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Background

The data from soil moisture sensors was used to guide the operation of irrigation system is critical for a well-designed drip irrigation. But the readings of soil moisture sensors can be different at different locations and measuring time. Thus, investigation of water movement in the soil can help for guiding the placement of soil moisture sensors.

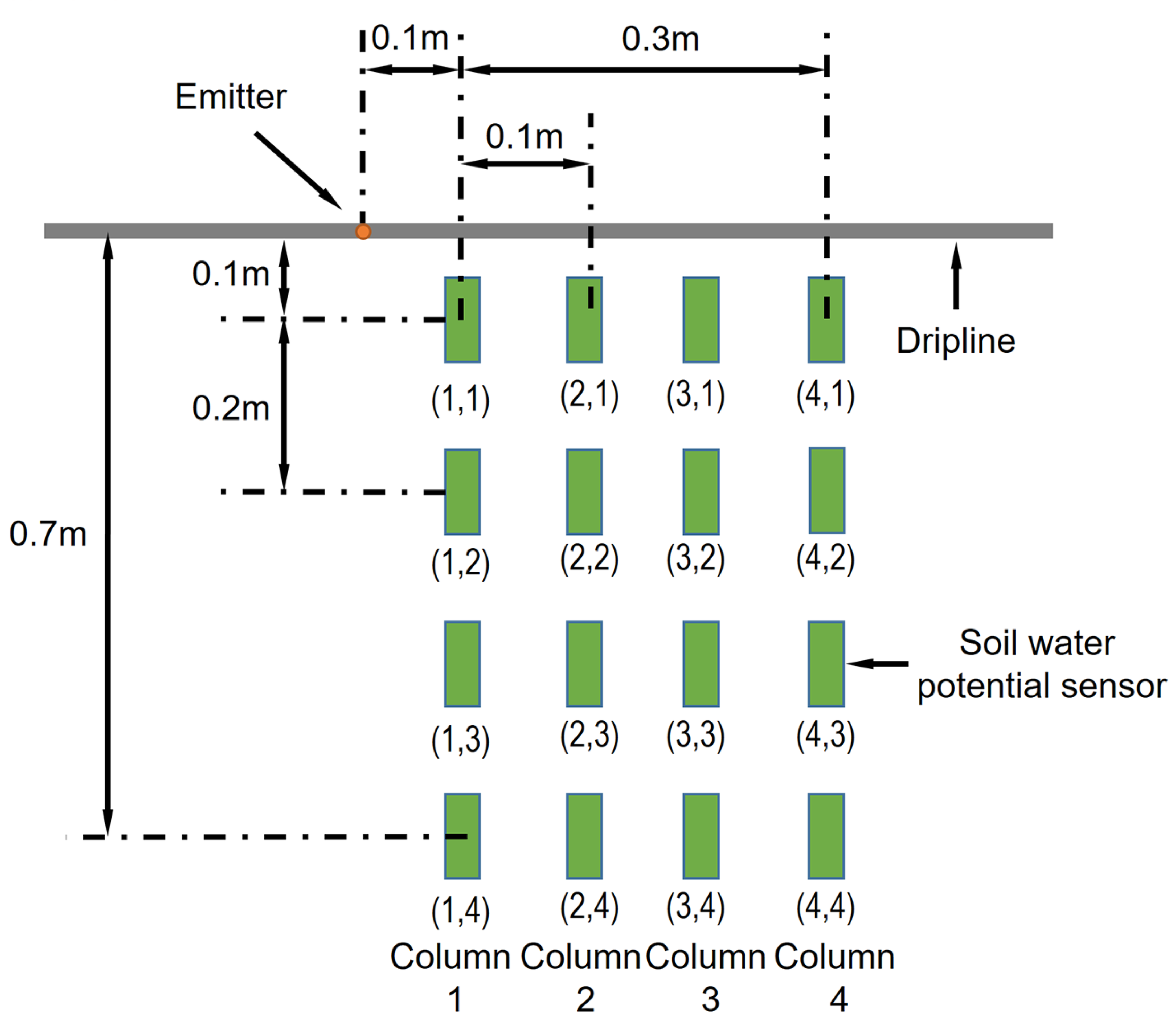
Primary Objectives

- Developing a LoRaWAN based Internet of Things (IoT) system
- Investigating the principle of water movement in the soil under drip irrigation
- Recommending the locations for installing soil moisture sensors

