Funded by the European Union

Marie Skłodowska-Curie Actions

Green Field Data

Exceptional
36-months Double Degree PhD Scholarship
Position-M
Phd in Engineering and Technology Sciences, and Environment

Assessing drought effects on grassland using IoT-enabled visual sensors

EU Recruiting institutions	PUT, Poznan University of Technology, Poznan, Poland (18 Months) UREP, Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE), Clermont-Ferrand, France (18 months)
Keywords	Drought, grassland, Data Science, ML & AI, Digital Agriculture, Remote Sensing (IoT), image processing

Exceptional benefits at a glance

- ***International PhD training excellence***
- ***Renowned supervisors & top-tier labs***
- ***Interdisciplinary & multi sectoral research***
- ***Competitive MSCA salary & allowances***
- ***Global academic & industrial network***
- ***Non-academic secondments***

Salary

	Living Allowance	Mobility Allowance*	Family Allowance**
Gross amount Per year	**EUR 35640**	**EUR 8520**	**EUR 7920**

Long Term leave allowance (if applicable)

Special needs allowance (if applicable)

*private mobility-related costs (e.g. travel and accommodation costs), not their professional costs under the action

**doctoral candidate has or acquires family obligations during the action duration, i.e. persons linked to him/her by (i) marriage, or (ii) a relationship with equivalent status to a marriage recognised by the legislation of the country or region where this relationship was formalised; or (iii) dependent children who are actually being maintained by the researcher, the family allowance must be paid to him/her as well

GreenFieldData Project at a glance

GreenFieldData: "IoRT Data management and analysis for Sustainable Agriculture" is a project funded under the action HORIZON Marie Sklodowska-Curie Action (MSCA) Joint Doctoral Network. **GreenFieldData** will train a new generation of researchers able to tackle digital and green transition challenges using a human-centric approach to ensure the robustness and relevance of the solutions responding to the specific needs of the EU market in a context of climate change and increasing socio-economic constraints. At a policy level, **GreenFieldData** outcomes will feed in directly to the aims of the HE Strategic Plan 2025-2027, EU Partnership Agriculture of Data and Digital EU Program. **GreenFieldData** proposes a high-level interdisciplinary, inter-sectoral and international (triple 'i') research project and training network on new IoRT (Internet

of Robotic Things) based solutions for sustainable agriculture. **GreenFieldData** will mobilize 14 Doctoral Candidates (DCs) enrolled in Double Degree Doctorate programmes with 12 academic main beneficiary partners, across 7 EU countries. Moreover, 21 non-academic associated partners, and 3 academic associated partners will provide support to the DCs. The partners form a high quality network, where Academic partners have previous research collaborations as outlined in a common vision paper. The ambitious project will provide the DCs with a unique toolbox of cutting-edge knowledge, tools and strategies which will boost their employability and benefit the next generation operational workforce (researchers, Digital Technologies (DTs) and agricultural stakeholders). The project results will also benefit EU innovation as the human-centric IoT devices & robotics, and data-based solutions tailored to EU context will enable the agricultural sector to assess and mitigate the impacts of climate change, and define new sustainable low input practices, thus increasing resilience and competitive-ness.

PhD Position M – Assessing drought effects on grassland using IoT-enabled visual sensors

Context:

Grasslands cover 39% of Europe's utilised agricultural area and store over 30% of the global stock of carbon, making them vital for climate regulation, biodiversity, and agricultural productivity. However, they are highly vulnerable to drought, with impacts on ecosystem health, carbon storage, and food production. This PhD project addresses the challenge by integrating Internet of Things (IoT)-enabled visual sensing technologies with advanced data analytics to detect and quantify drought effects on grasslands. IoT visual sensors, combined with machine learning, offer the possibility to monitor plant health and environmental conditions in near real-time, producing fine-grained spatial and temporal insights. These tools can identify early-warning signals of drought stress and provide actionable recommendations for adaptive management. In addition to its scientific contributions, this work aligns with EU strategic priorities, including the European Green Deal, the Digital EU Programme, and the Climate Adaptation Strategy. The project's results will inform evidence-based policies, guide land managers in sustainable practices, and contribute to climate resilience in the agricultural sector—bridging the gap between digital innovation and ecological stewardship.

