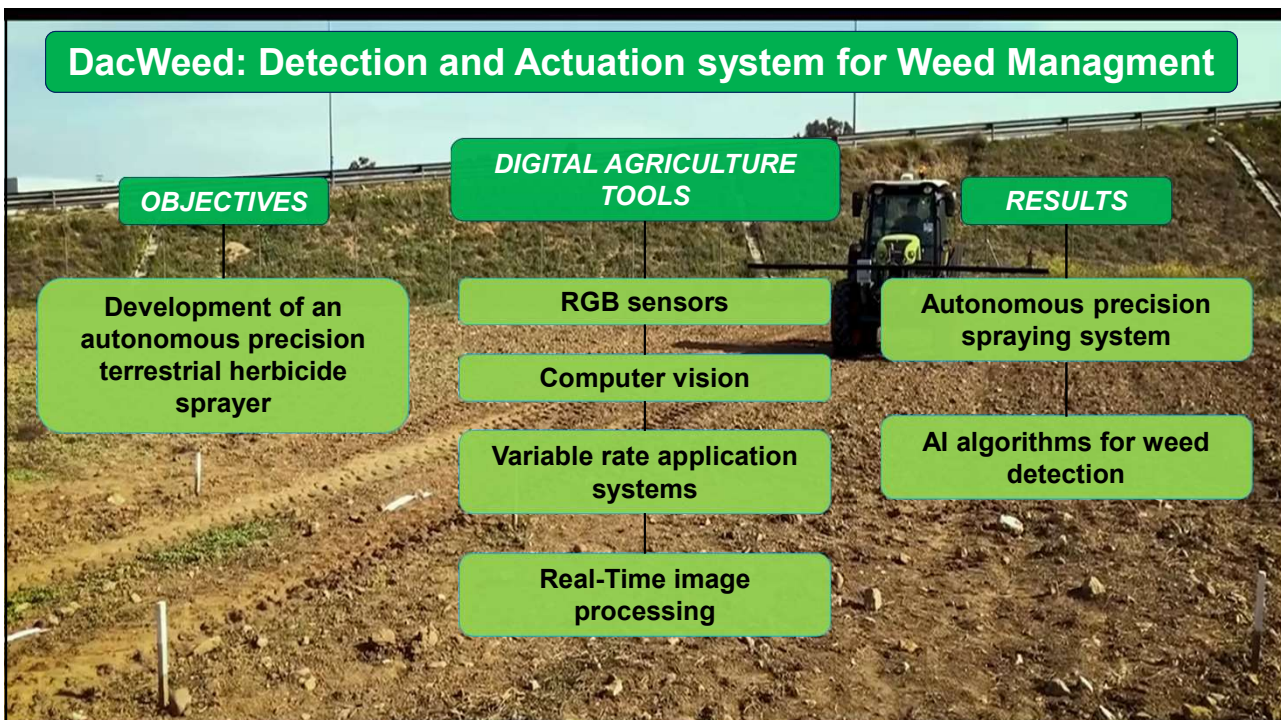
The use of AI models has great potential for yield estimation

O.E. Apolo-Apolo, J. Martínez-Guanter, G. Egea, P. Raja, M. Pérez-Ruiz, Deep learning techniques for estimation of the yield and size of citrus fruits using a UAV, European Journal of Agronomy, Volume 115, 2020, 126030, ISSN 1161-0301, <https://doi.org/10.1016/j.eja.2020.126030>.