Materials and Methods

Experiment System Concept

- Watermark SS200 soil moisture sensors
- Sixteen sensors were used at four different depths and four lateral locations

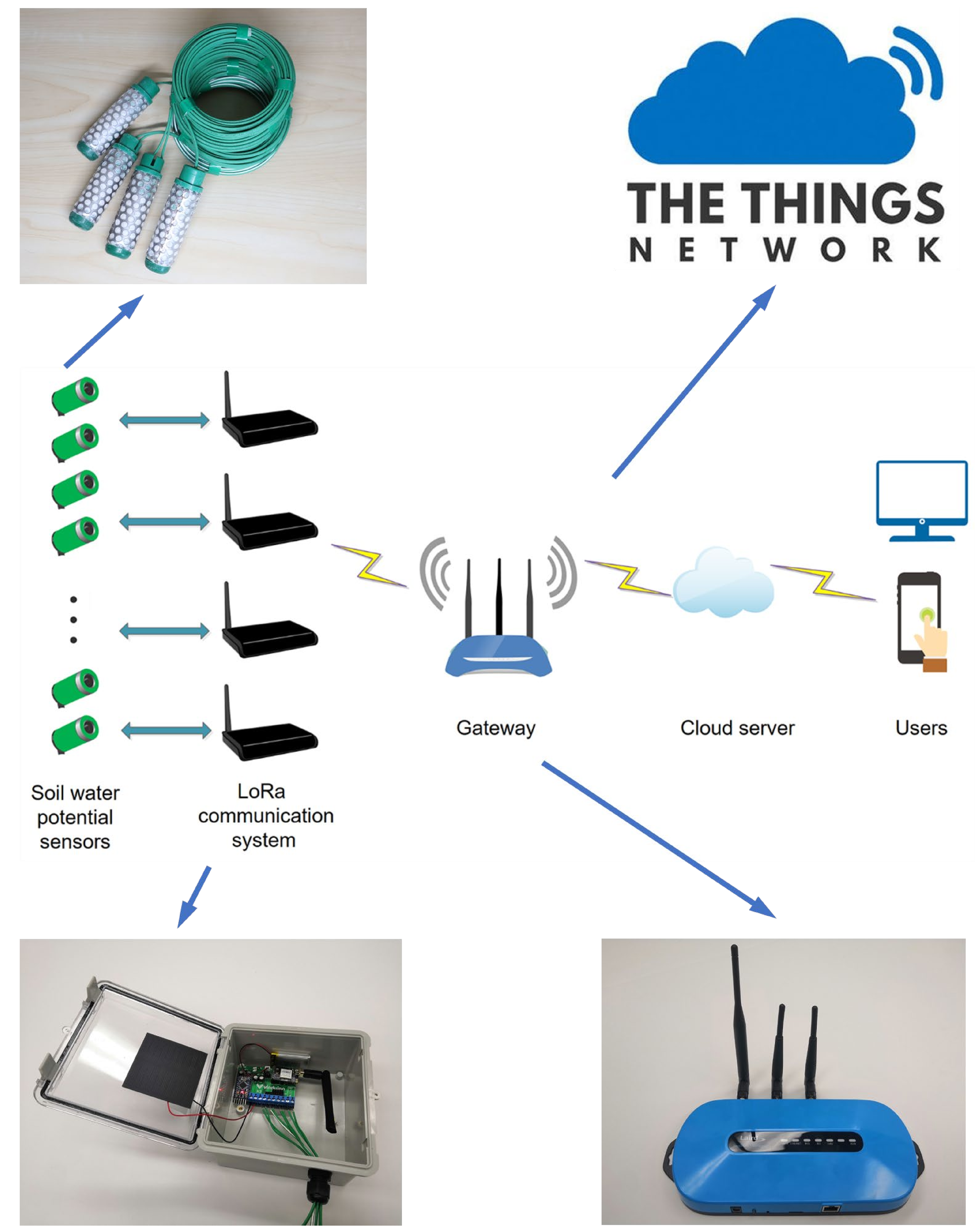


Installation of SWP Sensors

- Pre-installation procedure was applied for the sensors
- Four sensors at different depths were assembled with PVC pipes to be installed into one hole with the designed distance

