



This project is part of the PRIMA Programme supported by the European Union



# Intel-Irris

# INTEL-IRRIS

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

## THE INTEL-IRRIS STARTER-KIT AND MAIN SCIENTIFIC RESULTS

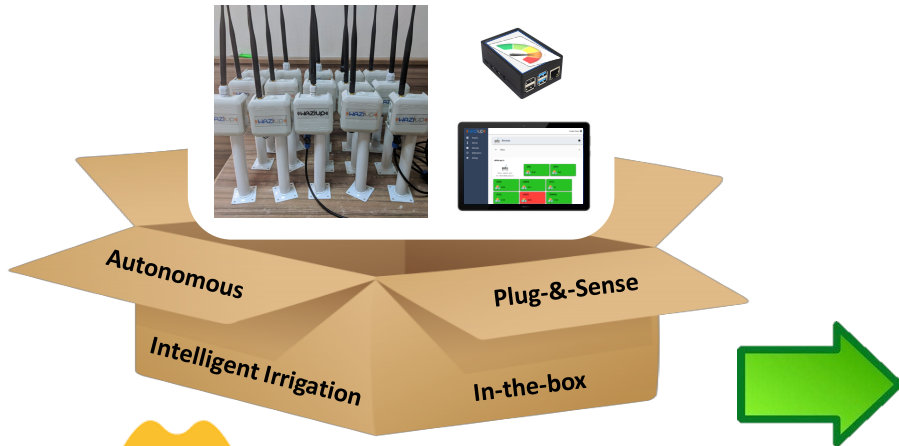
C. Pham, University of Pau, France

# INTEL-IRRIS's starter-kit

🕒 **From idea to reality!**

 **Intel-Irris**

**Starter-kit**



 **PRIMA**  
IN THE MEDITERRANEAN AREA  
 **Intel-Irris**



Prof. Congduc Pham  
<http://www.univ-pau.fr/~cpham>



**Small-scale farms,  
 Smallholder Farmers**



**NO INTERNET** ☹️

# 2 versions of the soil device



**~ 30€**

**SEN0308  
capacitive sensor**


**~ 60€**

**Watermark WM200  
Water tension sensor**



**A soil temperature  
sensor can be added**

**Especially for  
tensiometer**

A young green plant with several leaves is growing in a pot. In the foreground, a black irrigation tube is visible, partially buried in the soil. The background is a blurred, light-colored surface, possibly a table or a tray.

# INTEL-IRRIS

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

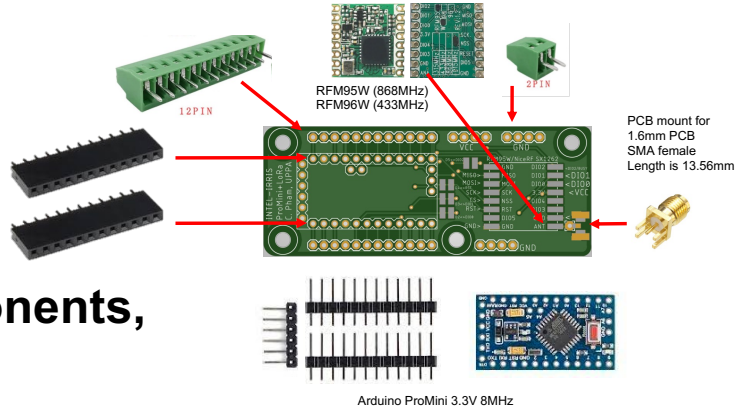
THE INTEL-IRRIS  
STARTER-KIT v3

**1 – the soil device**

# Low-cost design space

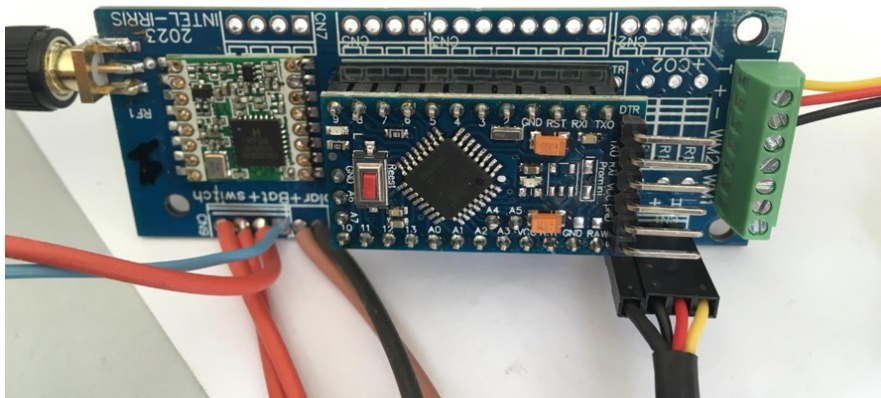
1

Simple design, off-the-shelves components, **100% DIY**



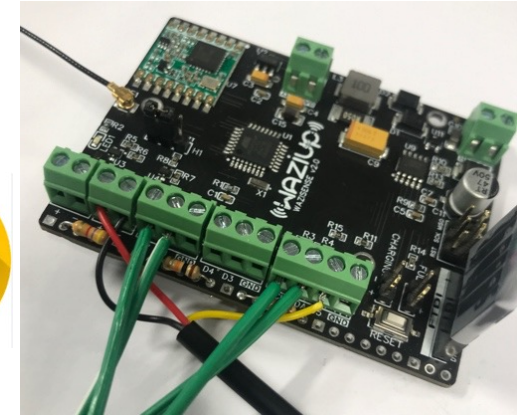
Simple design, off-the-shelves components, **low-cost support for solar panel, some components already soldered, mixed-DIY**

