Technology for Local and Regional-Scale Assessment of Agricultural Landscape Dynamics Within the Framework of EU Common Agriculture Policy (CAP)

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PROJECT CONCEPT. MAIN
OBJECTIVES
Technology for using Copernicus data to survey the dynamics of Romanian agricultural landscape in the context of economic transition and Common Agricultural Policy.

The Research, Development and Innovation STAR Programme – Space Technology and Advanced Research
identification and quantification of the changes that arable land in Romania faced after 1990, in correlation with the dynamics of both the environmental and the political factors.
- Crop diversification
- Land quality
- Organic farming

- Agricultural and rural development
- Land market development

- Agricultural productivity
- Land grabbing
- Rural life quality
METHODOLOGY
## I. Achieving and preparing the data

1. Clear delineation of the areas of interest

Defining the sampling system

<table>
<thead>
<tr>
<th>Relief unit</th>
<th>S (sqkm)</th>
<th>% S</th>
<th>Total number of administrative units</th>
<th>Number of rural administrative units</th>
<th>Number of sampling units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dobrogea Plateau</td>
<td>10159.52</td>
<td>7.35</td>
<td>113</td>
<td>97</td>
<td>18</td>
</tr>
<tr>
<td>Romanian Plain</td>
<td>48968.38</td>
<td>35.43</td>
<td>851</td>
<td>770</td>
<td>90</td>
</tr>
<tr>
<td>Western Plain</td>
<td>16194.58</td>
<td>11.72</td>
<td>247</td>
<td>216</td>
<td>30</td>
</tr>
<tr>
<td>Moldavian Plateau</td>
<td>22954.68</td>
<td>16.61</td>
<td>431</td>
<td>399</td>
<td>40</td>
</tr>
<tr>
<td>Getic Plateau</td>
<td>13823.51</td>
<td>10.00</td>
<td>323</td>
<td>294</td>
<td>25</td>
</tr>
<tr>
<td>Mehedinți Plateau</td>
<td>801.64</td>
<td>0.58</td>
<td>20</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Transylvanian Plateau</td>
<td>25297.44</td>
<td>18.30</td>
<td>421</td>
<td>373</td>
<td>45</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>138199.75</strong></td>
<td></td>
<td><strong>2273</strong> (from the total number of 3181 administrative units)</td>
<td></td>
<td><strong>250</strong></td>
</tr>
</tbody>
</table>

Statistically significant for:
- confidence interval: 90 %
- margin of error: 4.91 %
TEC-LAND. DISTRIBUTION OF THE SAMPLING AREAS INSIDE THE LANDSAT-8 GRANULES
TEC-LAND. DISTRIBUTION OF THE SAMPLING AREAS INSIDE THE SENTINEL-2 GRANULES
I. Achieving and preparing the data

1. Clear delineation of the areas of interest
   - Defining the sampling system

2. Satellite imagery acquisition / download
   - Level 1-C
   - Indexing and storing the images

1. Data extracted from satellite imagery
   - Landsat 4 – 5
     - T1 – T5
   - Landsat 7
     - T4 (2000)
   - Landsat 8
     - T6
   - Sentinel 2
     - T6
I. Achieving and preparing the data

1. Clear delineation of the areas of interest
   - Defining the sampling system

2. Satellite imagery acquisition / download
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3. Collecting geomorphological, climatic, socio-economic data

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1. Data extracted from satellite imagery
   - Landsat 4 – 5
     - T1 – T5
   - Landsat 7
     - T4 (2000)
   - Landsat 8
     - T6
   - Sentinel 2
     - T6

2. Geomorphological data
   - Indicators:
     - Altitude
     - Slope
     - Aspect

3. Climatic data
   - Indicators:
     - Temperature
     - Precipitation
     - Humidity

4. Socio-economic data
I. Achieving and preparing the data

1. Clear delineation of the areas of interest
   Defining the sampling system

2. Satellite imagery acquisition / download
   Level 1-C
   Indexing and storing the images

3. Collecting geomorphological, climatic, socio-economic data

4. Image preprocessing
   (atmospheric corrections, layer stacking, pan-sharpening)

5. Deriving additional satellite products
   (band combinations, indices regarding vegetation type / health)
II. Processing and analysis

6. Supervised classification. Extraction of the arable land mask (binary format)

7. Segmentation. Extraction of the arable land plots

8. Calculation of fragmentation indices and analysis of their evolution

9. Reporting the results at physical and administrative units’ level. Establishing patterns

10. Results’ interpretation. Establishing correlations with different types of variables
MAIN RESULTS
RESULTS

1. Administrative unit level
   - detailed analysis

2. Administrative unit level

3. Regional / county-scale level

4. National-scale level
COMPUTED INDICES

1. Indices regarding the area and density of the arable land plots
   - Number of plots
   - Average number of plots per inhabitant
   - Average plots’ area
   - RI (Reduction Index)
   - CC (Consolidation Coefficient)

2. Indices regarding the edge and shape of the arable land plots
   - TE (Total Edge)
   - ED (Edge Density)
   - SI (Shape Index)
   - MSI (Mean Shape Index)
   - AWMSI (Area-Weighted Mean Shape Index)
   - FD (Fractal Dimensions)
LAND FRAGMENTATION / LAND CONSOLIDATION TRENDS IN BALOTESTI, ROMANIA (1990 - 2017)
LAND FRAGMENTATION / LAND CONSOLIDATION TRENDS IN BALOTESTI, ROMANIA (1990 - 2017)

Bucuresti-Ilfov Development Region

Evolution of the number of arable land plots

Evolution of the shape index

Evolution of fragmentation indices
LAND FRAGMENTATION / LAND CONSOLIDATION TRENDS IN BISTRET, ROMANIA (1990 – 2017)

SW – Oltenia Development Region

Evolution of the number of arable land plots

Evolution of fragmentation indices

Evolution of the shape index
C1. Changes regarding arable land in Romania in the post-communist period are closely related to both the environmental factors and the dynamics of political factors.

C2. The use of Earth Observation (EO) data is a practical option in analyzing the long-term dynamics of agricultural landscapes.

C3. There are clear differences regarding the temporal evolution of the arable land fragmentation / consolidation process across the different counties and historical provinces.
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**Coordinator:** Terrasigna

**Partners:**
- USAMV – University of Agronomic Sciences and Veterinary Medicine Bucharest
- IEA – The Institute of Agricultural and Food Economics of the Romanian Academy