

OPTIMIZATION OF RENEWABLE ENERGY SOURCES COMBINATION IN RURAL AREAS TO CREATE POSITIVE EFFECTS IN AIR QUALITY, BIODIVERSITY AND SOIL HEALTH

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ECOLOOP AT A GLANCE

Start date: October 2023

End date: September 2027

Duration: 48 months

15 partners from 4 EU countries

Goals:

1. Optimizing biogas production;
2. Integrating various RES;
3. Developing innovative agricultural protocols and bioproducts;
4. Promoting regional development through innovative BMs.

7 KEY EXPLOITABLE RESULTS

KEY TECHNICAL DEVELOPMENT



KER 1: BIOGAS PRODUCTION



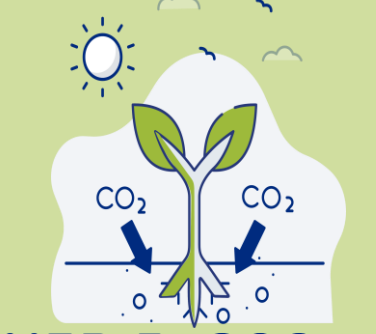
KER 2: RES INTEGRATION



KER 3: SOIL HEALTH



KER 4: ECOLOOP DSS



KER 5: CO2 SEQUESTRATION TOOL

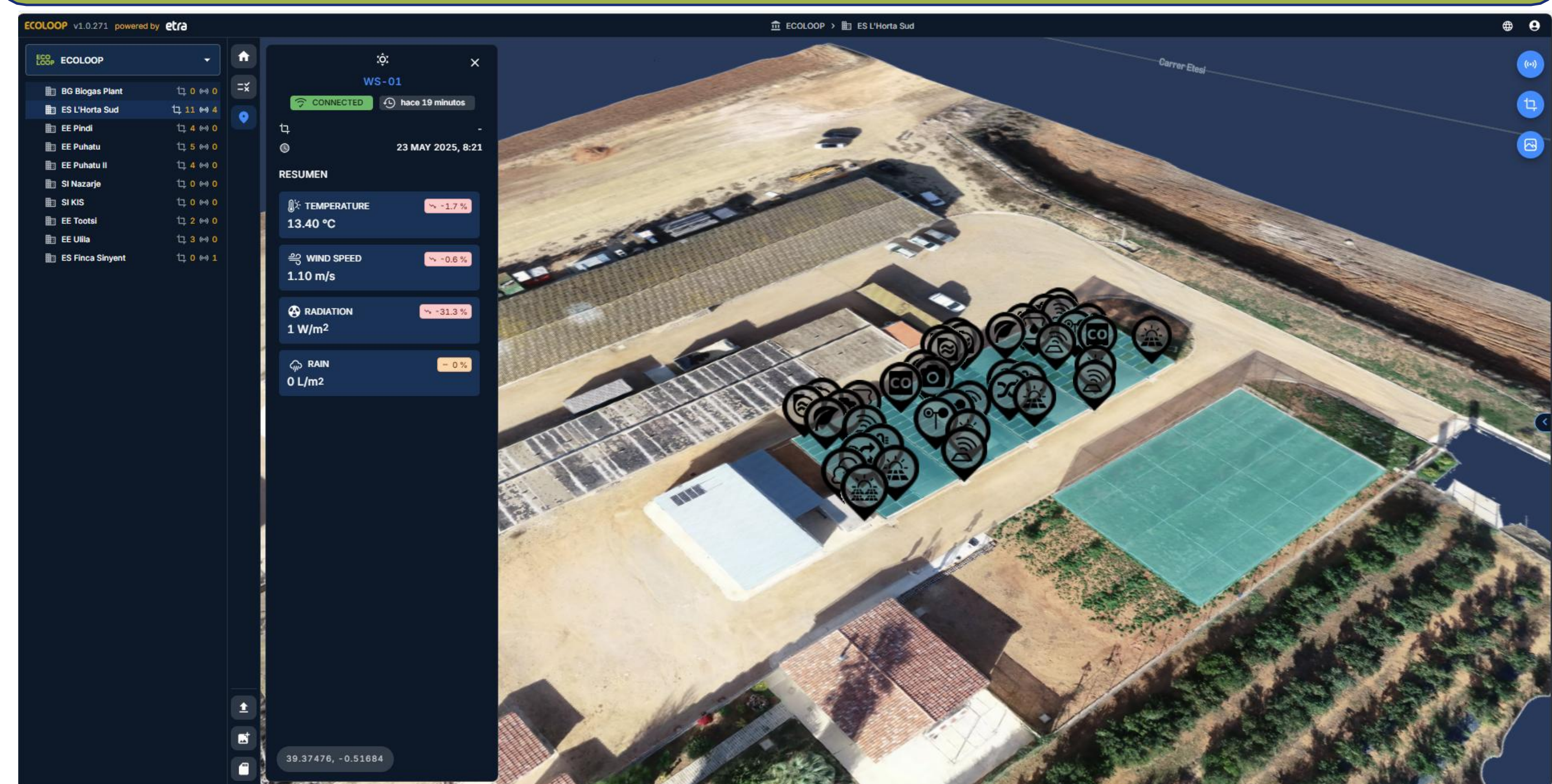


KER 6: FARMERS SUPPORT TOOL



KER 7: LIVING LAB

KER 4: DECISION SUPPORT TOOL FOR FARMERS AND FORESTERS (ETRA)



Advanced Software:

- Integrates a diverse variety of **hardware sources**.
- **Key data captured:** solar irradiance, ambient temperature, relative humidity, air pressure, wind speed and direction, soil and climatic conditions such as PAR, global radiation, pluviometry, soil moisture, luminosity, etc.
- **Optimization of Renewable Energy Use:**
 - ✓ **Monitoring, management and control** of multiple energy sources.
 - ✓ **Forecasting** production and consumption for each RES if feasible
 - ✓ **AI and Automated Recommendations:** With the help of a **rule-based** system

BENEFITS:

1. **Increase efficiency and profitability** of the fields.
2. **Reduce energy consumption** and GHG emissions.
3. **Increase the use of green energy sources** (biogas, PVs, geothermal).
4. **Monitor, manage and balance** energy grid remotely and based on **real-time** data.