2



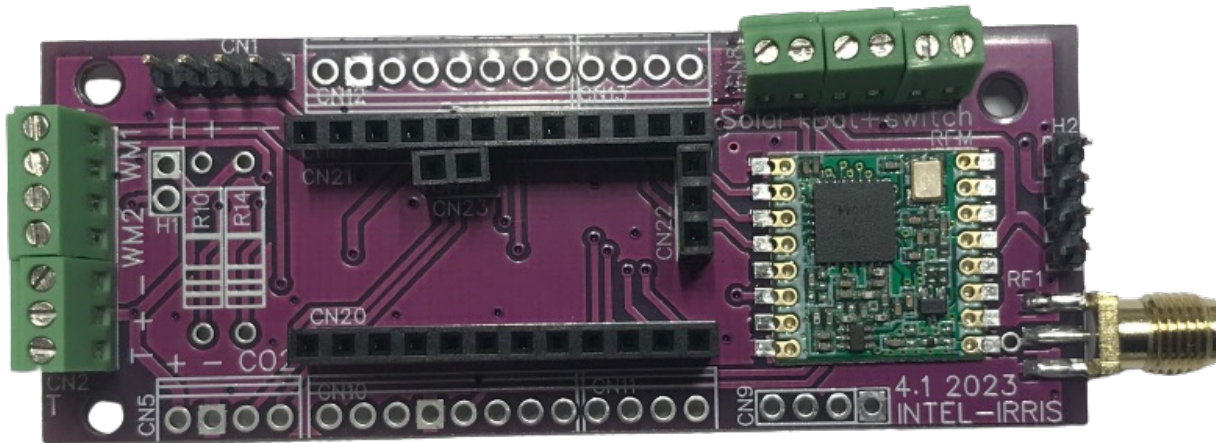
3

Integrated design, off-the-shelves components, **full support for solar panel, all components already soldered**



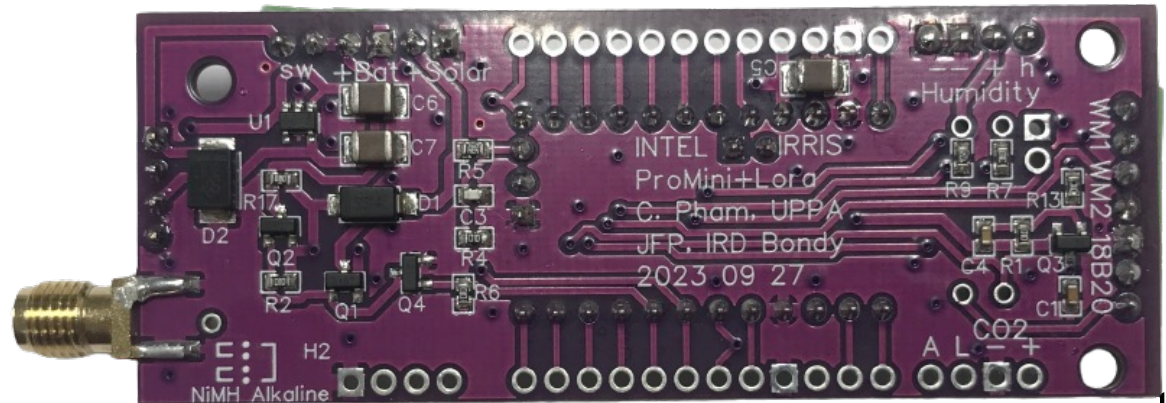
# The latest INTEL-IRRIS sensor board

- ⦿ The PCB is already fully assembled, including the resistors for the temperature and watermark sensors (on the back side)



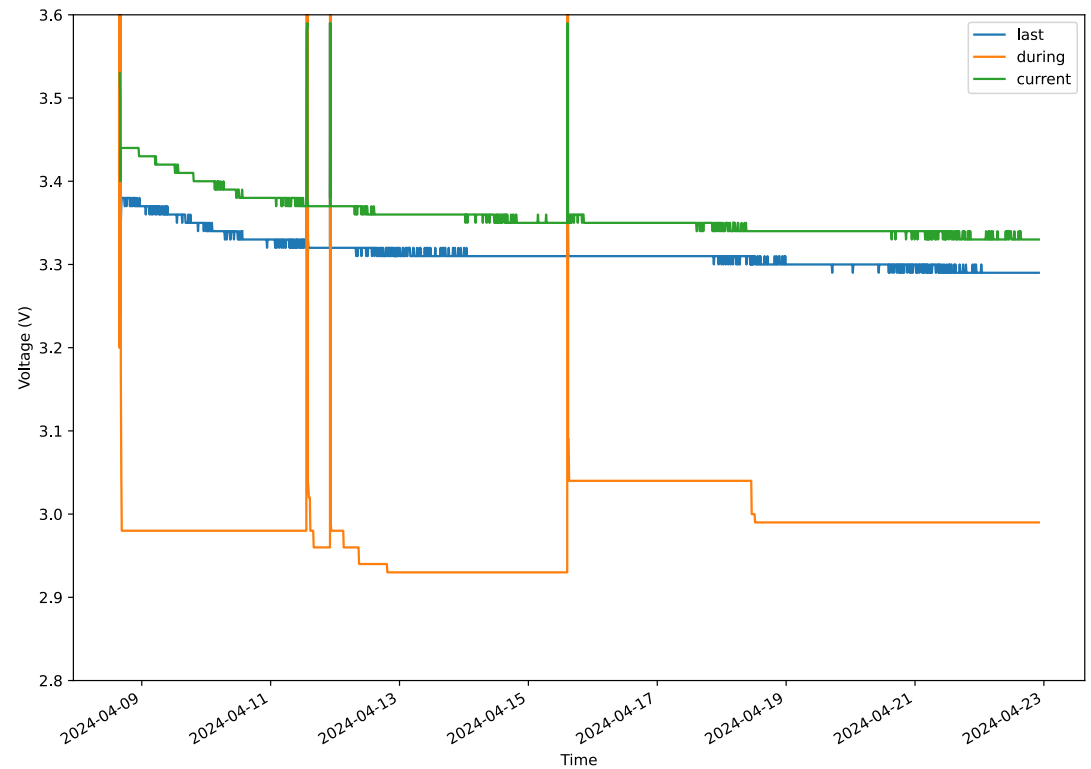
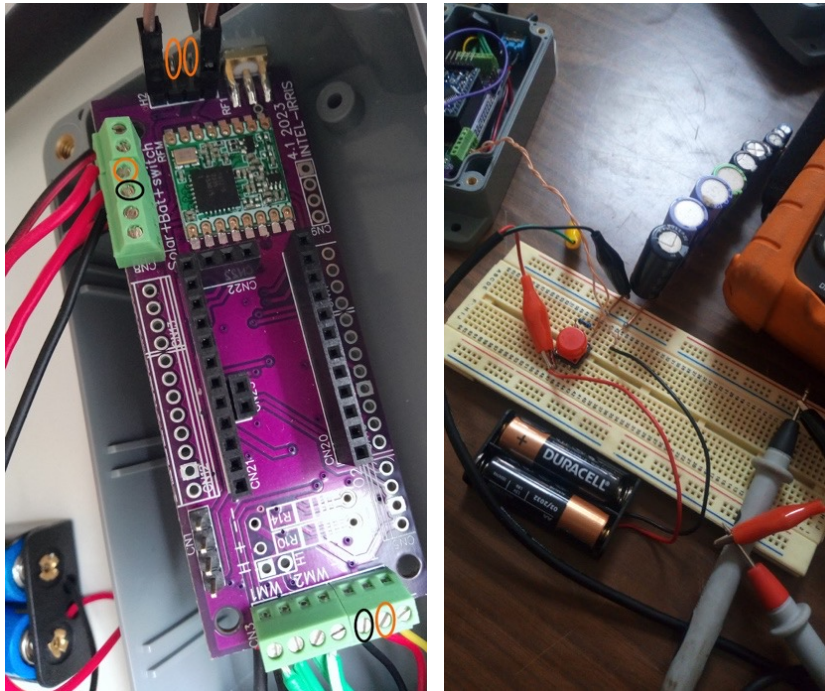
Radio module is already mounted, as well as connectors