Structure of the IoT System

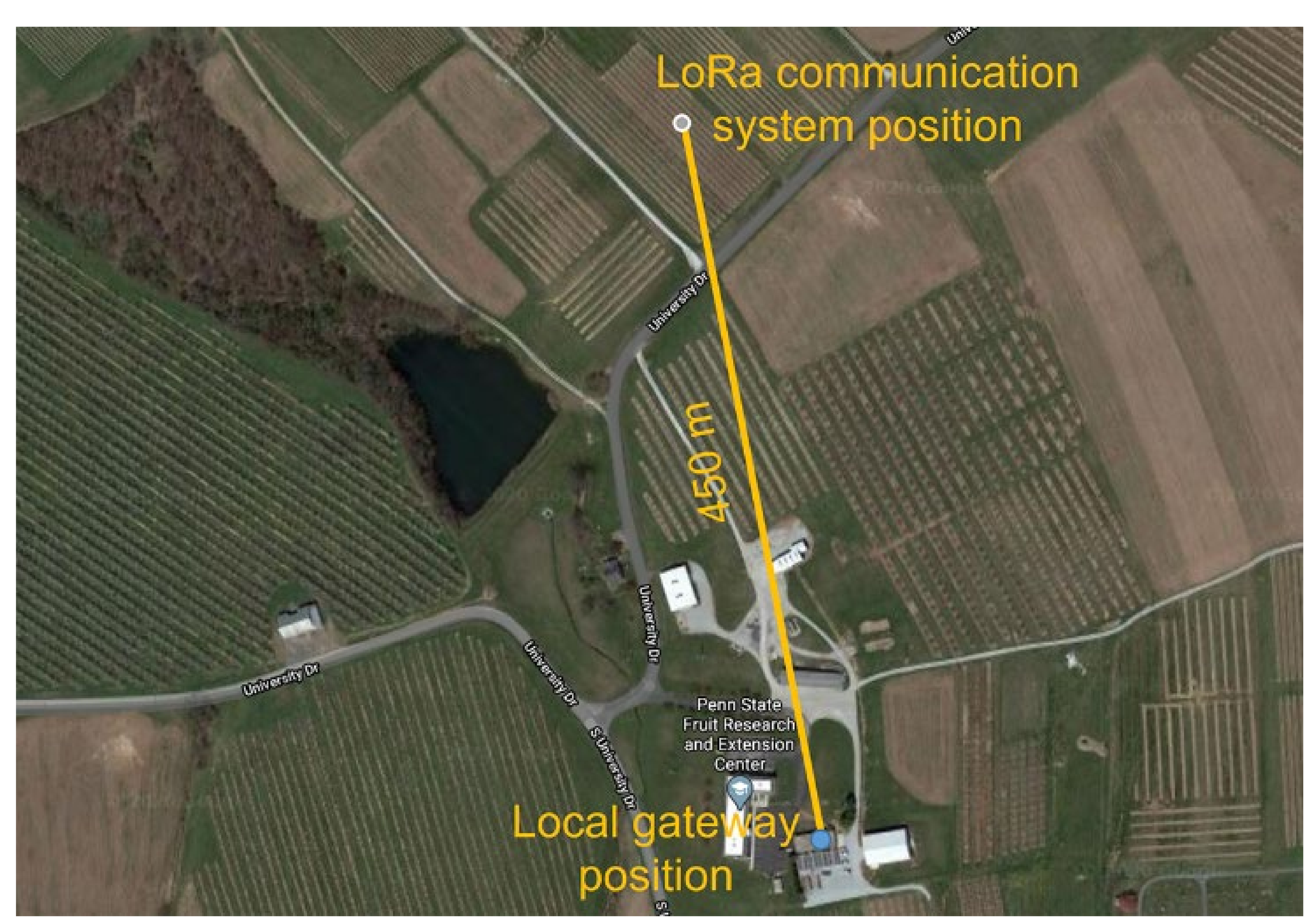
The IoT system consists of sixteen SWP sensors, a LoRa communication system, a local gateway, and cloud server. The end users can access the data from the cloud server through internet.



