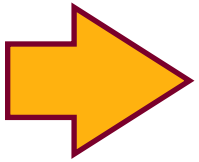
# FOSD Meeting 2026

March 23 - 27, 2026, University of Southern Denmark, Odense, Denmark

# Toward an Innovation-Oriented SPL Methodology for On-Premise Intelligent Systems

**Francisco J. Domínguez-Mayo**, Francisco S. Benítez, J. A. Galindo-Duarte, David Benavides

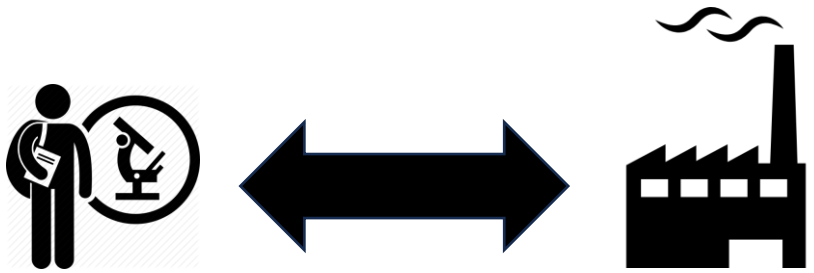
# Roadmap



1. Introduction
2. Context
3. Work-in-progress methodology
4. Projects (past & ongoing)
5. Final discussion

# 1. Introduction

## Toward an Innovation-Oriented SPL Methodology for On-Premise Intelligent Systems



INNOVASUR

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DIVERSO LAB international computing

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ig4 agronomía agricultura razonada

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inebir

SHERPA ADVISORY

businessgo

MISSIO.IA

INPRO Diputación Sevilla

Variability

+

Continuous experimentation

↓

Need for systematic reuse

**Enabling innovation through systematic reuse**

# 1. Introduction

## Real on-premise intelligent systems

**Agriculture** as a **real-world testbed** for on-premise intelligent systems.

AQUAIA Europa invierte en las zonas rurales

AI-based decision support system for deficit irrigation in horticultural polyculture

SensOlive Europa invierte en las zonas rurales

Digital twins of dendrometer sensors for optimizing irrigation in olive groves

# 1. Introduction

## Variability in on-premise intelligent systems

- heterogeneous sensors
  - sensor type, sampling rate, communication protocol or, calibration parameters
- satellite data
  - provider: Sentinel/Landsat, resolution, revisit frequency or preprocessing pipeline
- evolving AI models
  - model type, training dataset, hyperparameters, update strategy or inference mode
- different infrastructures
  - hardware constraints, deployment topology or communication architecture

**How can we systematically engineer reusable intelligent systems while supporting continuous experimentation?**

[1] Francisco Sebastian Benitez, José A. Galindo, Mireia Corell, and Francisco José Domínguez Mayo. 2025. AquaIA: Implementing Controlled Deficit Irrigation by Means of Feature Modelling Techniques. In Proceedings of the 29th ACM International Systems and Software Product Line Conference - Volume A (SPLC-A '25). Association for Computing Machinery, New York, NY, USA, 201–210. https://doi.org/10.1145/3744915.3748478

