LIFE AgriAdapt
Vulnerability assessment
in Southern European pilot farms
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2nd International Conference
ADAPTtoCLIMATE
24-25 June 2019
Heraklion, Crete island, Greece
AgriAdapt partnership

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EC, April 2009
**IN PRACTICE**

**Life AgriAdapt**

**IN VOLVING FARMERS IN THE FOUR MAIN EU CLIMATE RISK REGIONS**

- **Climate Projections**
  - Baseline reports (4 Main EU Climate Risk Regions)
  - Preliminary Catalogues of Adaptation Measures
  - Common decision supporting tool
  - Climate Change Vulnerability Assessment (120 pilot farms)
  - Adaptation Action Plans: sustainable adaptation measures (120 pilot farms)
  - Monitoring and evaluation of the impacts

→ **General and sustainable proposals for adaptation per farming system**

**Capacity Building on adaptation for current and future farmers**

→ **Mainstreaming & transferability at National, EU Level and Beyond**

→ **Communication and dissemination**

**4 BASELINE REPORTS WITH AGRO CLIMATE GRIDS PER CLIMATE ZONE**

**COMPILATION OF SUSTAINABLE ADAPTATION MEASURES**

**ONE DECISION SUPPORTING TOOL FOR THE FARM VULNERABILITY ASSESSMENT**

**5 STEERING COMMITTEE BOARDS: FARMER UNIONS, COOPERATIVES, EXPERTS, RESEARCHERS, AGRONOMIC SCHOOLS, DECISION MAKERS, ETC.**

**120 PILOT FARMS WITH DOMINANT AND MINOR FARMING PRACTICES.**

With the support of:
From vulnerability to adaptation... A learning process for farmers

CLIMATIC HAZARDS...

- Hail
- Drought
- Erosion
- Heat wave
- Flooding
- Intense frost

... AND CLIMATE TRAJECTORIES

AGRIADAPT ROADMAP FOR ADAPTATION

2017

Vulnerability unknown

Awareness of Vulnerability, but no solutions identified

Awareness of Vulnerability, solutions identified but no idea of their efficiency

Awareness of Vulnerability, solutions identified and their efficiency (advantages and disadvantages) is quantified

2019

With the support of:
AGRIADAPT VULNERABILITY ASSESSMENT

The vulnerability level (or risk level) combine the probability of occurrence of climate stress (exposure) and the extent of the consequences (crop impact).

**EXPOSURE**
Frequency of climate stress (i.e., key climatic parameters)

**IMPACT OR SENSITIVITY**
% of crop yield reduction experienced

**VULNERABILITY = EXPOSURE \times IMPACT**
AGRIADAPT VULNERABILITY ASSESSMENT

The assessment help to prioritize the level of vulnerability.

No scientific unit to measure a risk. To assess the levels of Exposure and Sensitivity, qualitative evaluation trough rating scale is then required.

AGRIADAPT VULNERABILITY MATRIX

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Very frequent (&gt;50%)</th>
<th>41-50%</th>
<th>31-40%</th>
<th>21-30%</th>
<th>11-20%</th>
<th>Rare &lt;10%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>6</td>
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<td>6</td>
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<td>30</td>
<td>30</td>
<td>24</td>
<td>18</td>
<td>12</td>
<td>6</td>
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<td></td>
<td>36</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity of Consequences (Yield impact %)</th>
<th>6 - 10%</th>
<th>11-15%</th>
<th>16-25%</th>
<th>26-30%</th>
<th>&gt;30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insignificant (&lt;5%)</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Major (&gt;30%)</td>
<td>36</td>
<td>30</td>
<td>24</td>
<td>18</td>
<td>12</td>
</tr>
</tbody>
</table>

With the support of:
COMMON DECISION TOOL:
A MULTISTEP APPROACH FROM THE AGRO CLIMATE ZONE TO FARM SCALE

1. Agro Climate Zone
The analysis provide a framework for analysis at the farm level: identified in a recent past period the strongly impacted years, main climate events,…

2. Farm Scale
Once the farm is characterized, assessment of vulnerability of the farm’s crops and reduction of Near Future Farm vulnerability
# COMMON DECISION TOOL: RELEVANT POINTS

<table>
<thead>
<tr>
<th>COMMON DECISION TOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop yields:</strong></td>
</tr>
<tr>
<td>Regional scale (statistics): annual yield of the last 15 years</td>
</tr>
<tr>
<td>Farm scale (average, minimum &amp; maximum)</td>
</tr>
<tr>
<td><strong>Climatic data:</strong></td>
</tr>
<tr>
<td>Climate daily observations (30 last years) for the Recent Past (RP)</td>
</tr>
<tr>
<td>Climate daily projection (30 years) for the Near Future (NF)</td>
</tr>
<tr>
<td><strong>Farm interview:</strong></td>
</tr>
<tr>
<td>Agronomic, livestock, economic, climatic data</td>
</tr>
<tr>
<td><strong>Vulnerability scoring:</strong></td>
</tr>
<tr>
<td>Qualitative (agronomic expertise &amp; bibliography) and quantitative information</td>
</tr>
</tbody>
</table>