Solar charging is available and the solar circuit is on the back side

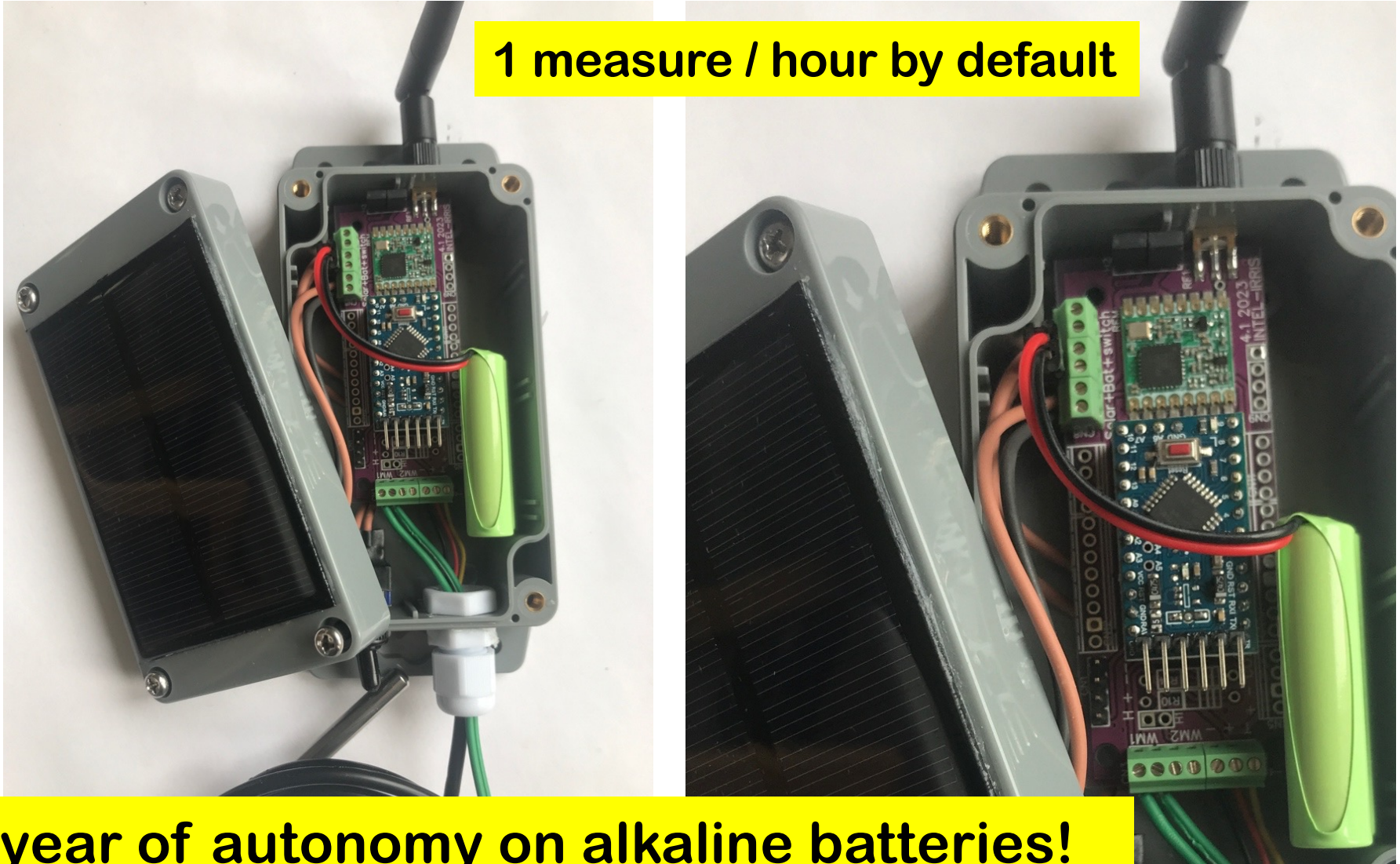


# Energy management

- ⦿ A lot of efforts have been devoted to carefully measure energy consumption and to optimize energy management