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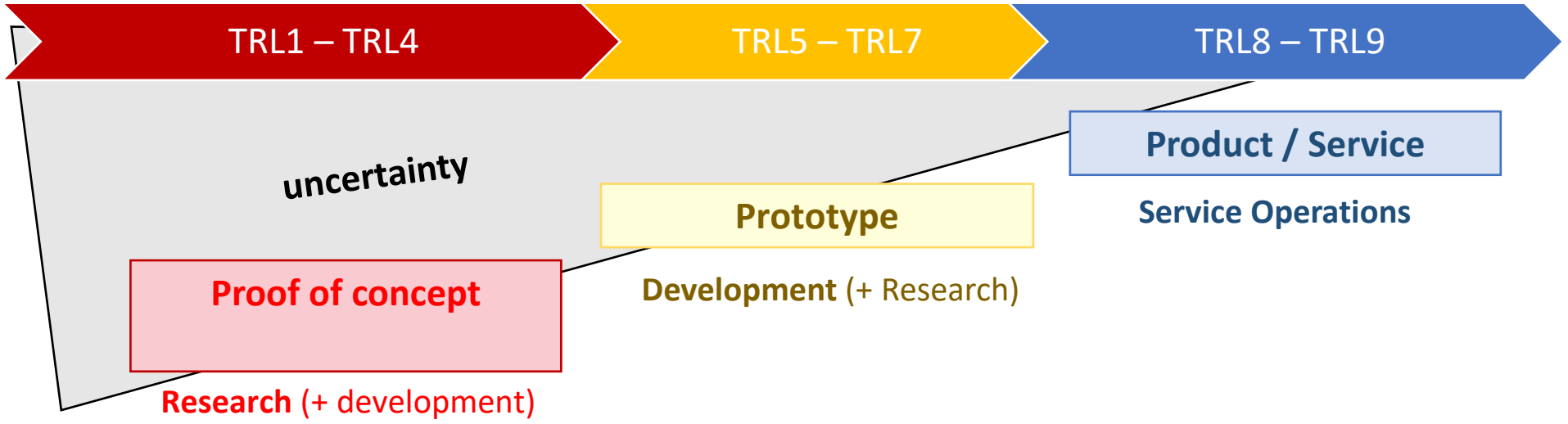
# 2. Context

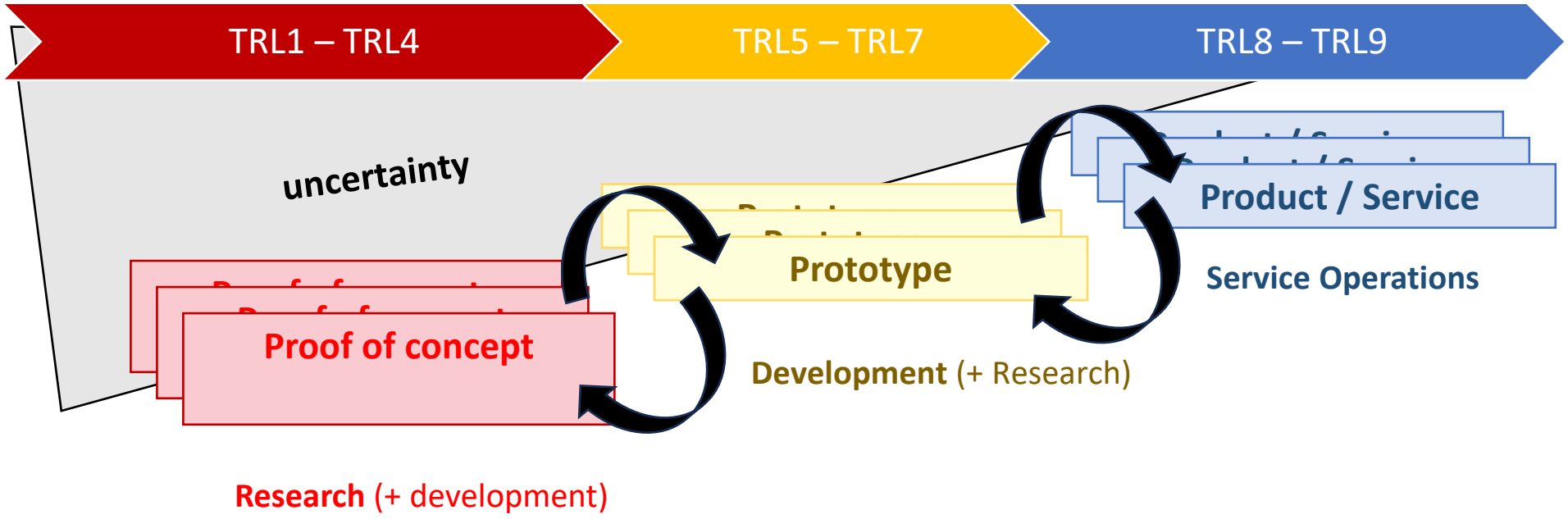
## Innovation as an evolutive maturity process