*With the support of:*
CLIMATE DATA

ACZ TOOL

Agri4Cast Resources Portal
Covering all the EU Member states and free access
Climate observations available from 1975 to the last calendar year completed (25x25 km grid)
Future daily weather data for Europe (25x25 km grid) for time horizon 2030, (SRES Scenario A1B, 3 GCM RCMs available).
For pilot farms assessment, only one climate model (ETHZ-CLM-HadCM3Q0 model) was used in order to show the pilot farmers the impacts of climate change in a simplified way.
<table>
<thead>
<tr>
<th></th>
<th>Arable</th>
<th>Tomato</th>
<th>Vineyard</th>
<th>Fruits</th>
<th>Dairy</th>
<th>Beef</th>
<th>Sheep</th>
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<td>Pilot Farms</td>
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<td>7</td>
<td>1</td>
<td>6</td>
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<tr>
<td>Minimum size (ha UAA)</td>
<td>11</td>
<td>15</td>
<td>4</td>
<td></td>
<td>87</td>
<td>232</td>
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<tr>
<td>Average size (ha UAA)</td>
<td>146</td>
<td>138</td>
<td>24</td>
<td></td>
<td>156</td>
<td>780</td>
<td>980</td>
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<tr>
<td>Maximum size (ha UAA)</td>
<td>400</td>
<td>230</td>
<td>130</td>
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<td>230</td>
<td>1715</td>
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Yield variability

<table>
<thead>
<tr>
<th>Year</th>
<th>Yield (kg/ha)</th>
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<tbody>
<tr>
<td>1990</td>
<td>2068.00</td>
</tr>
<tr>
<td>1991</td>
<td>1819.00</td>
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<tr>
<td>1992</td>
<td>175.00</td>
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<tr>
<td>1993</td>
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<td>1428.00</td>
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<td>1996</td>
<td>3044.67</td>
</tr>
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<td>1808.87</td>
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<td>2913.75</td>
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</table>

Rainfall & hot days - Observed

Nb of days >30°C. 01/05 & 30/06

Solagro from Agri4Cast
### Yields 1990 - 2015

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### Yield variability

#### Rainfall & hot days - Observed

- Rainfall 01/05 & 30/06
- Nb of days >30°C. 01/05 & 30/06

Solagro from Agri4Cast
Agro Climate Indicators (ACIs)

Automatic calculation of 70 different ACIs

- **General (x13):** rainfall, temperatures, etc.
- **Fodder (x11):** date for grass regrowth, date for 1st grazing, etc.
- **Cereal crops (x12):** end of cycle thermal and hydric stress, etc.
- **Summer crops (x9):** temperatures > 32°C, summer hydric deficit, etc.
- **Vineyards (x13):** date of late frost, Huglin index, etc
- **Rapeseed (x4), Field tomatoes (x5), Field peas (x1)**
- **Irrigation (x2):** winter reload, etc.
- **Livestock (x3):** Temperature-Humidity Index, etc.
ACI : Cereal crops

ACI - CL - Heat stress - Cereals
(Tx >30°C 15/04 to 15/07)
ACI - A1 - THI Moderate severe stress

Quartile 1
MIN
Median
MAX
Quartile 3

RP | NF
---|---
ESTREMADURA (Mérida) | ESTREMADURA (Plasencia) | VALENCIA (Requena) | CASTILE AND LEON (Medina del Campo) | CANTABRIA (Santander)

With the support of:
ACI Vineyard

ACI - V2 - Cold Night Index (Th - September)

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Quartile 1</th>
<th>MIN</th>
<th>Median</th>
<th>MAX</th>
<th>Quartile 3</th>
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</thead>
<tbody>
<tr>
<td>ESTREMADURA</td>
<td>Mérida</td>
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<tr>
<td>ESTREMADURA</td>
<td>Plasencia</td>
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<td>CASTILE AND LEON</td>
<td>Medina del Campo</td>
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<tr>
<td>CANTABRIA</td>
<td>Santander</td>
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</tbody>
</table>

SPAIN
Climate projections

SPAIN (extremadure) - From Recent Past to Near Future

SPAIN (Castilla y Léon) - From Recent Past to Near Future

With the support of:
How to disseminate adaptation?