Objectives:

- Investigate IoT-enabled visual sensors for monitoring and analysing drought effects on grassland ecosystems.
- Deploy strategically sensors across areas with varying drought levels to capture high-resolution data on vegetation and environmental conditions.
- Establish protocols for data acquisition (calibration, quality control, noise reduction). Integrate IoT sensor data with historical datasets to address spatial and temporal variability.
- Apply machine learning to uncover patterns, develop grassland health indicators, and forecast drought impacts.
- Provide adaptive practices and early-warning systems to support land managers.

Work plan and task scheduling:
Months 1-6 Poland: S1

1) Months 1-3: state of the art of the PhD work : grassland responses to drought and methodologies to phenotype in the field, and define robust sensor-based indicators for the impacts of drought on grassland health and productivity.

2) Months 3-6: choice and order cameras (multispectral, RGB...); acquire knowledge on plant ecophysiology (leaf gas exchange, leaf and soil water status); first analysis of available field data set (species composition, leaf traits, biomass, quality, soil data).

Months 7-24 France: S2-S4

3) Months 7-9: setup of cameras and ecophysiological plant material in the field to study spatial and temporal insights into grassland ecosystem responses to different drought intensities, enabling early-warning signal identification measure vegetation traits and record images; Secondment at Sherpa (France) - 1 month - training on embedded artificial intelligence and sensor design.

4) Months 9-12: continue field measurements with cameras and analyse data with predictive models using real-time sensor data and effective ML for grassland drought stress forecasting; Secondment - 1 month in the Sidam organisation - field-based assessment of drought impacts on grassland in the Massif Central region (France) - agricultural feasibility study exploring technology adaptation, stakeholder engagement, and sustainable monitoring strategies.

5) Months 13-24: Identification of essential components for a robust framework integrating real-time visual sensor data and historical climate patterns to monitor grassland resilience and inform adaptive management; continue to record images and measure vegetation traits;

Months 25-36 Poland: S5-S6

6) Months 25-30: Analyse data and use of sensor-driven models to quantify long-term ecological shifts in grasslands under varying drought intensities, linking sensor data with ecological indicators to monitor health and resilience trends. First draft of scientific papers. Secondment at WODR (Poland), 1 month - field-based assessment of drought impact on grasslands and its monitoring strategies in the Wielkopolska region.

7) Months 31-36: conference communication and papers submissions; PhD writing

Expected results

1. Validated, standardised indicators from visual sensor data for assessing drought impacts on grassland health and productivity.
2. Spatial and temporal insights into grassland responses to different drought intensities, enabling early-warning signal identification.
3. Predictive models combining real-time sensor data with machine learning to forecast drought stress.
4. Robust monitoring framework integrating visual sensor data with historical climate records for adaptive grassland management.
5. At least two journals (ranked in Scimago not lower than Q2)
6. At least two international conference papers (ranked in CORE not lower than B)