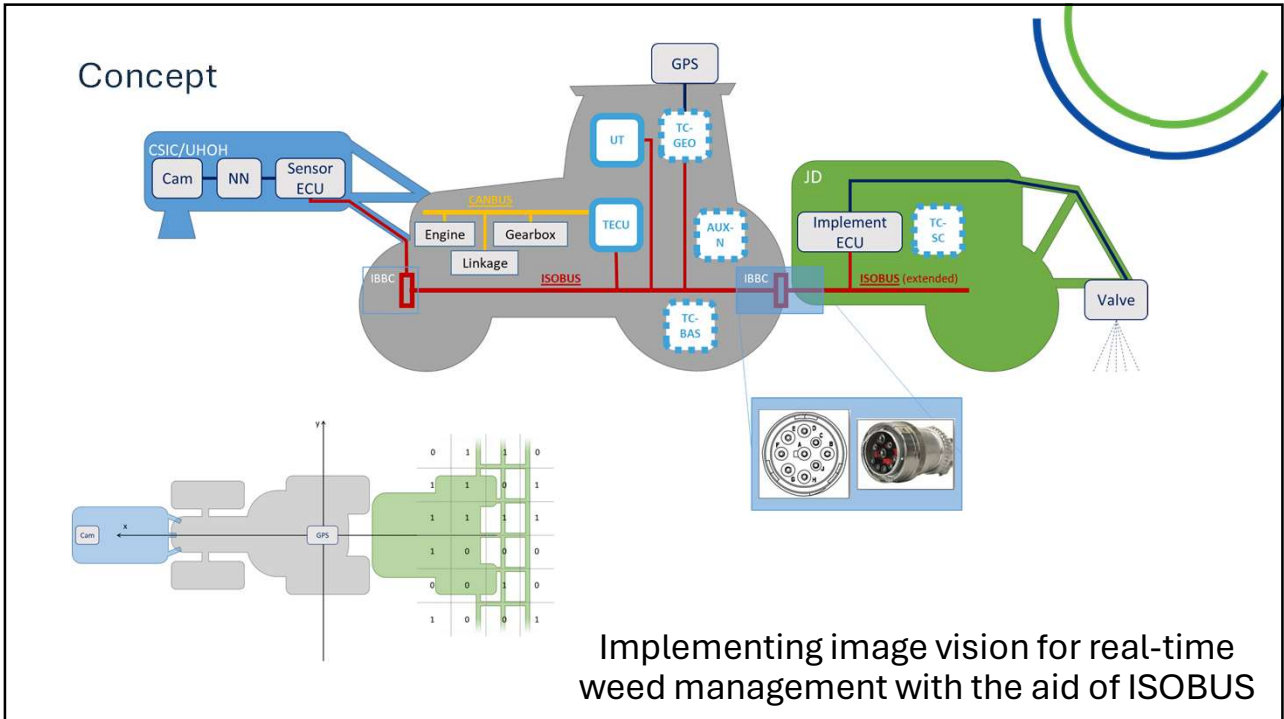
18



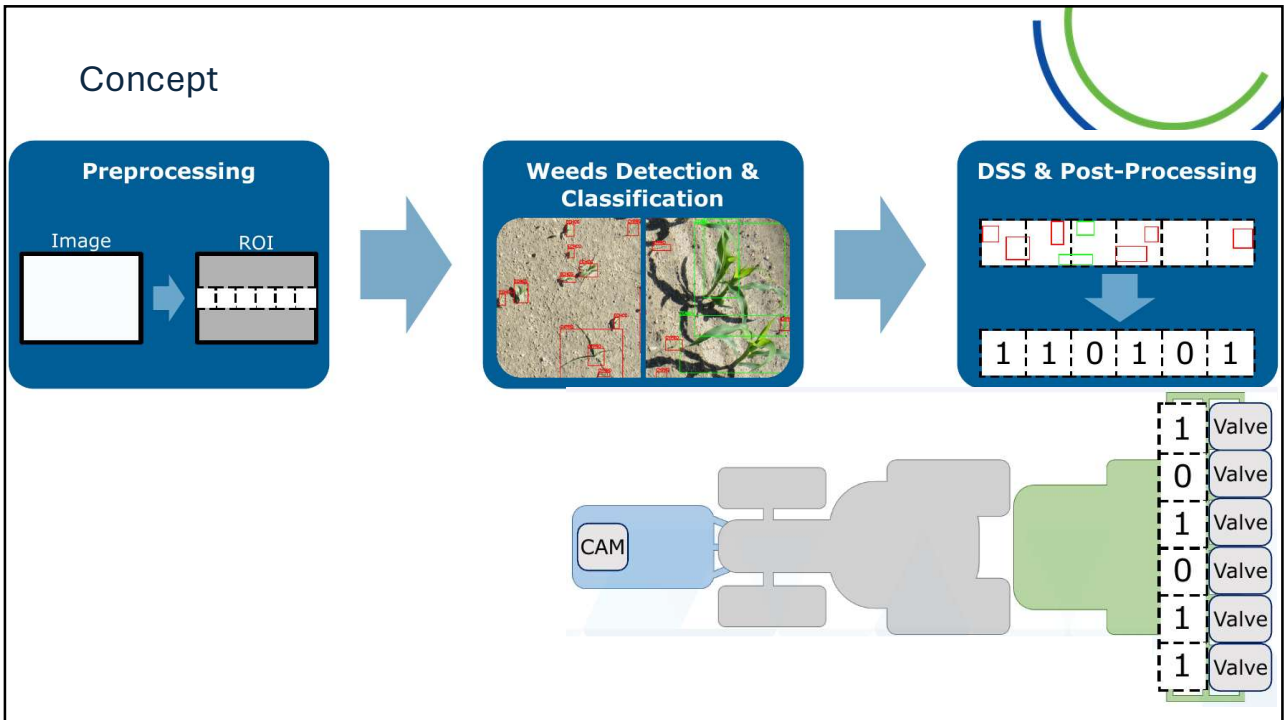
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