# The INTEL-IRRIS soil device



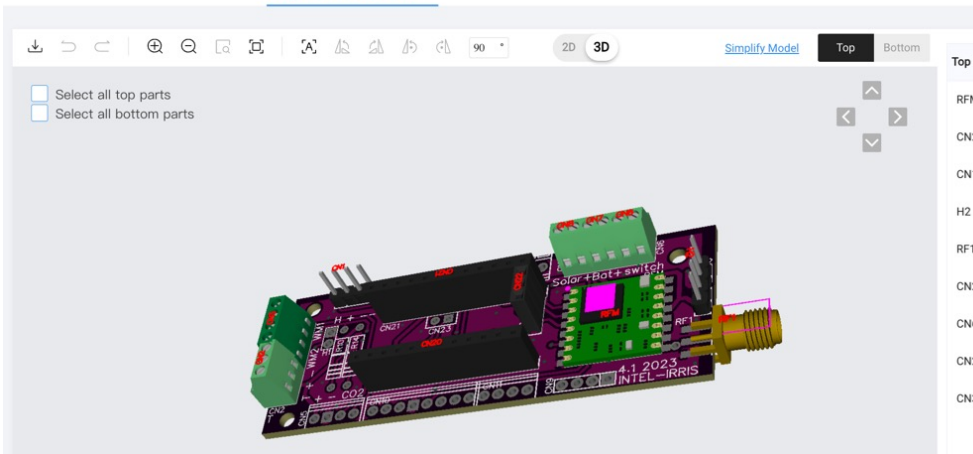


# Ordering the fully assembled PCB

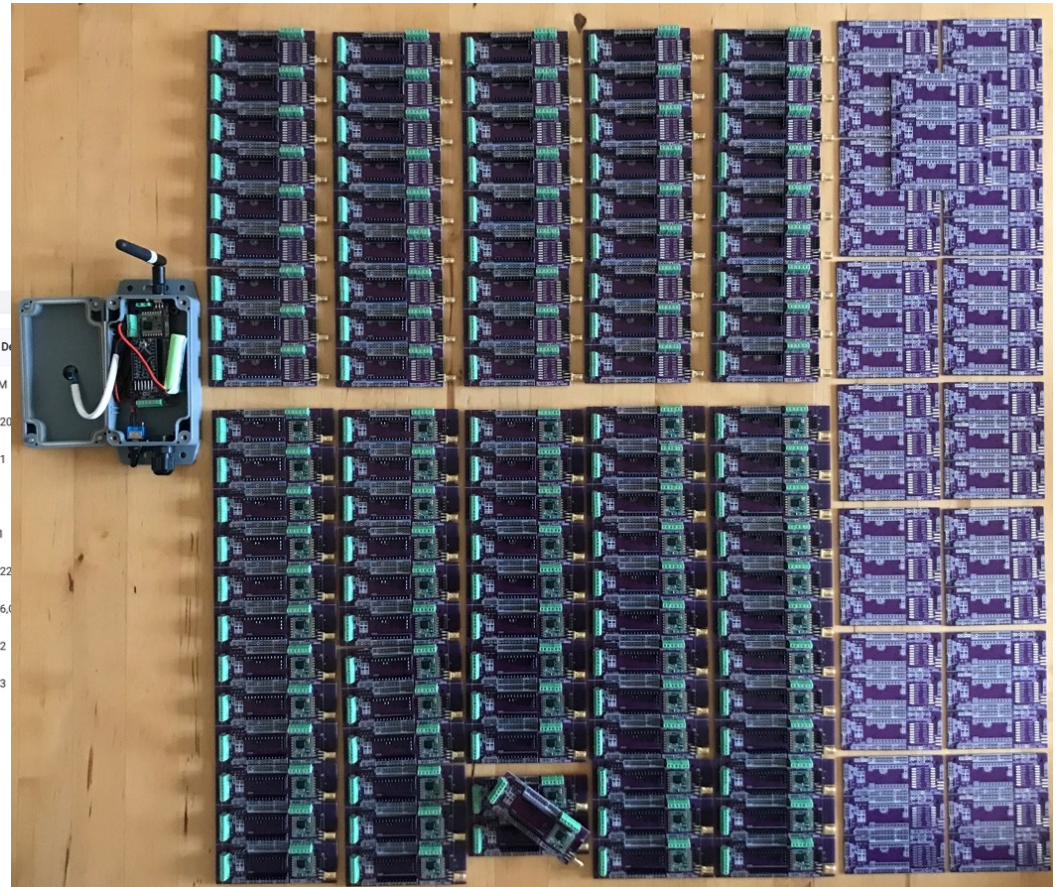
- Ordering the fully assembled PCB is very simple from PCB manufacturer
- Manufacturing files are freely available