References

1. Zwicke M, Picon-Cochard C, Morvan-Bertrand A, Prud'homme MP, Volaire F. 2015. What functional strategies drive drought survival and recovery of perennial species from upland grassland? *Annals of Botany*, **116**, 1001-1015. Part of a special issue on Plants and Climate Change.
2. Zwicke M, Alessio GA, Thiery L, Falcimagne R, Baumont R, Rossignol N, Soussana J-F, Picon-Cochard C. 2013. Lasting effects of climate disturbance on perennial grassland above-ground biomass production under two cutting frequencies. *Global Change Biology*, **19**, 3435–3448.
3. Luna DA, Pottier J, Picon-Cochard C. 2023. Variability and drivers of grassland sensitivity to drought at different timescales using satellite image time series. *Agricultural and Forest Meteorology*, 331:109325.
4. Shi B, Delgado-Baquerizo M, Knapp AK, Smith MD, Reed S, Osborne B, Carrillo Y, Maestre FT, Zhu Y, Chen A, Wilkins K, Holdrege MC, Kulmatiski A, Picon-Cochard C, Roscher C, Power S, Byrne KM, Churchill AC, Jentsch A, Henry HAL, Beard KH, Schuchardt MA, Eisenhauser N, Otfinowski R, Hautier Y, Shen H, Wang Y, Wang Z, Wang C, Cusack DF, Petraglia A, Carbognani M, Forte TGW, Flory SL, Hou P, Zhang T, Gao W, Sun W. 2024. Aridity drives the response of soil total and particulate organic carbon to drought in temperate grasslands and shrublands. Science Advances, 10, eadq2654.

5. Smith MD, et al. 2024. Extreme drought impacts have been underestimated in grasslands and shrublands globally. *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 121, No. 4, e2309881120.
6. Bimonte, S., Bellocchi, G., Pinet, F. et al. Data engineering for sustainable agriculture: developments, challenges, and case studies of a novel IoRT architecture. J Big Data 12, 195, 2025.

PRACTICAL INFORMATION

Recruiting and host institutions	• PUT, Poznań University of Technology, Poznań, Poland (18 Months**)** (Recruiting institution) • UREP, Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE), Clermont-Ferrand, France (18 Months)
Doctoral schools	• Doctoral School of the Poznań University of Technology, Poznań, Poland • Doctoral School SVSAE of the University Clermont Auvergne, Clermont-Ferrand, France
Supervisors	• Prof. Piotr Skrzypczyński (Poznan University Technology, Poznan, Poland) • Dr. Catherine Picon-Cochard (UREP, INRAE, Clermont-Ferrand, France)
Non-academic mentors	• Dr. Nicolas Chollet (Sherpa, France) (1 month) • Ms Léa Geneix (Sidam, France) (1 month) • Ms Aleksandra Kapska (WODR, Poland) (1 month)
Secondments **(1 to 6 hosting months)**	• Sherpa, Clermont-Ferrand, France. Business process and data engineering. Comprehensive guidance and advisory support will be provided throughout the PhD program on AI, Robotics and Embedded system technologies. 1 month (Month 7) • SIDAM, Aubière, France. SIDAM is an inter-institutional body within the network of Chambers of Agriculture of the Massif Central. Support will be provided by agricultural advisers to farmers affected by droughts. 1 month (Month 11) • WODR (Wielkopolska Agricultural Advisory Centre). Public institution, supports sustainable rural development by enhancing farmers professional skills — provides the setting for field-based drought impact assessments and stakeholder engagement. 1 month (Month 25)
Contact information	• piotr.skrzypczynski@put.poznan.pl • catherine.picon-cochard@inrae.fr

RECRUITMENT CRITERIA

General criteria

- MSCA Mobility Rule: researchers must not have resided or carried out their main activity (work, studies, etc.) in Poland for more than 12 months in the 36 months immediately before their date of recruitment
- Doctoral Candidate Status: you must not already hold a doctoral degree
- Educational Background:
  - you must hold a master's degree in Computer Science or related field applied to environmental studies
  - you must have earned the equivalent of 300 ECTS credits, a minimum of 60 of these ECTS must be from your master's degree.
  - your master's degree must be from a university recognized by the International Association of Universities.

Required skills

- Strong programming skills (e.g., Python, C++ or similar)
- Sensor technologies
- Soil and plant sciences
- Analytics on remote sensing data
- Scientific excellence: your academic background and skills must be a strong fit for the specific PhD project
- Language Proficiency: you must be fluent in both written and spoken English, as it is the official language of the project
- Publication Record (Merit): while not mandatory, a record of scientific publications will be considered a significant advantage
- Interdisciplinary mindset

APPLICATION

How to apply?

