

Industry-Academia Collaboration in Montenegro

Digital Solutions for Smart Agriculture

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Content

- **Introduction**
- Digital Solutions for Smart Agriculture
- Partnership Development & Collaboration Projects
- Conclusions



SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



SUSTAINABLE
DEVELOPMENT
GOALS

Smart Specialisation Priorities



Crna Gora
Ministarstvo nauke

STRATEGIJA PAMETNE SPECIJALIZACIJE CRNE GORE 2019 - 2024



Vertikalni prioriteti

Održiva poljoprivreda i
lanac vrijednosti hrane

Energija i održiva
životna sredina

Održivi i zdravstveni
turizam

ICT

Horizontalni prioritet



-
- **Innovative** university with strong **research** and **entrepreneurial** orientation, intensive **internationalization** activities and **individual approach** to student



Overview



- Unique **interdisciplinary** institution, founded in 2007, located in suburban of Podgorica, capital of Montenegro.
- Currently, it has around **2500 students**, and **305** professors and teaching **staff**.
- It offers at **undergraduate** and **postgraduate** level of education, including Bachelor, Specialist, Master's and PhD level of studies.



Education model

- UDG mission: **THE HISTORY OF FUTURE** – UDG conceptual framework and values
- UDG strategy – education model represented through „**Professor's equation**“ $S = z \cdot i^2$

Research Domains in Focus

- Digital transformation, digital innovation
- Applied Computer Science
- Entrepreneurship
- Sustainable Development



13. jul Plantaže

- The largest vineyard in Europe in one complex, area of 2310 ha
- Around 11 million vines
- 22,500 tons of table and wine grapes
- 1,5 million kg of peaches
- 10,000 olive trees
- 1 million vine cuttings
- 100 tons of rainbow trout
- 17 milion bottles of wine and brandy annually

13. jul Plantaže

- **Wine cellars:**
 - Čemovsko polje, 30 million liters
 - Lješkopolje, 2.8 million liters
 - Šipčanič, 2 million liters
- **Exports of products to 43 countries** worldwide
- More than **1000** international and national **awards**
- 2 restaurants, several retail facilities
- Horseback riding club
- About **720 employees**
- **Development sector**, over **20** national and international projects



Ready to be consumed

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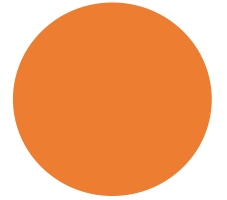
Smart Agriculture Domains

- Arable Crops
- Fruit and Vegetables
- Livestock
- Supply Chain



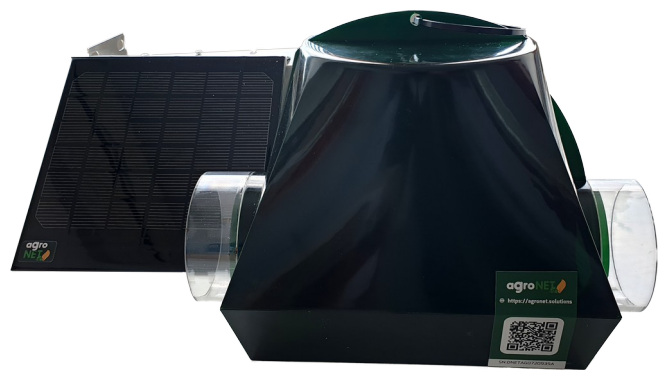
Digital Solutions

- Weather conditions and **micro-climate**
- **Monitoring parameters** in fields, vineyards, orchard, livestock farms
- Agriculture **machinery** and fleet management
- Assessing **health** and **growth**
- **Detecting disease** or conditions for developing diseases
- **Growth** monitoring, detecting optimal **harvesting time**
- **Pest** control and spraying **optimization**
- **Irrigation** optimization