[2] M. Giménez-Medina, J.G. Enríquez, F.J. Domínguez-Mayo, A systematic review of capability and maturity innovation assessment models: Opportunities and challenges, Expert Systems with Applications, Volume 213, Part B, 2023, 118968, ISSN 0957-4174.
[3] M. Giménez-Medina, J.G. Enríquez, M.A. Olivero, F.J. Domínguez-Mayo, The innovation challenge in Spain: A Delphi study, Expert Systems with Applications, Volume 230, 2023, 120611, ISSN 0957-4174,

# 2. Context

## Innovation as an evolutive maturity process



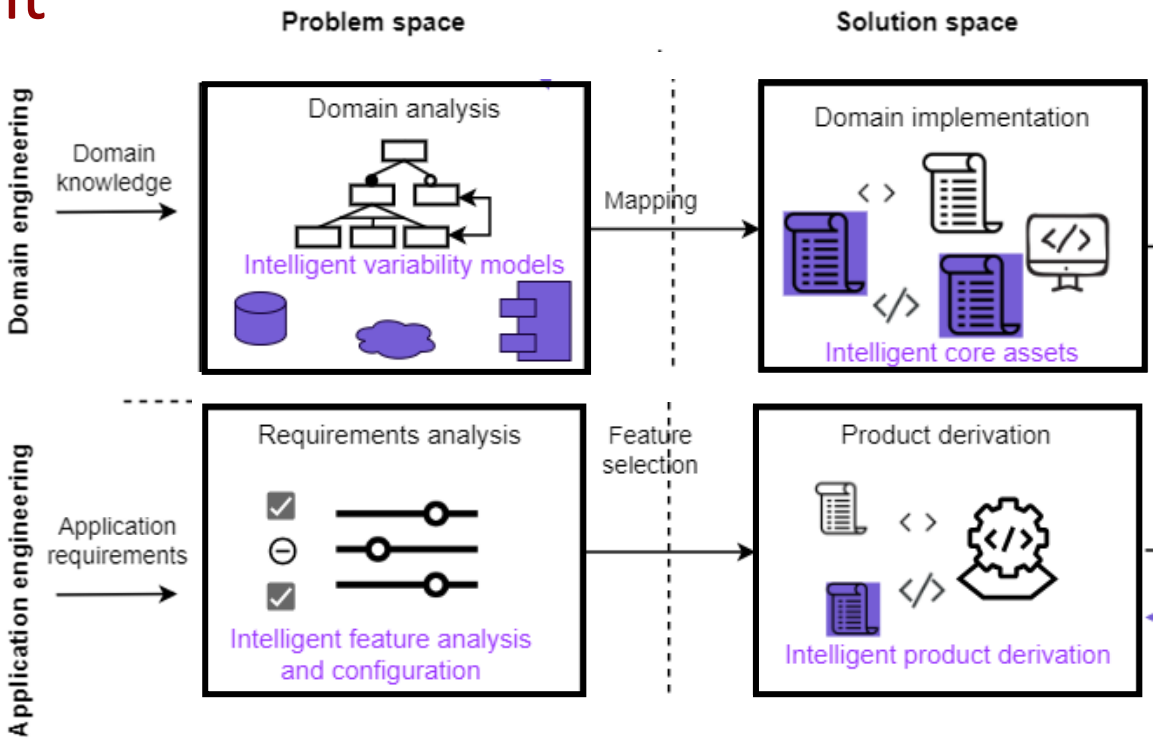

Models/Artefacts are continuously refined and evolved over time.
It introduces variability, which needs to be systematically managed

# 2. Context

## SPL Foundations – Why SPL is relevant

SPL provides mature techniques for managing variability and reuse across product families.