Climate services actors

Module 1: Farm vulnerability quiz
Module 2: Yield & Climate
Module 3: Sustainable adaptation measures

AgriAdapt Webtool for Adaptation
SOUTHERN CLIMATE ZONE SWOT

**STRENGTHS**
- Adaptation options already in place
- Agricultural insurance
- Varieties adapted to CC
- High professionalized crops (horts)
- Diversified crops, extensive agroforestry systems.

**WEAKNESSES**
- Water: long-term availability? Deficit irrigation necessary
- High dependence on Monoculture
- Insufficient management of Grasslands

**OPPORTUNITIES**
- Higher productivity in temperature-limited areas if water is ensured
- Increased pasture production in autumn/winter due to increased temperature
- Possibility for new crops through warmer winters

**THREATS: limits for some crops**
- Heat waves in summer
- Less rainfall in Winter-spring
- Hydric déficit <-300 mm in Spring
- Increase in days with $T_{\text{Max}}>30^\circ$C in April and May and days $>35-38^\circ$C in summer
Farm vulnerability components

- Vineyards / Orchards
  - Management practices
    - Density
    - Pruning
    - Nets
    - New plantation
  - Processing
  - Insurance
  - Water dependency
  - Plant and grape varieties

- Herd management
  - Breeds
  - Renewal rate
  - Stocking rate
  - Ration
  - Birth strategy
  - Animal Welfare
  - Fodder system & concentrates
  - Water dependency
  - Market
  - Insurance

- Cereal crops
  - Crop system
  - Varieties
  - Market
  - Water dependency
  - Policies
  - Insurance

With the support of:
Sustainable adaptation: examples

**OPTIMIZATION OF THE IRRIGATION SYSTEM**

- **Climate Risk Region:**
- **Weather event addressed:**

- **Farming System:** Arable crops
- **Farm vulnerability component:** Water dependency
- **Description:** Better efficiency of the water used for irrigation for an equivalent surface irrigated at farm level

- **Comments on sustainability:**
  It is often possible to reduce the water volume per ha through the equipment (removal of water pump, drip irrigation versus sprinkler, etc.) and irrigation management tools (tensiometric probes, etc.).

---

**SUSTAINABILITY COMPONENTS**

- GHG emissions
- Air quality
- Soil
- Water
- Biodiversity
- Animal Welfare
- Economic
- Social
- Technical Feasibility

**CROP DIVERSIFICATION > 6 MAIN CROPS AT FARM LEVEL**

- **Climate Risk Region:**
- **Weather event addressed:**

- **Farming System:** Arable crops
- **Farm vulnerability component:** Crop System
- **Description:** Combination of crops with contrasting climatic characteristics

- **Comments on sustainability:**
  In a climate constituted of more variable climate events, crops presenting physiological complementarity (annual or perennial, winter or spring type, botanical families, etc.) could help the farm to be more resilient. Opportunity to cultivate leguminous crops (fennel, chickpeas, etc.) with positive feedbacks for soils and biodiversity.

---

**SUSTAINABILITY COMPONENTS**

- GHG emissions
- Air quality
- Soil
- Water
- Biodiversity
- Animal Welfare
- Economic
- Social
- Technical Feasibility

---

**With the support of:**
RECOMMENDATIONS FOR ARABLE CROPS

- Create a varietal bouquet
- Diversify crops and rotations to avoid main climate stress
- Improve soils: OM & structure, no bare soil
- Comfort or Deficit irrigation
- Hedgerow and flower strips plantations
RECOMMENDATIONS FOR VINEYARDS

• Use traditional varieties
• Focus on Quality (wine production) and not quantity
• Prune in green to balance leaf surface and number of bunches
• Improve soils: OM, Structure, no bare soils
RECOMMENDATIONS FOR ANIMALS

**DAIRY:**
- Fodder autonomy and diversification.
- Balance farmland surface and number of animals.
- Infrastructures designed to ensure passive ventilation.
- Active ventilation systems.
- Appropriate density of animals in buildings.

**EXTENSIVE BEEF (DEHESAS):**
- Grazing management plans to increase quantity and quality of pasture.
- Native seeds sowing for pasture improvement.
- Keyline design to maximize beneficial use of resources.
AgriAdapt “Training Pack”

FINAL CONFERENCE IN MADRID  
NOVEMBER 2019. WORKSHOPS

Downloadable from www.agriadapt.eu

“Self service” of digital resources about farming adaptation
- Life AgriAdapt, Vulnerability context in EU and per climate zone, methodology for farm level assessment, sustainable adaptation
- Cases studies: soft wheat, grasslands, rapeseed, maize, field peas, vineyards, livestock buildings

Video clips
- Experts interviews
- Pilot farms adaptation strategy

Baseline report
Some conclusions

Stop looking at the sky to look at the soil

- Adaptation is efficient at farm level, resilience depends not only on climate expected projection but even on farming practices,
- The agrarian practices related to the soil are a key for adaptation at all the crops and all the regions.