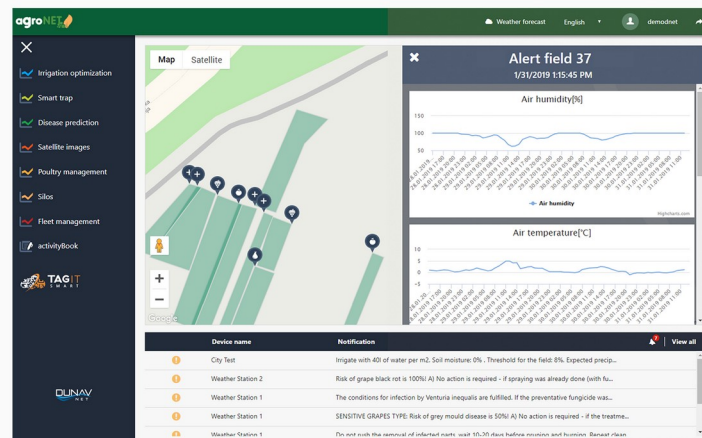




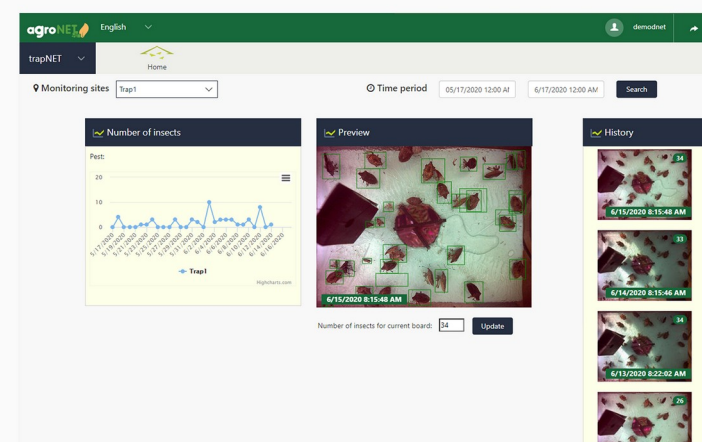
A Variety of IoT Devices



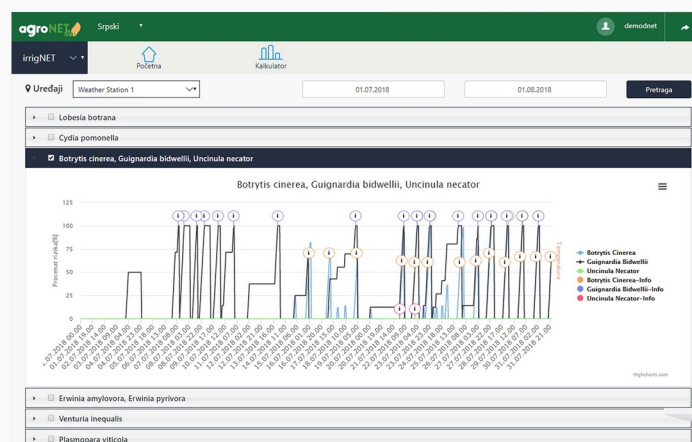
AgroNET: Decision Support System