Gerber\_PCB4\_1\_ISS\_2023\_09\_27

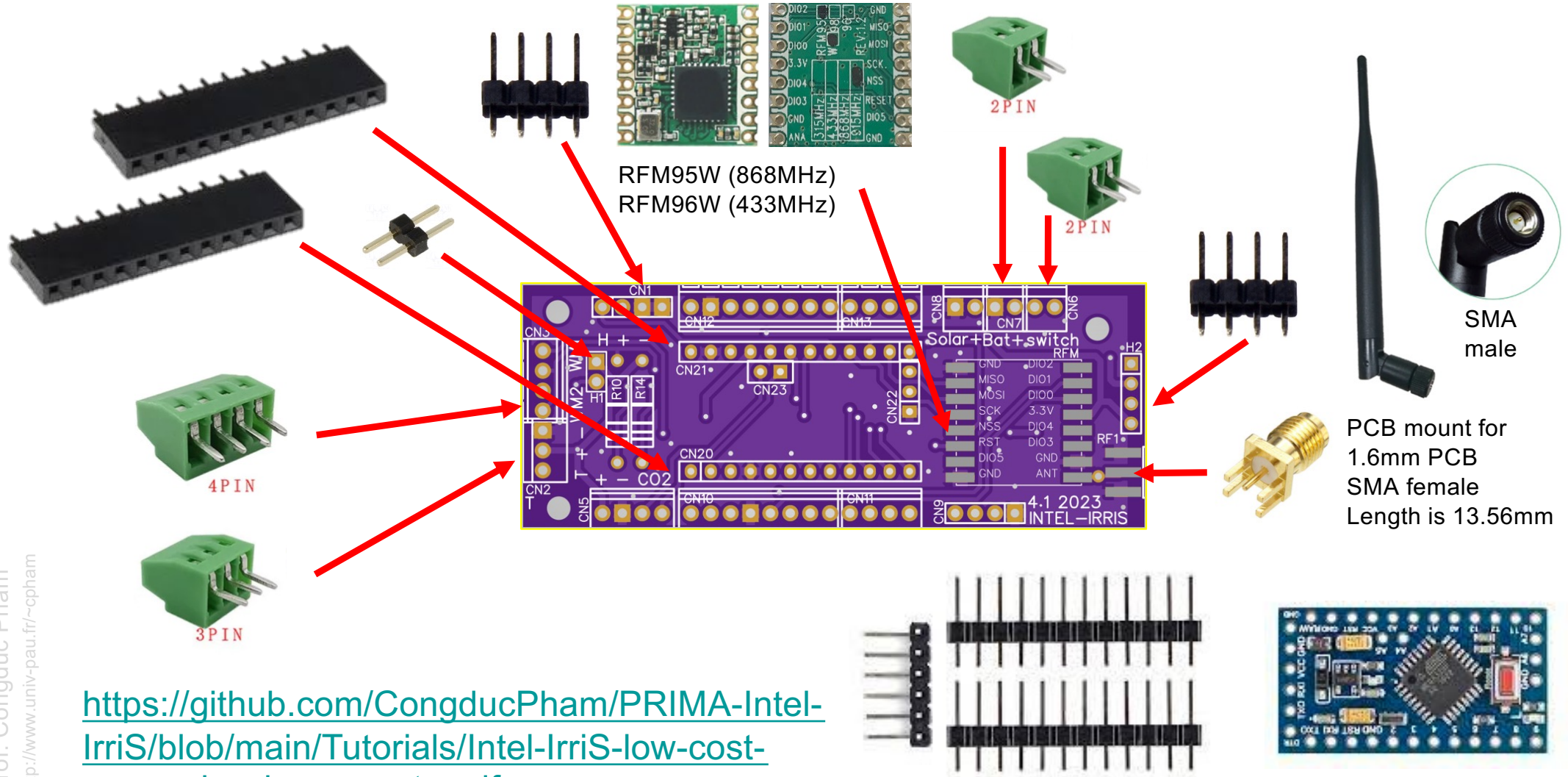
PCB Bill of Materials Component Placements Quote & Order



**~ 8€/piece if QT > 100**



# 100% DIY is still possible!

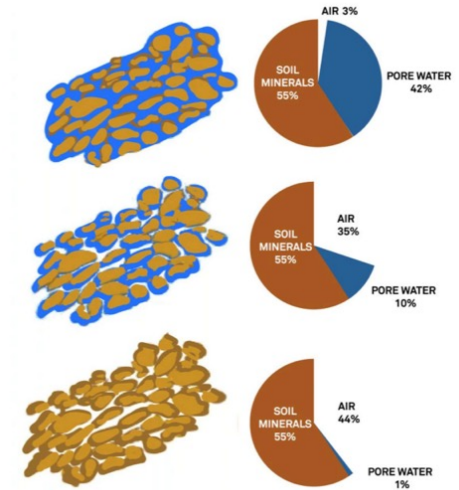
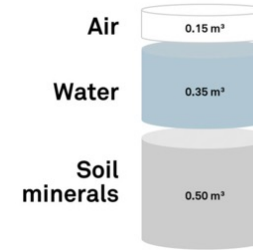


<https://github.com/CongducPham/PRIMA-Intel-IrriS/blob/main/Tutorials/Intel-IrriS-low-cost-sensor-hardware-parts.pdf>



# Capacitive sensor

- Capacitive soil moisture sensors usually measure volumetric water content
- Soil density & soil texture are important parameters



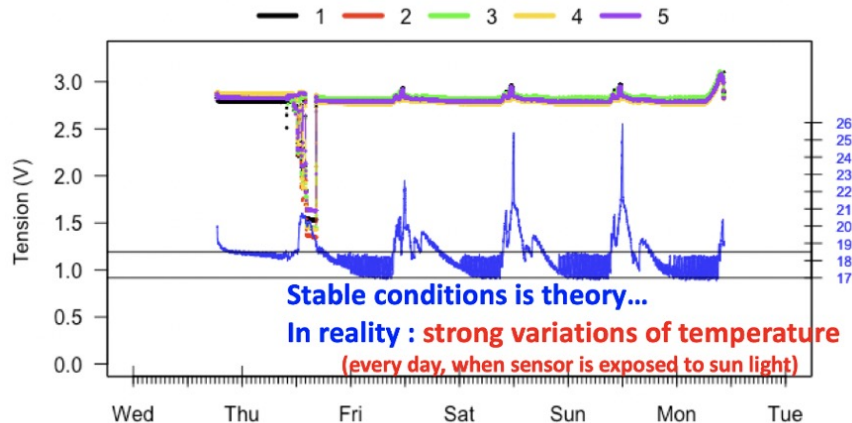
From METER group



Impact of temperature ?



