CLUAS®: A software for managing remotely sensed imagery of orchard plantations for precision agriculture


Institute for Sustainable Agriculture (CSIC), Cordoba, Spain
INTRODUCTION:

• Using very-high spatial resolution remote sensed imagery (Airborne, Ikonos, QuickBird, WorldView) in Precision Agriculture: Discrimination of/within orchard plantations.

• ENVI+IDL®: Software to manage and analyse remote sensed imagery.

• CLUAS® (Clustering Assessment Software): ENVI’s add-on.

OBJECTIVE of CLUAS:

• To automatically assess agronomic and environmental characteristics of fruit orchards and forests from remote sensed imagery.

• 1) Tree by tree; 2) Subplot by subplot; 3) Whole tree-orchard.
References:


AIM of this presentation:

- To describe the operational procedure of CLUAS® and illustrate examples of the information provided for citrus orchards and Mediterranean forest.

**Partial view of citrus tree plantation, QB Panchromatic image**

**Partial view of Mediterranean Forest (Quercus spp), QB Panchromatic image**
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CLUAS® Phases:

1. **Image Pre-Processing**: field or orchard selection → Tree discrimination or classification → Definition of the Digital Value Range.

2. **CLUAS Implementation**: ENVI → Basic tools menu → Clustering Assessment add-on. Clustering parameters: Digital Value Range (Min, Max), Merging distance, Pixel Number. Clustering size: Width, Height. Region of Interest (ROI) parameters: Width, Height. ROIs Classification: Generation of subplots.

3. **CLUAS outcome report**: Interpretation and analysis.

CLUAS®: Software for Managing Remote Sensed Imagery for Precision Agriculture (Clustering Assessment, CLUAS)

CLUAS numerical process

Example 1: Assessment of Citrus Orchard Characteristics.

Partial view of citrus tree plantation

Main CLUAS Interface
CLUAS®: Software for Managing Remote Sensed Imagery for Precision Agriculture (Clustering Assessment, CLUAS)

**CLUAS numerical process**

**Example 1**: Assessment of *Citrus* Orchard Characteristics.

![Image of CLUAS ROI Parameters]

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**CLUAS®** Software for Managing Remote Sensed Imagery for Precision Agriculture (Clustering Assessment, CLUAS)

**CLUAS numerical process**

**Example 1**: Assessment of *Citrus* Orchard Characteristics.

![Image of CLUAS-Roi Parameters](image1.png)

![Main CLUAS Interface](image2.png)
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CLUAS numerical process

Example 1: Assessment of Citrus Orchard Characteristics.

Main CLUAS Interface
**CLUAS numerical process**

**Example 1:** Assessment of *Citrus* Orchard Characteristics.

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**Main CLUAS Interface**

**CLUAS-ROI Parameters**

- **Clustering parameters**
  - Min. DV: 30
  - Max. DV: 150
  - Max. Distance: 1
  - Min. Pixels: 5

- **ROI parameters**
  - Width: 10
  - Height: 10

- **Clustering Size**
  - Width: 6
  - Height: 6

---

**ROIs Classification**

- A 0%
- B 25%
- C 50%
- D 75%
- E 100%

**Output File**

Choose: C:CLUAS\Citrus Results

[OK] [Cancel]
**CLUAS®**: Software for Managing Remote Sensed Imagery for Precision Agriculture (Clustering Assessment, CLUAS)

**CLUAS numerical process**

**Example 1**: Assessment of *Citrus* Orchard Characteristics.
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174 126 98 135 85 153 201 220 141 87
189 152 84 67 146 215 199 112 65
201 166 47 31 110 167 201 158 53
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  - **CLUAS-ROI Parameters**
    - Clustering parameters
      - Min. DV: 30
      - Max. DV: 150
      - Max. Distance: 1
    - ROI parameters
      - Width: 10
      - Height: 10
      - Min. Pixels: 5
    - **ROIs Classification**
      - % of pixels
      - VDAG
      - Edit Selected Item
    - Output File: Choose C:\CLUAS\Citrus Results

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**Example 1:** Outcome / Assessment of tree by tree *Citrus* Orchard Characteristics.

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<th>Tree (AG)</th>
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**NTP:** 100

**NTAG/NTP:** 0.37 (37%)

**NTAG:** 37

**IVDA:** 3290

**VDAM:** 90.1
Example 1: Outcome / Assessment of *tree by tree* *Citrus* Orchard Characteristics.

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NTP: 100    NTAG/NTP: 0.37 (37%)
NTAG: 37    IVDA: 3290    VDAM: 90.1
Example 1: Outcome / Assessment of tree by tree *Citrus* Orchard Characteristics.

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NTAG: 37       IVDA: 3290       VDAM: 90.1
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NTAG: 37  IVDA: 3290  VDAM: 90.1
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Conclusion:

- CLUAS® provides detailed agronomic information from remote sensed imagery of tree orchards/ forest, both “tree by tree” and for each small area/ micro-plot of the orchard defined.
- So, CLUAS® can contribute to setting up the basis for site specific/ precision management for plantations of trees.