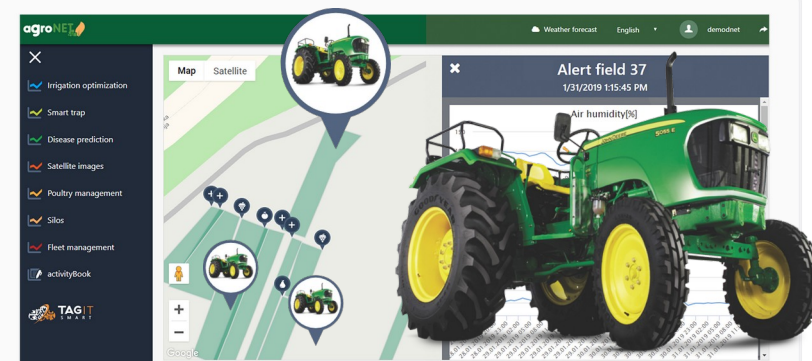
Integrated overview



Insects' monitoring



Pests and disease prediction



Machinery monitoring and integration

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Core Team

- University of Donja Gorica
- 13. Jul Plantaže
- DunavNET



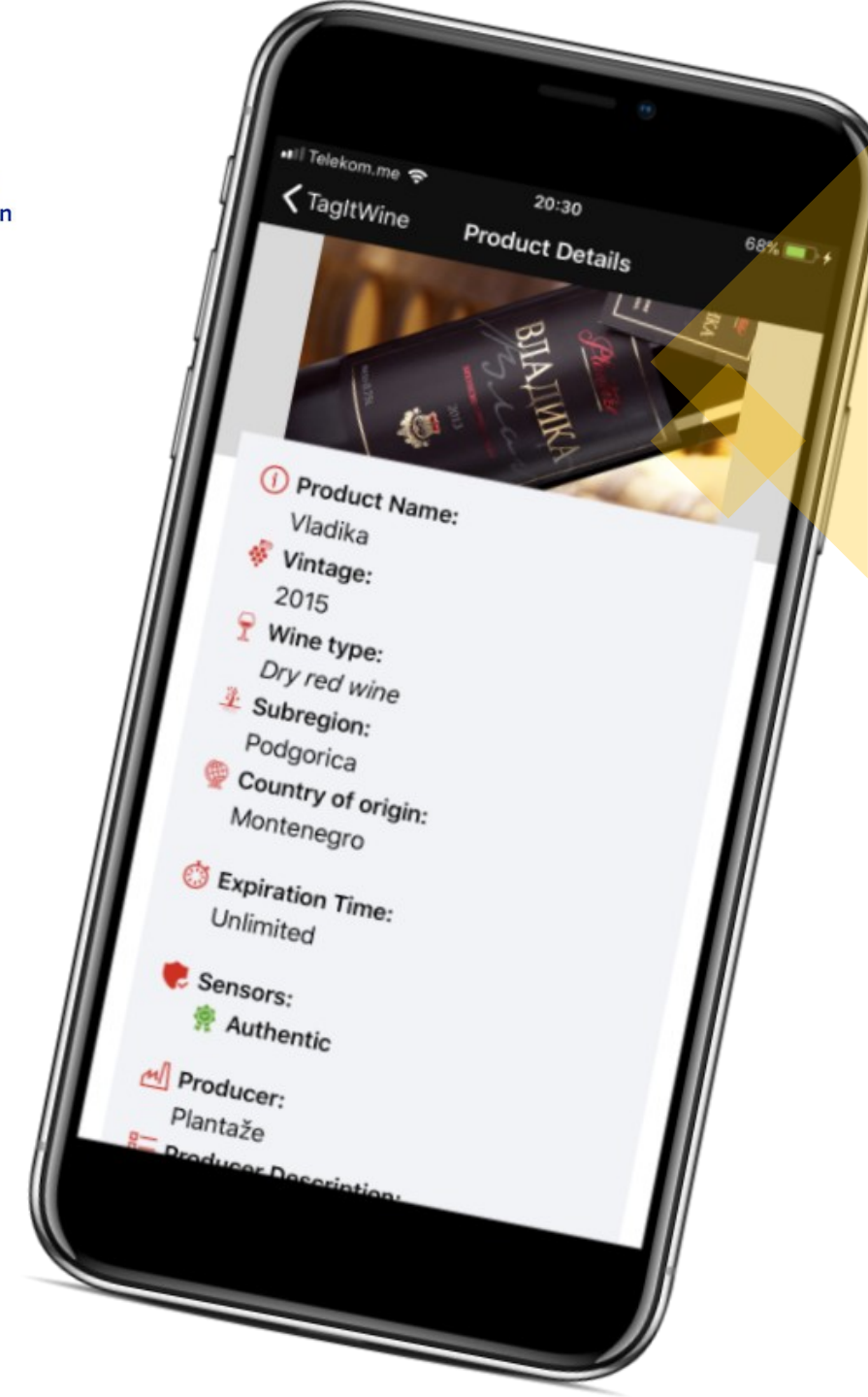
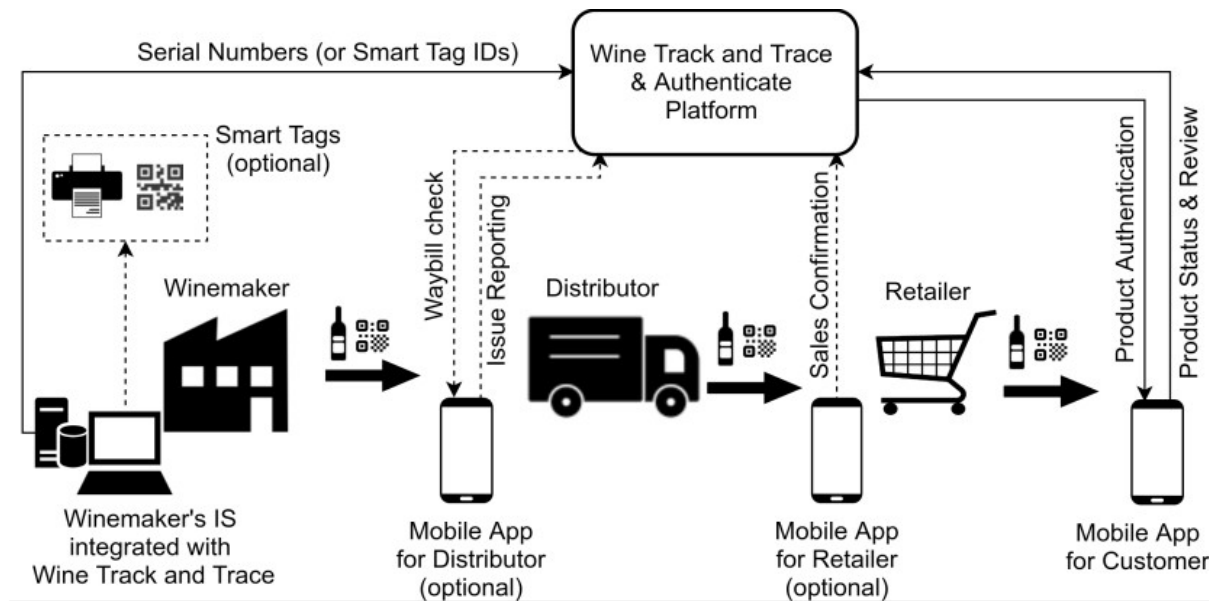
Collaboration and Joint Projects