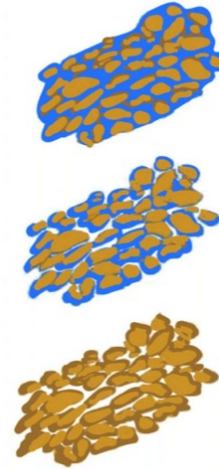
5 sensors are placed in a sand tank at constant water content



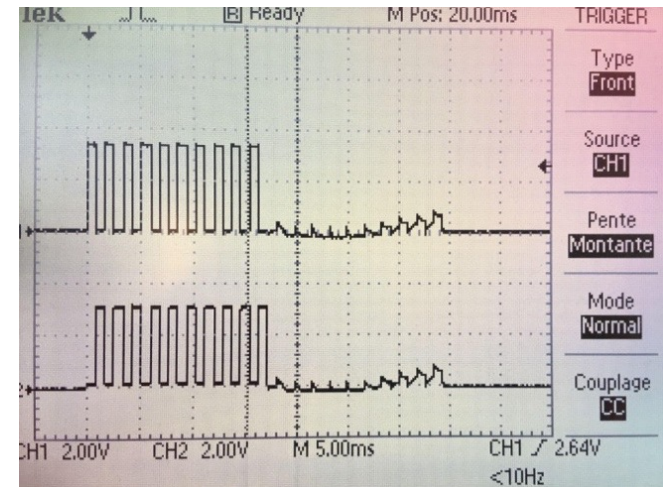
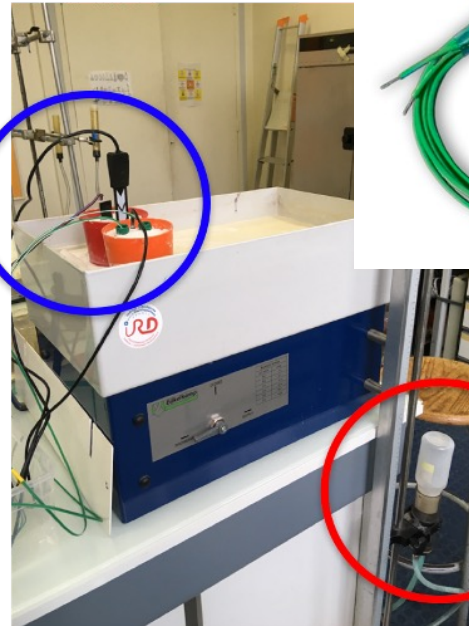
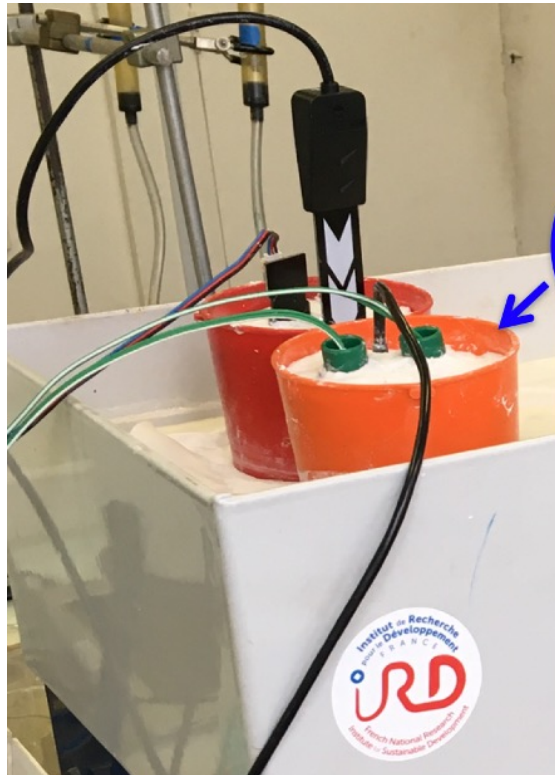
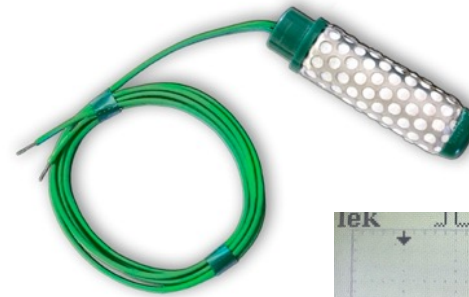
IRD in conducting extensive test on the accuracy and the stability of the low-cost SEN0308 capacitive sensor

# Water tension sensor

- Water tension sensor measures the amount of force required to extract water from soil's pores



