



# **Intelligent Irrigation System for Low-cost Autonomous Water Control in Small-scale Agriculture**

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## **Data Management Plan**

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# 1. DATA MANAGEMENT PLAN (DMP)

## 1.1. DATA DESCRIPTION AND COLLECTION OR RE-USE OF EXISTING DATA

### 1.1.1. How will new data be collected or produced and/or how will existing data be re-used?

There is no pre-existing data. New data is collected through interviews (information on farms and farm owners/operators) and by physical measurements with sensors and then radio transmissions to a gateway (soil moisture value). Data is organized by farm and by sensor.

### 1.1.2. What data (for example the kind, formats, and volumes), will be collected or produced?

The data is of 2 types:

- textual data: information on farms and farm owners/operators: name of the farm, surface area of the farm, location of the farm, name of the owner/operator of the farm and type of crops. The format is a txt, xls or doc file. The volume of data is for approximately a few dozen farms.
- digital data: soil moisture value measured by a sensor and voltage value measured at the battery terminals. During radio transmission the encoding format used for the payload is Cayenne LPP. Once received on the gateway, the data is then converted and stored in json. The volume is a few tens of megabytes per sensor/month.

## 1.2. DOCUMENTATION AND DATA QUALITY

### 1.2.1. How will new data be collected or produced and/or how will existing data be re-used?

For farm information, there is no metadata or documentation.

For the soil moisture values and the voltage measured at the battery terminals, the metadata are the field identification, the sensor identification, the type of soil moisture sensor used, the crop type and a date for each measurement. There is no specific documentation.

Data is organized by farm and by sensor, then matched to the farm plot where the sensor is deployed.

### **1.2.2. What data quality control measures will be used?**

Concerning the measurements from the sensors, there are initially, for the 2 types of sensors selected for the project, calibration studies to determine the representative values according to the type of soil, the supply voltage to sensors and effects such as warming due to exposure to the sun.

Other than this, no other quality control measures are being put in place at this stage as the project is developing a technological solution to deploy low-cost sensors and seeks to validate the ease of deployment.

During the data analysis phase, if it exists, the values reported when the sensors are underpowered are discarded.

## **1.3. STORAGE AND BACKUP DURING THE RESEARCH PROCESS**

### **1.3.1. How will data and metadata be stored and backed up during the research?**

For farm information, it is stored in several places: on laptops, copies on partner university servers and copies on different cloud storage used by partners.

For the vast majority of data from sensors, they are stored on the gateway with local backup on USB key because the gateways are not connected to the Internet. For some farms, some sensor data is stored on the cloud of the partner who develops the gateway software, when the gateway is synchronized by Internet access, and only to test the synchronization mechanism.

Sensor data is not used operationally at this stage as the project is developing a technological solution to deploy low-cost sensors and seeks to validate ease of deployment. The data is interpreted immediately by the farm owner/operator.

### **1.3.2. How will data security and protection of sensitive data be taken care during the research?**

Generally speaking, there is no sensitive data.

For information on farms, only partners who are in contact with the owners/operators have access to all the data.

For data from sensors, partners who are in contact with owners/operators can access it, if necessary, by connecting to the gateway. Generally speaking, sensor data is not operationally exploited at this stage as the project develops a technological solution to deploy low-cost sensors and seeks to validate the ease of deployment. The data is interpreted immediately by the farm owner/operator.

## 1.4. LEGAL AND ETHICAL REQUIREMENTS, CODE OF CONDUCT

### 1.4.1. If personal data are processed, how will compliance with legislation on personal data and on security be ensured?

For farm information and sensor data that is deployed on these farms, partners who are in contact with the owners/operators have obtained informed consent on the use of this data for research purposes to optimize the system which is developed as well as for communications purposes (farm name and photos of deployments).

Partners who are not in direct contact with the owners/operators of the farms do not have direct access to this data, but can request a copy of the data and can use it for research and communication purposes.

### 1.4.2. How will other legal issues, such as intellectual property rights and ownership, be managed? What legislation is applicable?

The partners who are in contact with the owners/operators have obtained informed consent on the ownership of the data collected: the project consortium owns the data and all partners can request a copy of this data to use for research and communications purposes.

Data is not currently freely accessible (GitHub, website, etc.) due to its still very exploratory nature and mainly used to check the proper functioning of the deployed systems.

### 1.4.3. What ethical issues and codes of conduct are there, and how will they be taken into account?

Data is not currently freely accessible (GitHub, website, etc.) due to its still very exploratory nature and mainly used to check the proper functioning of the deployed systems. They are therefore only used by project members for research and communication purposes. Given the nature of these data, ethical issues have little impact. The code of ethics applies here quite simply: all project partners can request a copy of the data.

## 1.5. DATA SHARING AND LONG-TERM PRESERVATION

### 1.5.1. How and when will data be shared? Are there possible restrictions to data sharing or embargo reasons?

For farm information, most of the data is available in the project deliverables. There are no other preservation plans.

For the soil moisture values that were collected on the gateways, most of the data was deleted, after being used to verify the proper functioning of the system. There is no preservation plan for the test data as it can easily be reproduced from a real sensor. The

construction of consolidated datasets with detailed metadata will be the subject of a future project.

### **1.5.2. How will data for preservation be selected, and where data will be preserved long-term (for example a data repository or archive)?**

There is no data to preserve.

### **1.5.3. What methods or software tools are needed to access and use data?**

The data is either in textual or digital form in json format. There is no need for any special software to use the data. The data is not currently freely accessible (GitHub, website, etc.) due to its still very exploratory nature and mainly used to check the proper functioning of the deployed systems. They are therefore only used by project members for research and communication purposes.

### **1.5.4. How will the application of a unique and persistent identifier (such as a Digital Object Identifier (DOI)) to each data set be ensured?**

Not applicable.

## **1.6. DATA MANAGEMENT RESPONSIBILITIES AND RESOURCES**

### **1.6.1. Who (for example role, position, and institution) will be responsible for data management (i.e. the data steward)?**

All data is accessible by all members of the consortium. Each partner who is in contact with the owners/operators of the farms in which the data is collected are the managers of this data. All partners can request a copy of this data to use it for research purposes as well as communications purposes.

The implementation of the Data Management Plan is the responsibility of the project coordinator: Prof. Congduc Pham from the University of Pau and Pays de l'Adour (UPPA).

### **1.6.2. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?**

The project does not produce reusable data because for the soil moisture values that were collected on the gateways, most of this data was deleted, after being used to verify the proper functioning of the system. There is no preservation plan for the data.

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## ACRONYMS LIST

Acronym	Explanation
LPP	Low Power Payload

## PROJECT CO-ORDINATOR CONTACT

Pr. Congduc Pham

University of Pau

Avenue de l'Université

64000 PAU

FRANCE

Email: [Congduc.Pham@univ-pau.fr](mailto:Congduc.Pham@univ-pau.fr)

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