- **TagItWine** – H2020 TagItSmart
- **Smart Irrigation** – 13. jul Plantaže
- **DIPOL** – Digital transformation of agriculture and food supply chain in Montenegro
- H2020 **DEMETER** – Building an Interoperable, Data-Driven, Innovative and Sustainable European Agri-Food Sector
- **VIRAL** ErasmusPlus – Vitalising ICT Relevance in Agricultural Learning
- **FoodHub** - Centre of excellence for digitalisation of food safety

TagItWine

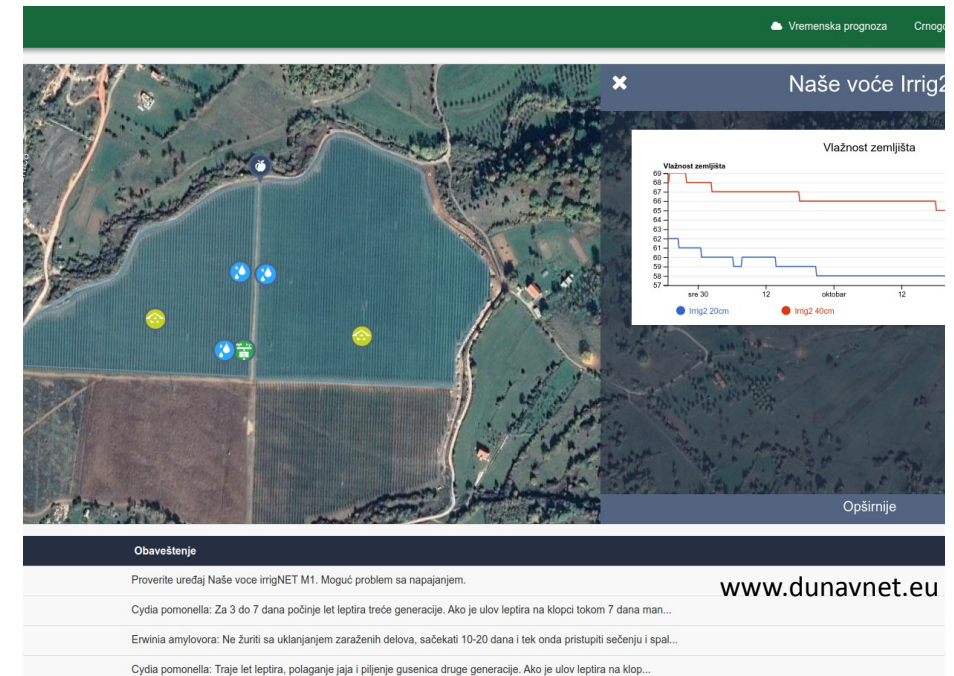


- Use of active QR codes
- Food track and trace use case
- Counterfeit prevention and detection



Irrigation optimization

- Sensor
 - Soil moisture, Teros 10 (30cm/60cm)
- IoT node:
 - Mobile and/or LoRa communications
 - Solar and battery power
 - Embedded computing
- AgroNET platform in Cloud
 - Data Integration
 - Visualization
 - Decision Support: Irrigation Optimization
 - Web and mobile access and notifications



DIPOL: Precision Agriculture

- Data collection
 - Weather stations
 - Soil moisture
 - Leaf wetness
 - Pheromon traps with cameras
 - Weather forecast data
- Digital platform (AgroNET) and Use Cases
 - Data collection and visualization (Cloud)
 - Irrigation optimization
 - Disease prediction
 - Insect monitoring and Spraying protection