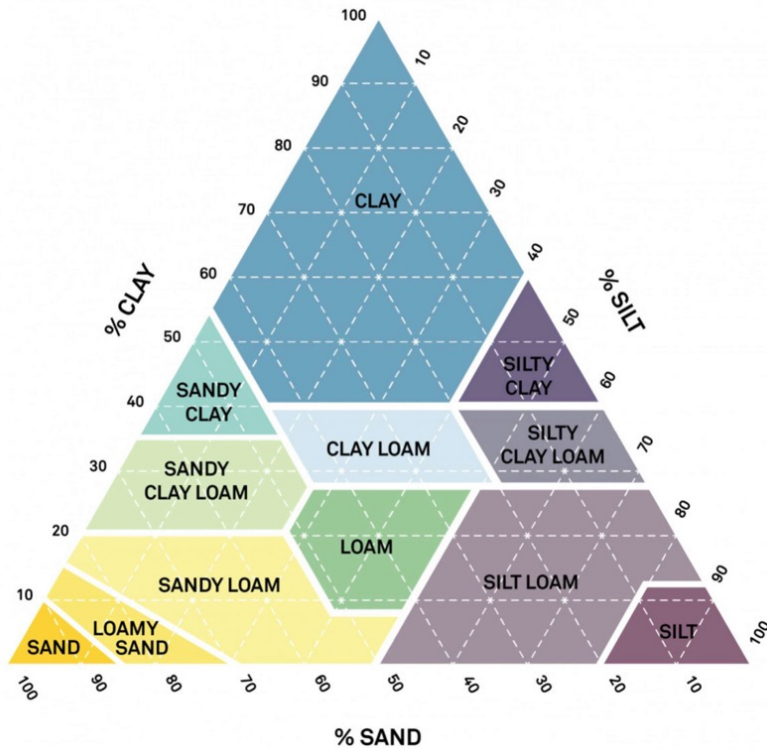
From METER group



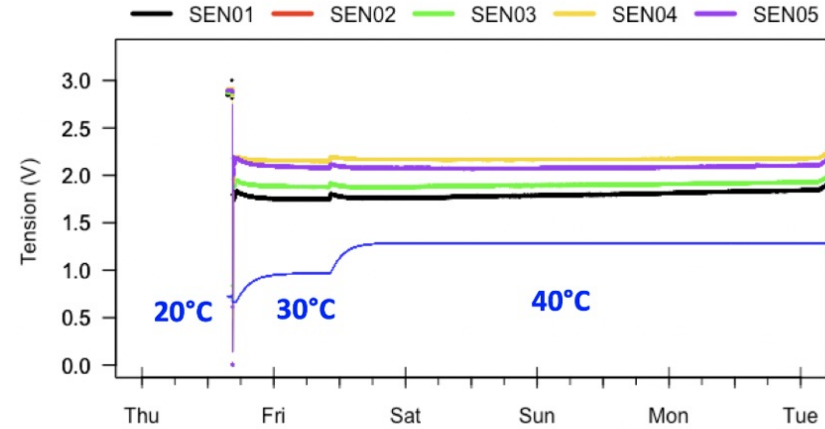
IRD in conducting extensive tests on the stability & suitability of microcontroller-based usage of the Watermark water tension sensor

# Calibration

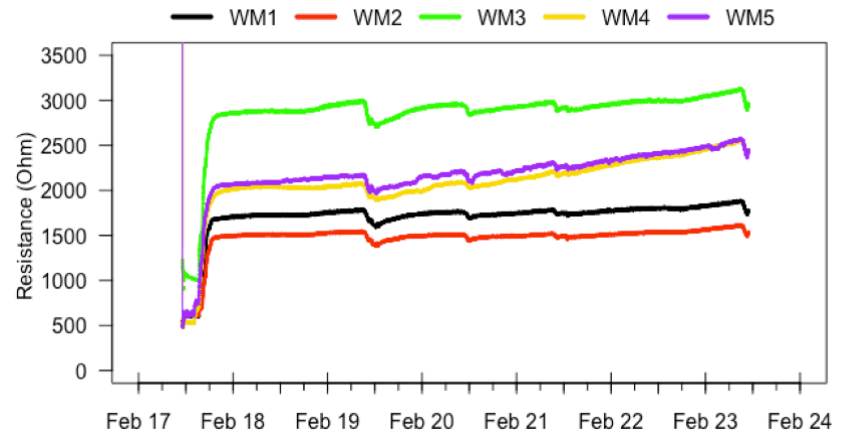
- Soil-specific calibration
- Impact of external "noise"



SEN 0308




Ambient air emperature has low impact, except...



# Tests in controlled environments





# INTEL-IRRIS

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

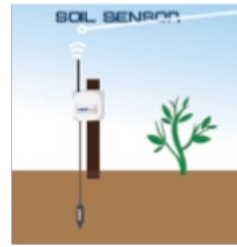
THE INTEL-IRRIS  
STARTER-KIT v3

2 – the IoT gateway

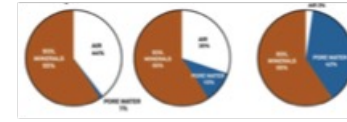
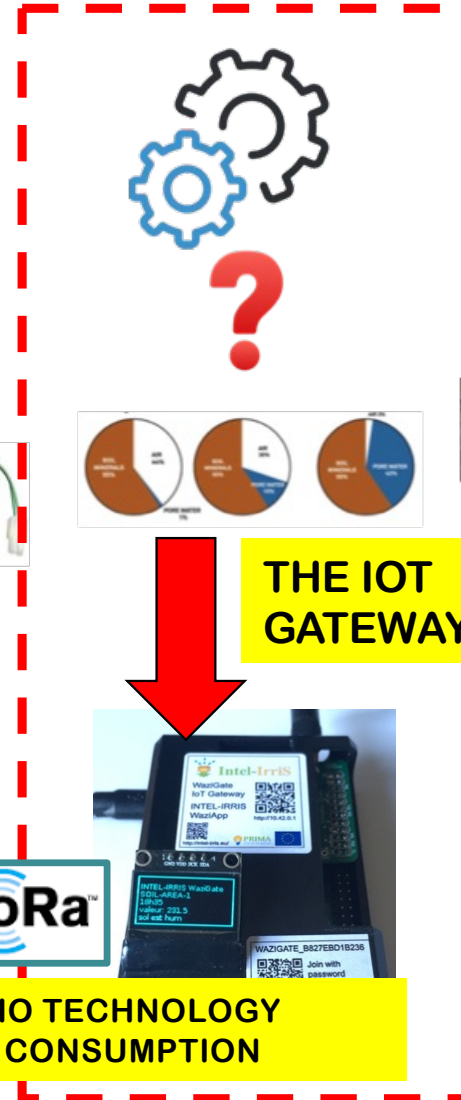
# Towards Plug-&-Sense