Results and discussions

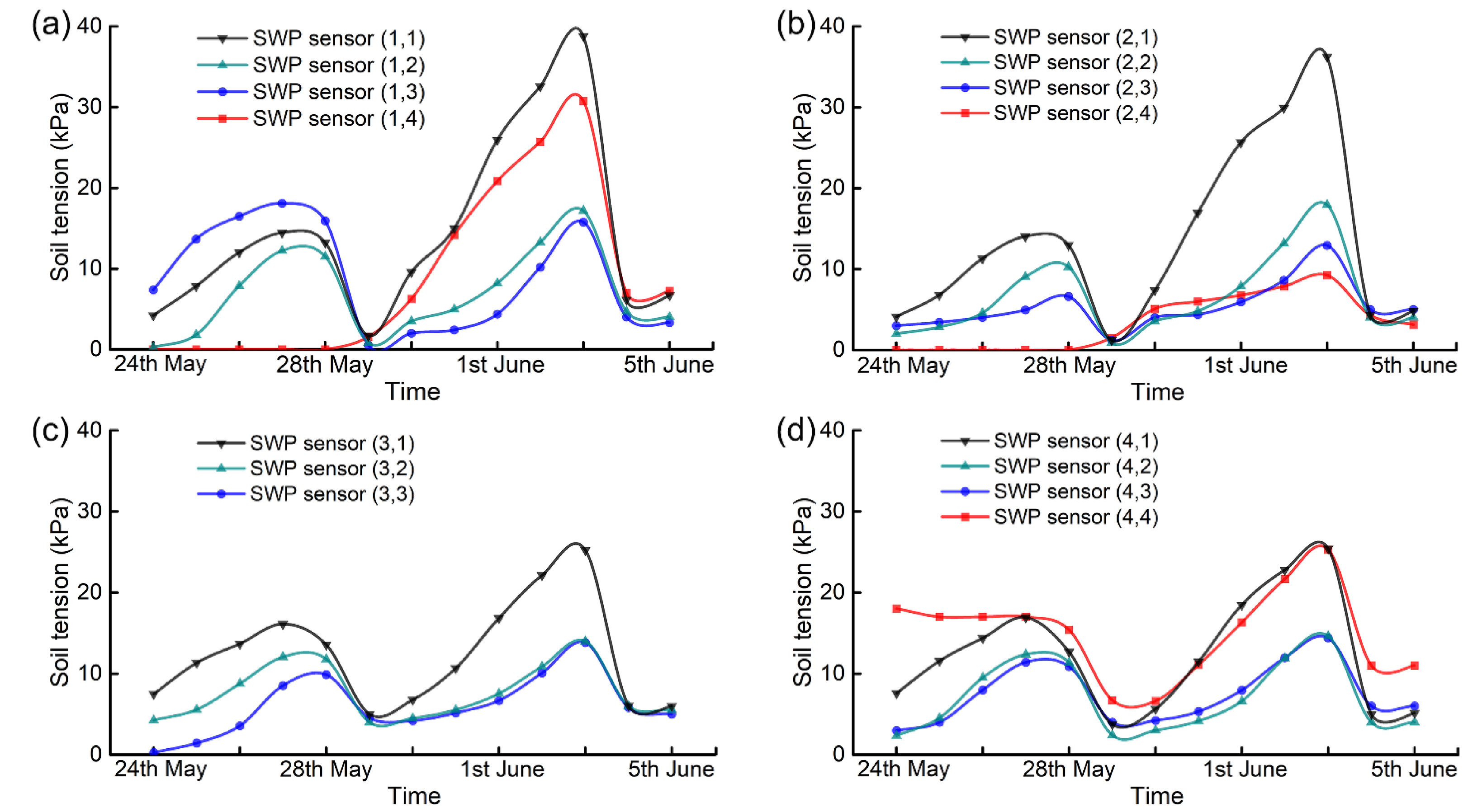
Feasibility of the IoT System

The distance between the gateway and LoRa communication systems is about 450 m. The data of SWP sensors were successully uploaded to the cloud sever and monitored through a computer connected with internet.