- variability management
- reusable artefacts
- systematic derivation



# 2. Context

## Research Gap

But innovation-driven approach require:

- experimentation
- continuous learning
- model evolution

The ISO/IEC 26550:2015 and 26580:2021 standards address Software Product Lines (SPL), but not their integration with innovation

**SPL methodologies do not support evolving artefacts in innovation processes**

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# 3. Work-in-progress methodology

## Methodological Pillars

Our proposal is structured around 4 pillars:

1 Classical variability management

Feature models and automated analysis

2 System-specific variability

AI models, data pipelines, hardware

3 Innovation processes

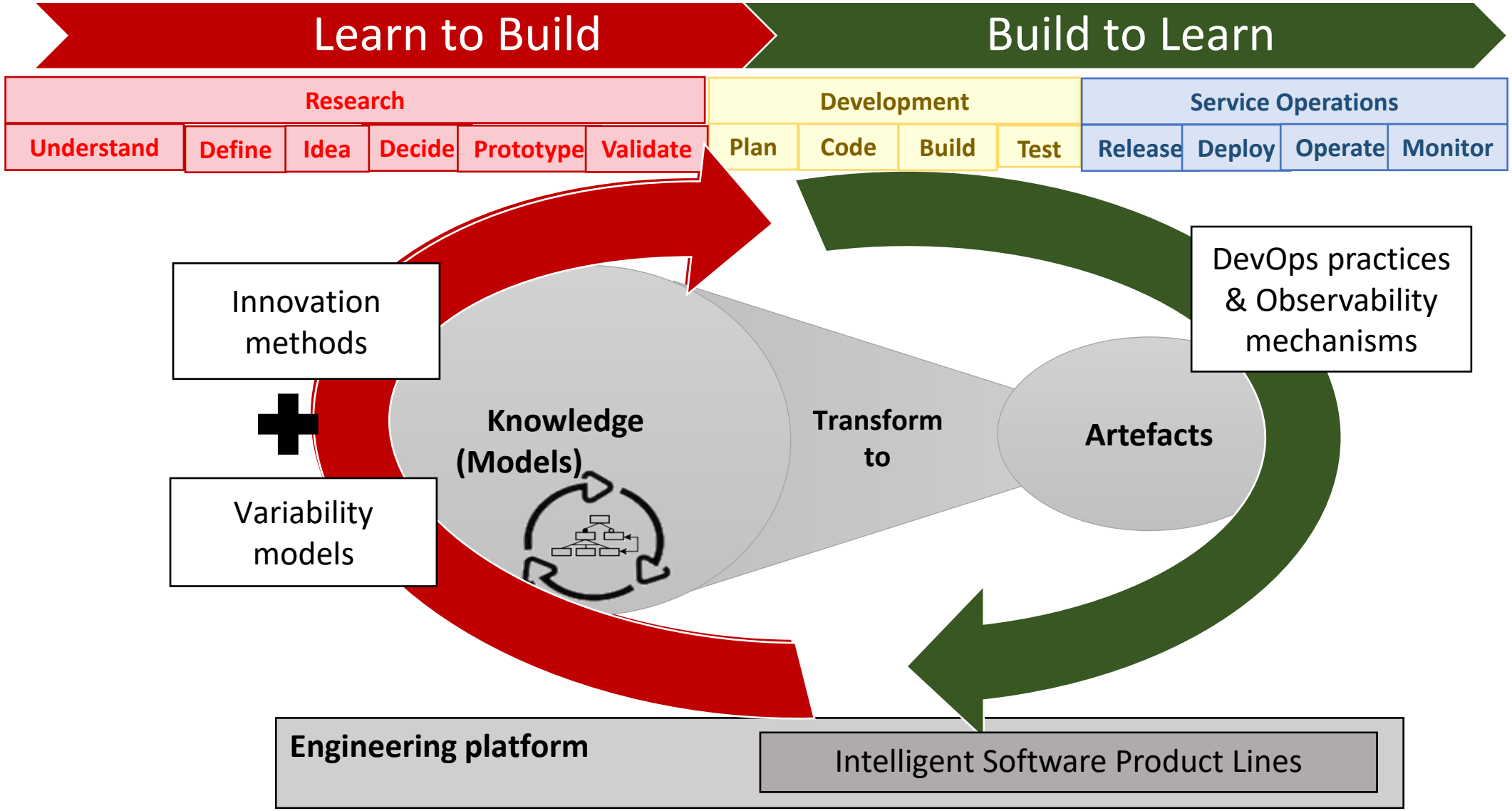
exploration + prototyping

4 Continuous evolution

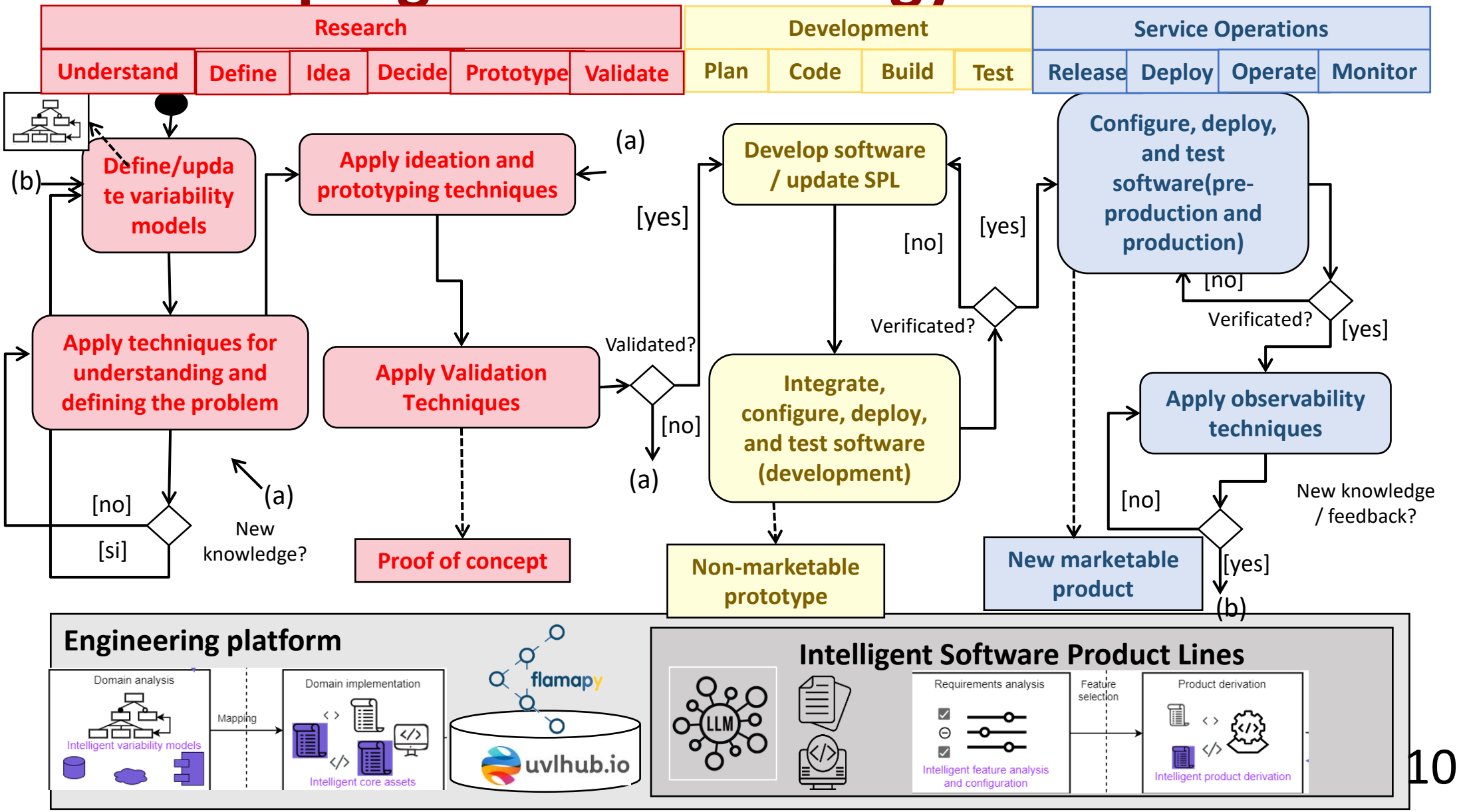
DevOps, CI/CD, model lifecycle

# 3. Work-in-progress methodology

## Integrating innovation cycles into SPL



# 3. Work-in-progress methodology



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# 4. Projects (past & ongoing)

## Example: Smart Agriculture as a high-variability domain

Agriculture is a **high-variability domain**

SPL techniques enable reuse of knowledge across multiple agricultural scenarios:

AQUAIA Europa invierte en las zonas rurales

https://aquaia.eu/

SensOlive Europa invierte en las zonas rurales

https://sensolive.diversolab.io/

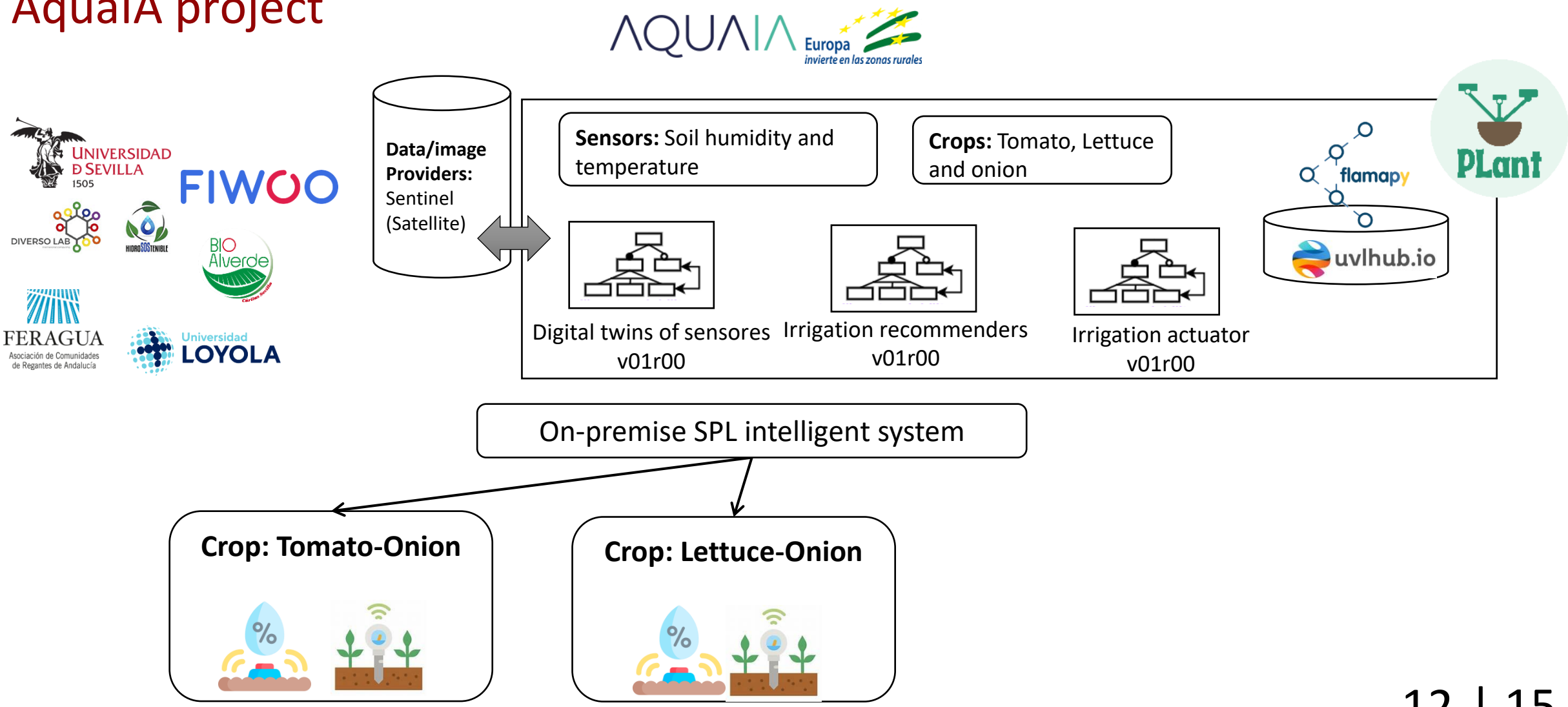
**They allow us to study variability and evolution in real intelligent systems**

PLant

*New **research Project**:*
*Software product lines for the inteligent specialization of sustainable agricultural production (*PLANT)