- **All information are provided here**

Deadline: **15th April 2026**

Other information

PUT

Poznań University of Technology (PUT) is one of Poland's leading technical institutions and an increasingly attractive destination for international PhD candidates in information technology, robotics, automation, and related engineering fields. The university combines a strong research culture with modern laboratories and an environment that encourages interdisciplinary collaboration. Foreign doctoral students benefit from working within well-established research groups specializing in areas such as artificial intelligence, autonomous systems, control engineering, mobile and industrial robotics, computer vision, and advanced computing. Many of these teams participate in European and global research projects, creating opportunities for joint publications, international mobility, and academic networking.

Doctoral studies at PUT are conducted entirely in English offering a clear research-oriented training program. Each PhD candidate develops an individual research plan under the supervision of experienced faculty members, gaining access to cutting-edge equipment and project infrastructure. The university emphasizes practical, application-driven research, often developed in partnership with industry, technology companies, and external research centers. This makes PUT a strong choice for candidates interested in applied robotics, machine intelligence, automation of complex systems, or computational technologies with real-world impact.

INRAE

INRAE and UREP research unit

INRAE. The French National Research Institute for Agriculture, Food and Environment (INRAE) is a public research institution bringing together a working community of 12,000 people, with 272 research, service, and experimental units located in 18 centers throughout France.

INRAE ranks among the world's leading institutions in agricultural and food sciences, and in plant and animal sciences. Its research aims to build solutions for multi-performing agriculture, quality food, and the sustainable management of resources and ecosystems.

UREP. The research unit employs 25 staff and is based at Clermont-Ferrand (63). Its activities come under INRAE's ECODIV department.

UREP studies the agroecology of grassland ecosystems in the context of global change, particularly climate change and management practices. The unit has international expertise in the fields of carbon and nitrogen cycles (greenhouse gas balance and carbon sequestration), plant community assembly, biotic interactions (plant-soil-animal) and their consequences on grassland functioning. The unit studies more specifically how climate change, including extreme drought, modifies grassland in terms of species composition and forage production. Plant mechanisms involved in drought resistance and recovery are focused at species or community level by using experimental (rainfall manipulation) or observational (long-term) approaches. The unit has strong expertise in microclimate measurements (below and above-ground) by setting up sensors in field conditions, with the help of technicians and engineers staff.

The UREP direction team consists of Catherine Picon-Cochard (Director), Juliette Bloor (Deputy Director).

Your Quality of Life at INRAE

By joining INRAE, you benefit from (depending on the type and duration of your contract):

- Up to **30 days of paid leave** + **15 RTT** days per year (for a full-time position);
- **Parental support**: **CESU** for childcare, benefits for leisure activities;
- **Skill development schemes**: training, professional orientation counselling;
- **Social support**: advice and listening, social aid and loans;
- **Holiday and leisure benefits**: *chèque-vacances* (holiday vouchers), accommodation at preferential rates;
- **Sports and cultural activities**;
- **Collective catering** (cafeteria/canteen).

The site is served by bus, and is also equipped with parking and services dedicated to cycling.

Notes on terms:

- **INRAE**: The French National Research Institute for Agriculture, Food and Environment.
- **RTT** (*Réduction du Temps de Travail*): Days off granted in compensation for working slightly more than the official legal working hours (a mechanism for reducing working time in France).
- **CESU** (*Chèque Emploi Service Universel*): A payment voucher/scheme in France used to pay for personal services, often including childcare. **CESU for childcare** refers to a specific pre-financed voucher for childcare expenses (usually for children aged 0-6).
- ***Chèque-vacances***: Government-subsidized holiday vouchers in France used to pay for travel, accommodation, and leisure activities during holidays.