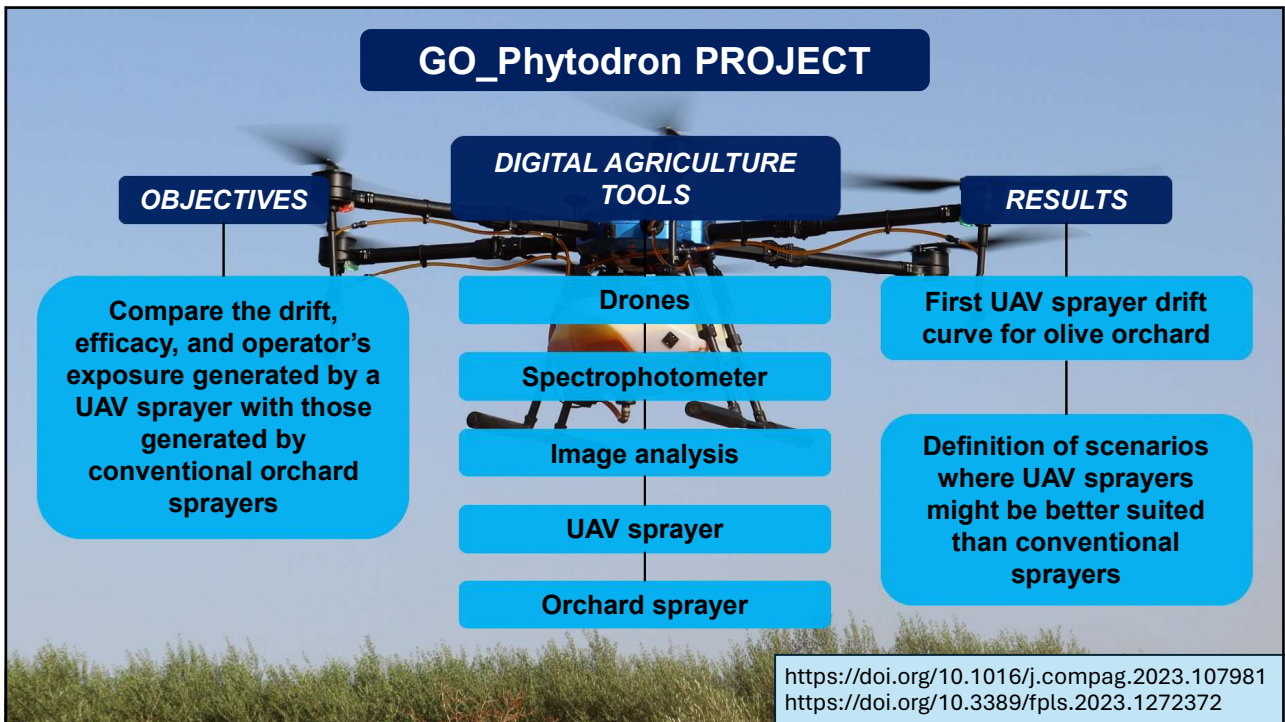
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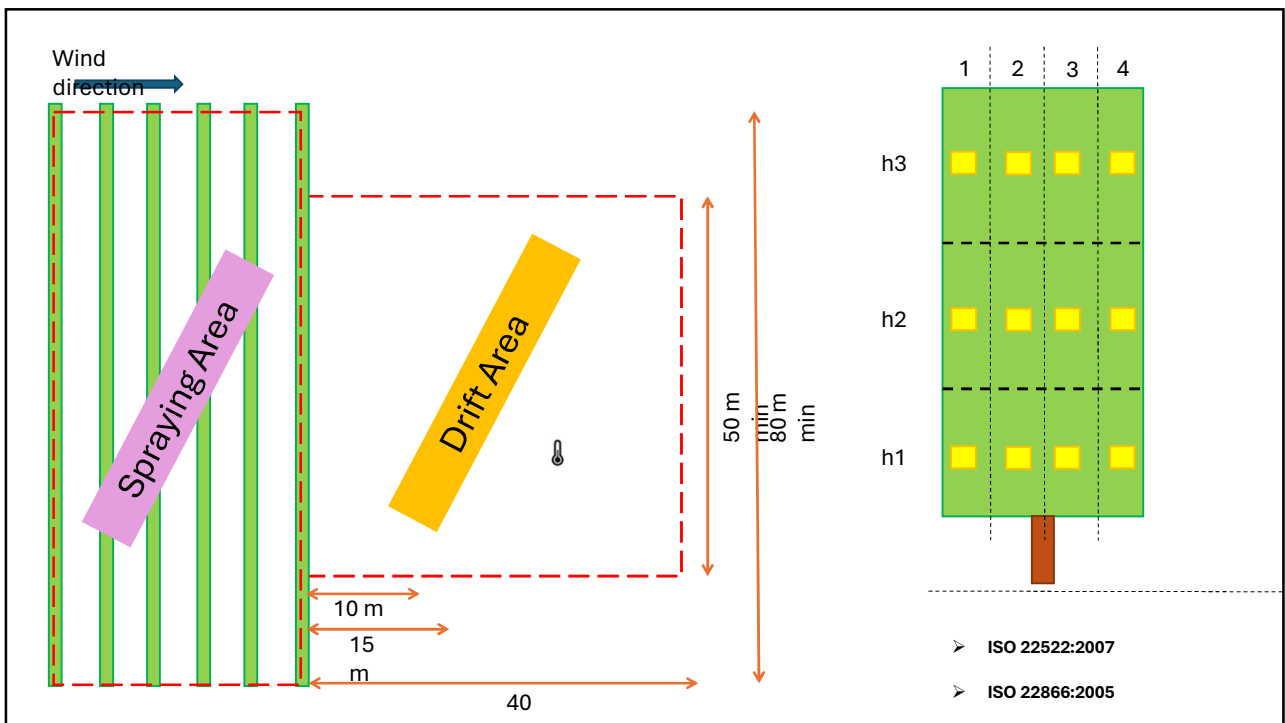