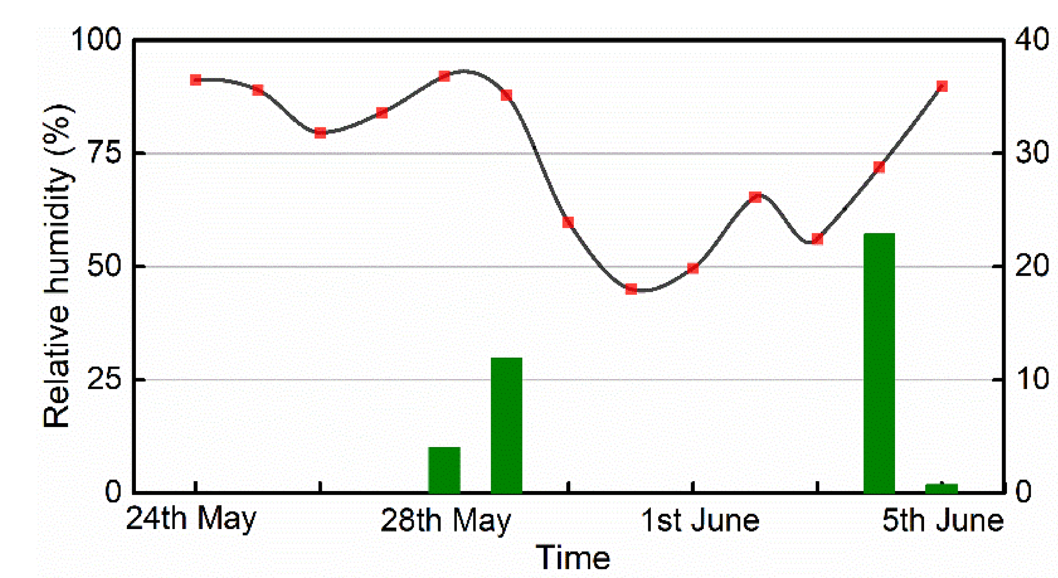


Soil Moisture Monitoring with IoT System

The surrounding area were wetted to ensure better connection between soil and sensors. After installation, the readings from these sensors increased gradually.

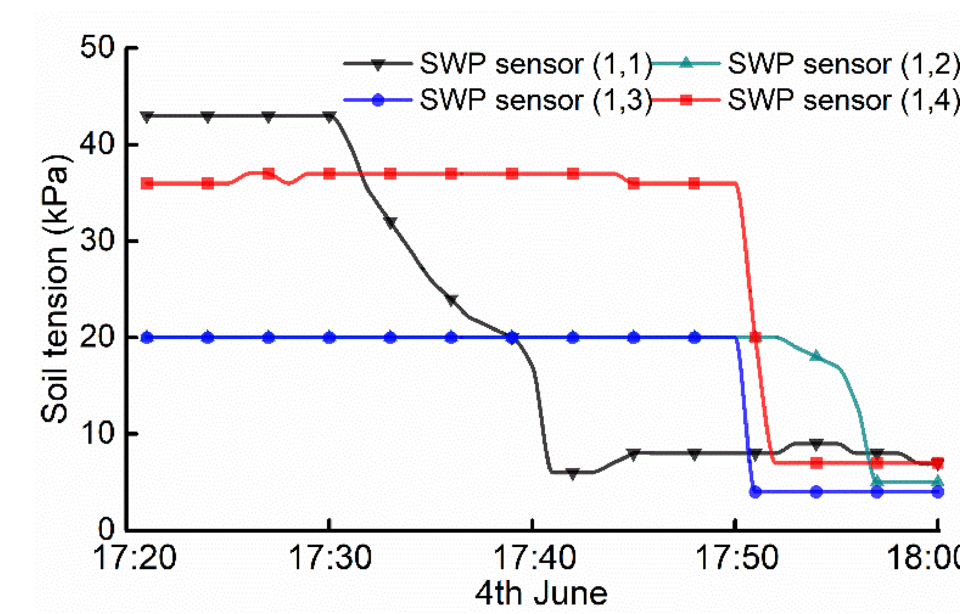


There was no irrigation event applied during the period, while the results showed the change of soil water potential values according to the precipitation. After the precipitation, the reading from all sensors decreased obviously.



SWP Changes in A Precipitation

During a precipitation event, the reading of SWP sensors started to decrease from top to bottom.



Conclusions

- The IoT system is effective to monitor the data from the SWP sensors with a long distance between local gateway and LoRa communication system.
- The SWP sensors could detect the change of the SWP status in the soil during a precipitation event.
- More results will be expected with the irrigation events, and recommendation for sensor locations will be provided.

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