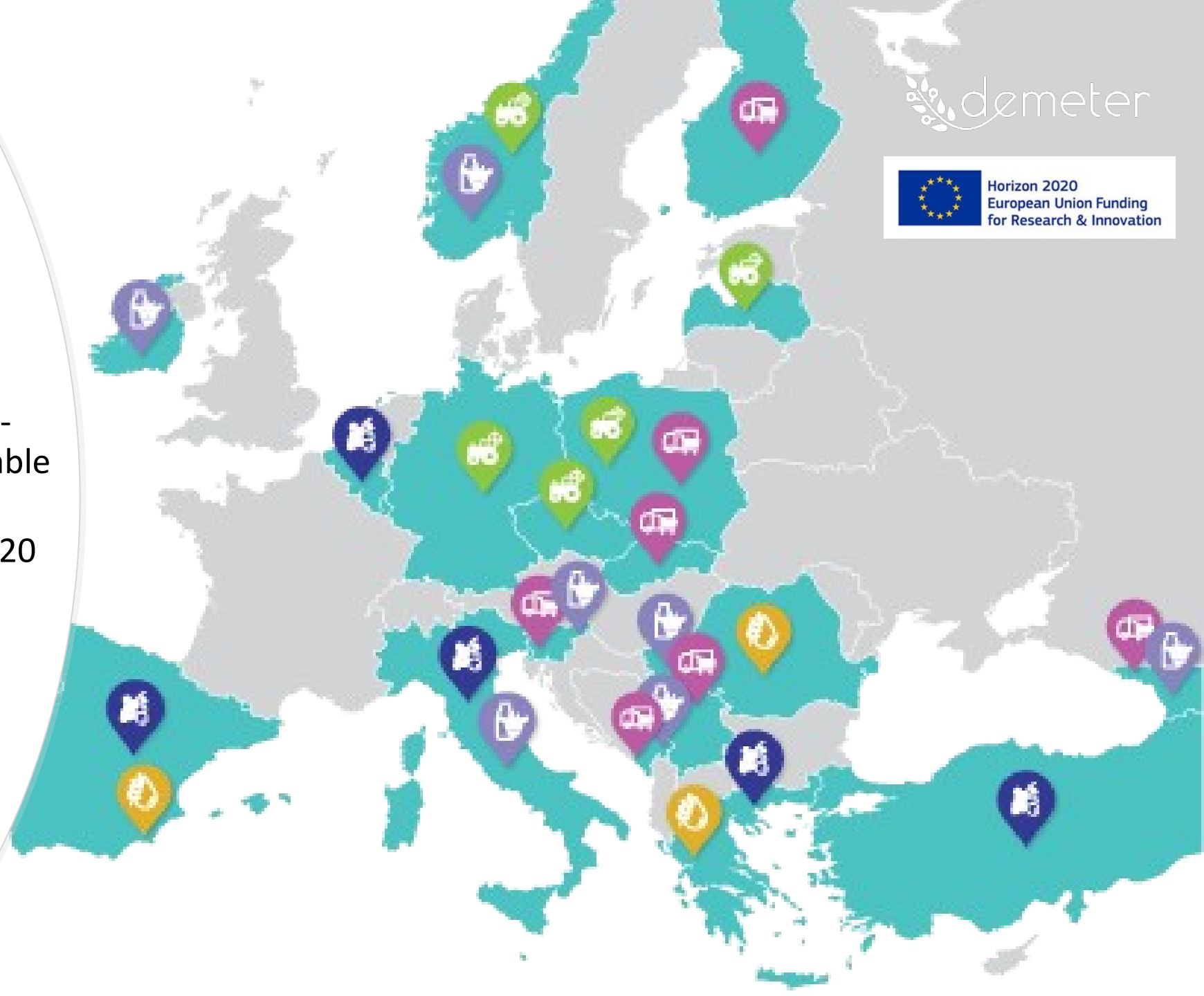


H2020 DEMETER

- Building an Interoperable, Data-Driven, Innovative and Sustainable European Agri-Food Sector
 - Horizon 2020, grant 8572020
 - Budget 17,704,191 EUR
 - Period 09/2019 - 02/2023
 - **60 partners**
 - 2 institutions from Montenegro



Horizon 2020
European Union Funding
for Research & Innovation



 **15** member states



18 Countries

60
Partners



318k hectares
of land

Working with

5.7k
Farmers

29k Sensors
used across **80** sites

demeter

20 Pilots



5 Agri Sectors

Global
Outreach:

69
farming
associations

47 Countries

1.5 Billion People



Multi-Actor
Approach



Using Practical skills

& knowledge to
target real life
needs, problems
& opportunities.

9.2k Devices
& **131** Large
Machinery



demeter

DEMETER



Horizon 2020
European Union Funding
for Research & Innovation

An abstract geometric composition featuring a central cluster of seven overlapping, curved green lines that resemble stylized grass or reeds. Surrounding this central element are various other geometric shapes: a large green triangle in the top left, a blue circle in the top right, a blue ring on the left, and an orange semi-circle at the bottom left. Several yellow curved lines are scattered around the bottom and right edges, and a green L-shaped line is in the bottom right corner.

-
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FoodHub CoE

- **Blockchain DLT**
 - ~ Food track and trace
 - ~ Balancing market access
 - ~ Trade applications



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Conclusions

- Academia
 - ~ Multidisciplinary Research
 - ~ International Collaboration
 - ~ Research and Innovation
- Business
 - ~ Technology Providers
 - ~ End Users

Conclusions

- Joint Projects / Grant Applications
 - ~ Horizon 2020 / Horizon Europe
 - ~ Erasmus Plus
 - ~ IPA
 - ~ National
 - ~ Start-up





VITALISING ICT RELEVANCE IN AGRICULTURAL LEARNING