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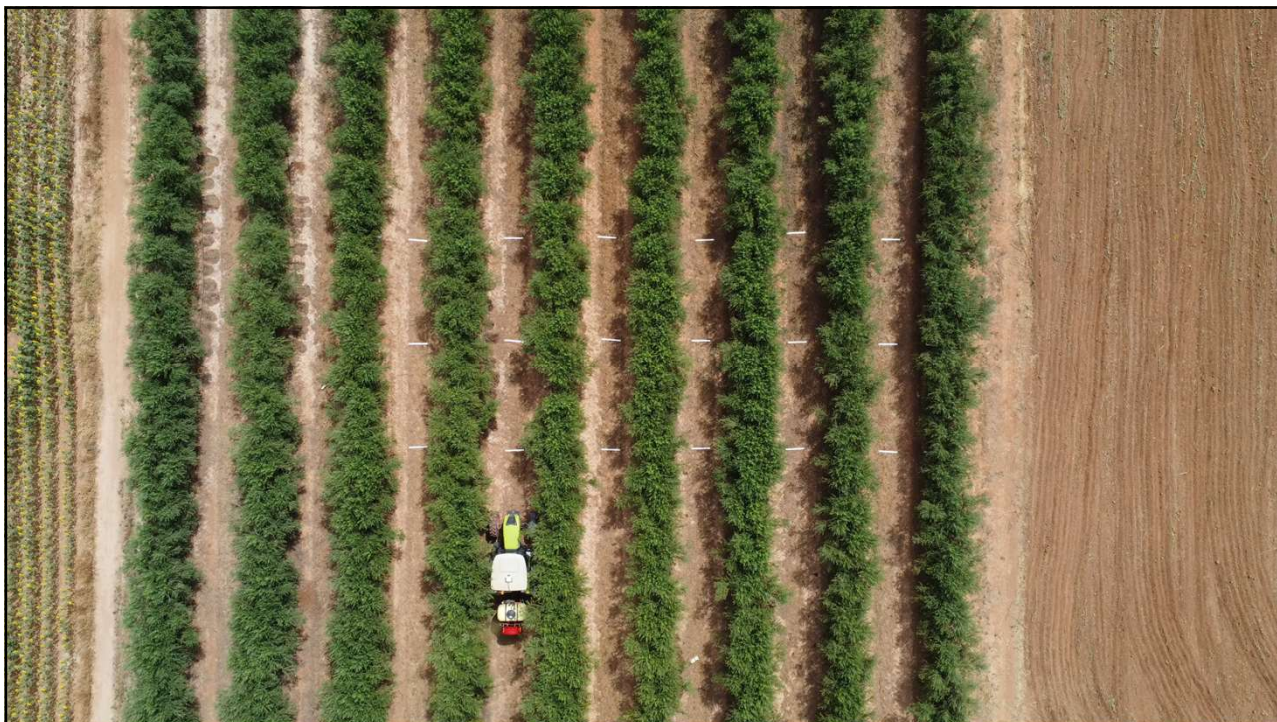
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Main objective