MAIN ACHIEVEMENTS

1. Definition of **quantities and types of agroforestry wastes** to be used.
2. Proposal of **mass and energy balances**.
3. Estimation of **biogas and biomethane production** and **lab testing** waste.
4. Design of the **process flow** and **type of technologies** applied.
5. Selection and purchase of **equipment** to be used.
6. Definition of **pre-treatment and post-treatment processes** of digestate.
7. Design of the **uses and treatment** on the biogas to be used as **biomethane**.
8. **Environmental requirement licenses** for the activity of biogas plant.



SLOVENIAN PILOT: KIS & BIOMASA

Small-scale biogas production from on-site organic residues (cow slurry) and its conversion into biomethane at the KIS experimental farm in Jable.

1. Following digestate separation, the solid phase is used to produce **organic biofertilizer pellets**.
2. A modular biomethane upgrading unit based on **Slovenian PSA technology** was successfully developed.
3. Biomethane will be used on a **tractor running on two biofuels** (HVO and biomethane).

Figure 1. Biogas and digestate production process.

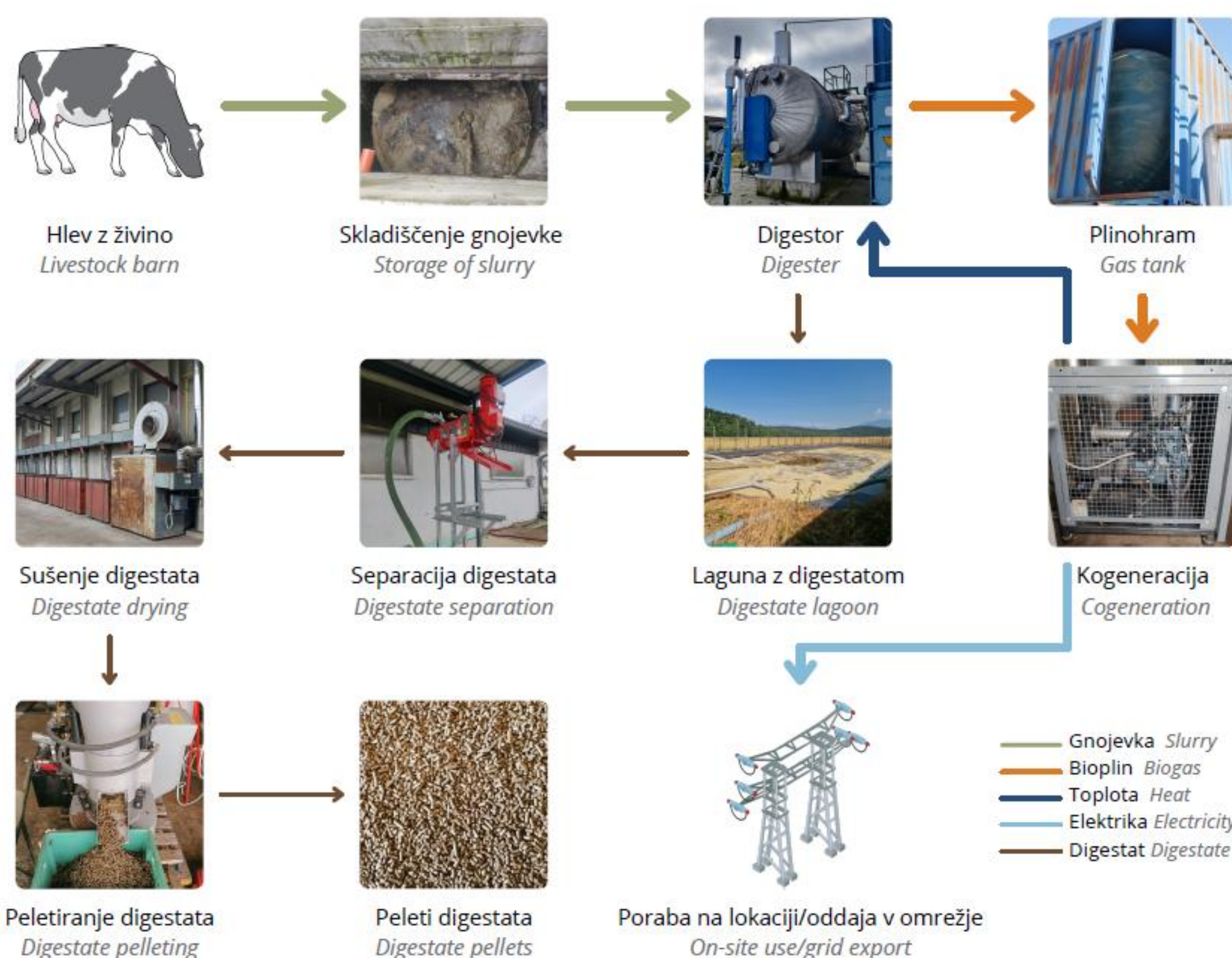


Figure 2. Pressure Swing Adsorption (PSA) system for upgrading biogas to biomethane.



Figure 3. Gas analysis system for real-time monitoring of biomethane composition connected to DSS (KER4)