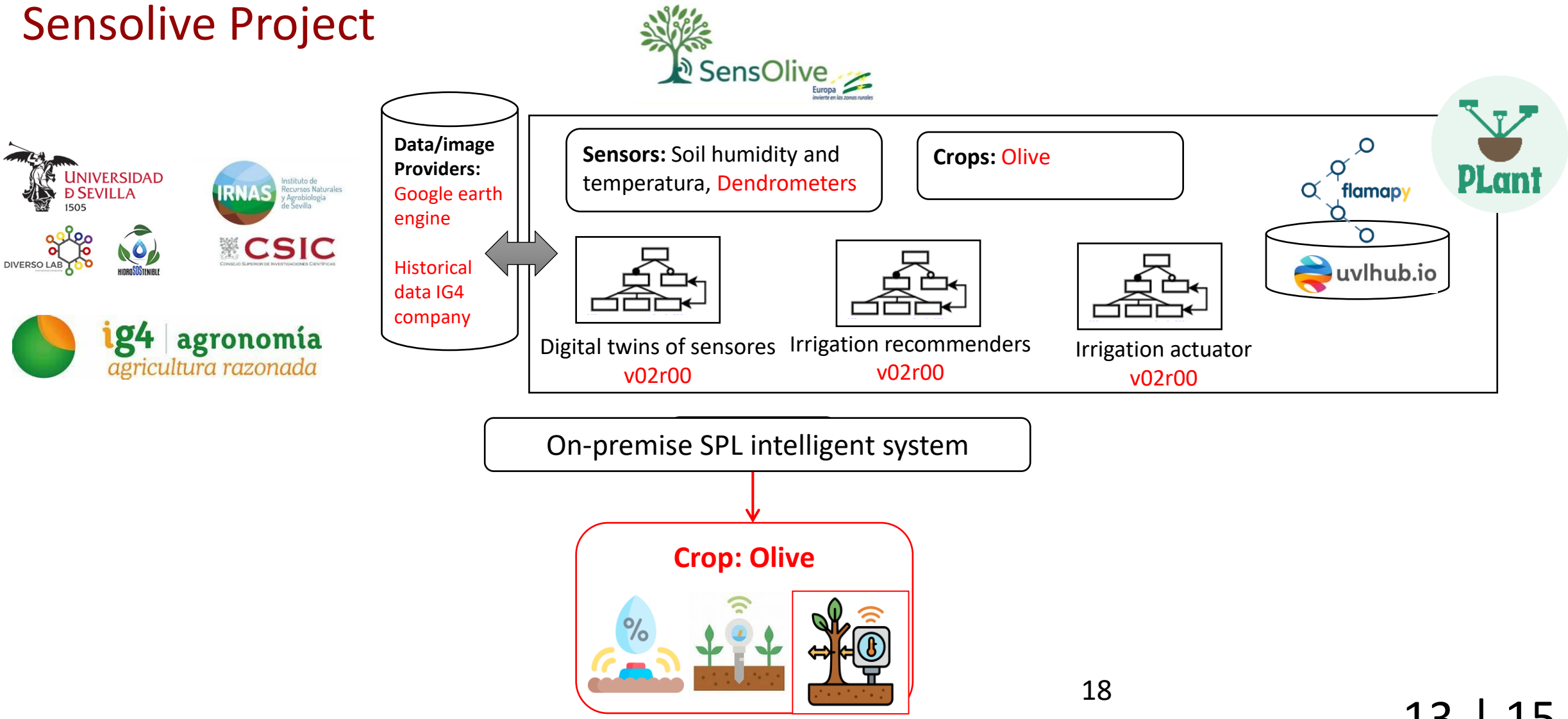
# 4. Projects (past & ongoing)

## AqualA project



# 4. Projects (past & ongoing)

## Sensolive Project



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## Expected Contributions

**From ad-hoc innovation to systematic engineering of intelligent systems**

The research aims to deliver:

1. A methodology for **SPL engineering of on-premise intelligent systems**
2. Models for **new variability dimensions**
3. Engineering platforms
4. Validation across multiple domains

This is not only about building intelligent systems… but about engineering them systematically

# 5. Final discussion

Questions, comments, feedback

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