Delineation of homogeneous management zones in corn cultivation through multilayer data and artificial intelligence

Digital Agriculture Tools

Yield monitor Sentinel-2

Machine Learning

Supervised Learning Algorithms

Regression

Classification

Unsupervised Learning Algorithms


Clustering

Association

Results

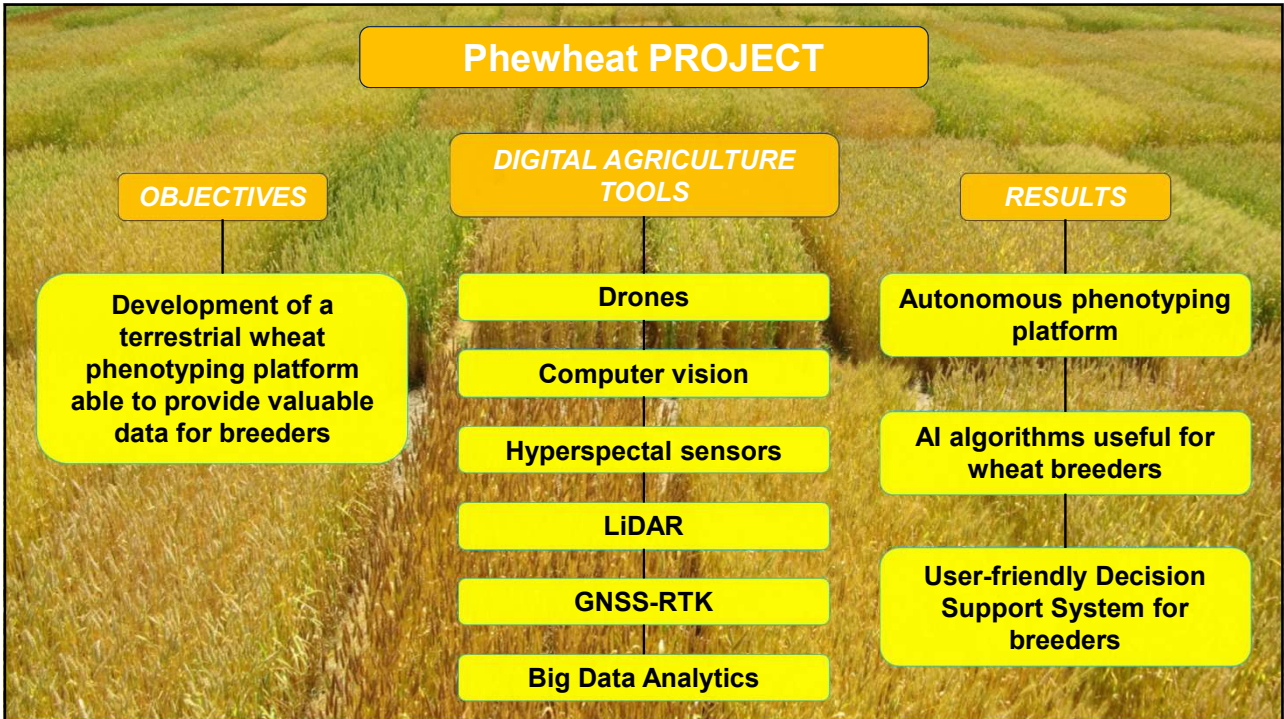
The **supervised learning** models (RF, SVM, GBT and CART) obtained accuracy values in the range **0.67-0.99** in the generation of management maps.

The **unsupervised learning** model **k-means** showed similar results, and even more accurate than the supervised models in indices such as **MCARI**.



Gallardo-Romero, D.J.; Apolo-Apolo, O.E.; Martínez-Guanter, J.; Pérez-Ruiz, M. Multilayer Data and Artificial Intelligence for the Delineation of Homogeneous Management Zones in Maize Cultivation. *Remote Sens.* **2023**, *15*, 3131. <https://doi.org/10.3390/rs15123131>

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