**NO INTERNET ☹️**



**LONG-RANGE RADIO TECHNOLOGY  
VERY LOW POWER CONSUMPTION**



**THE IOT GATEWAY**



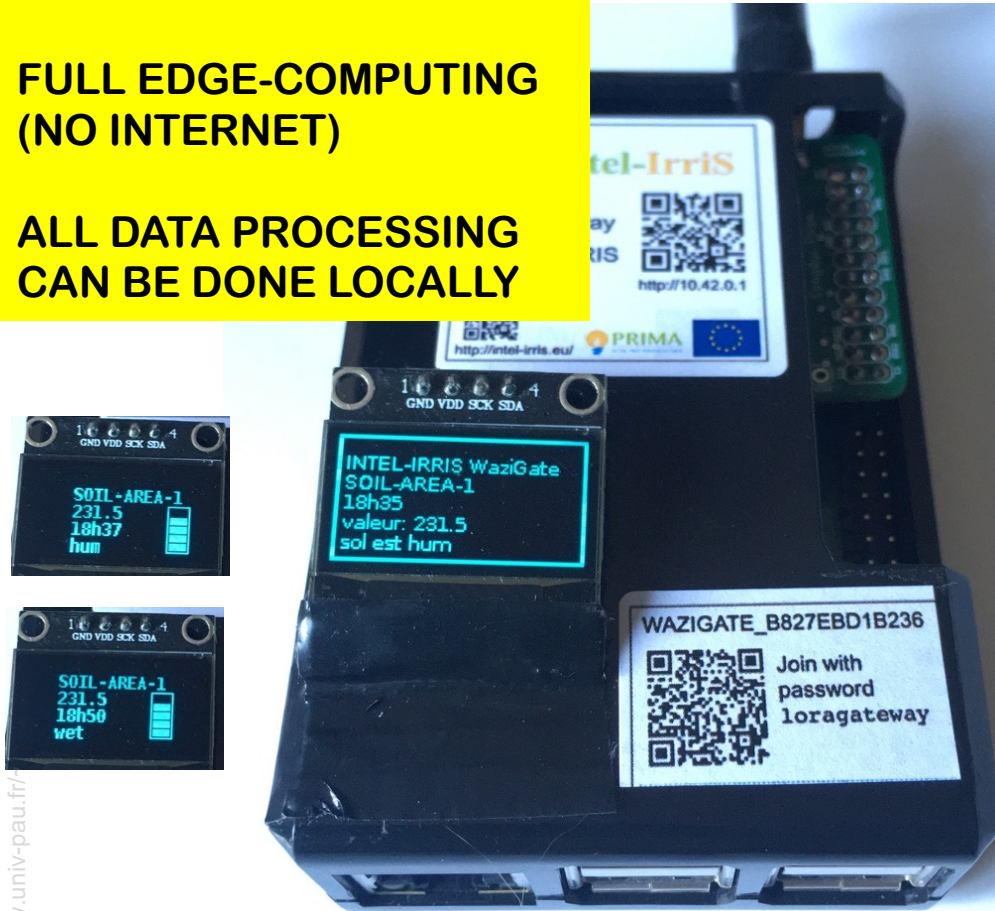


# Gateway: collect sensor data

## WAZIGATE GATEWAY

**FULL EDGE-COMPUTING  
(NO INTERNET)**

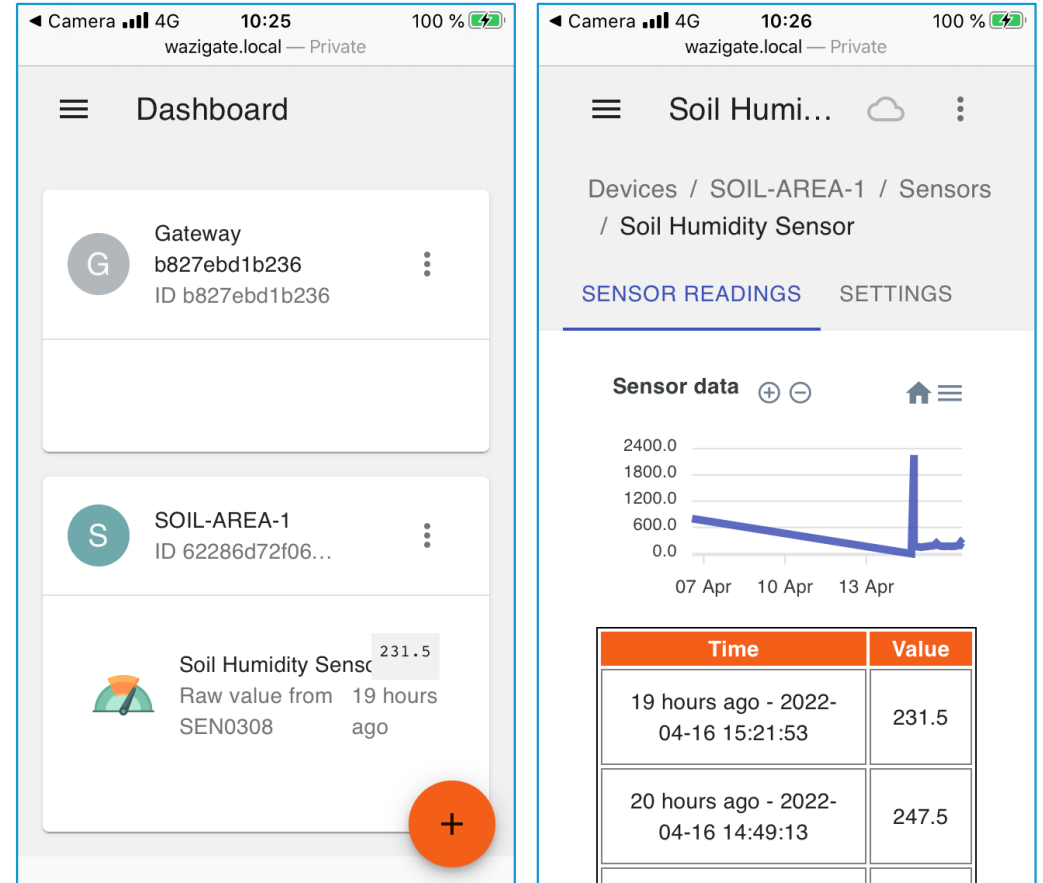
**ALL DATA PROCESSING  
CAN BE DONE LOCALLY**



**1 GATEWAY HANDLES  
SEVERAL DEVICES**

**< 50€**

## EMBEDDED WEB INTERFACE


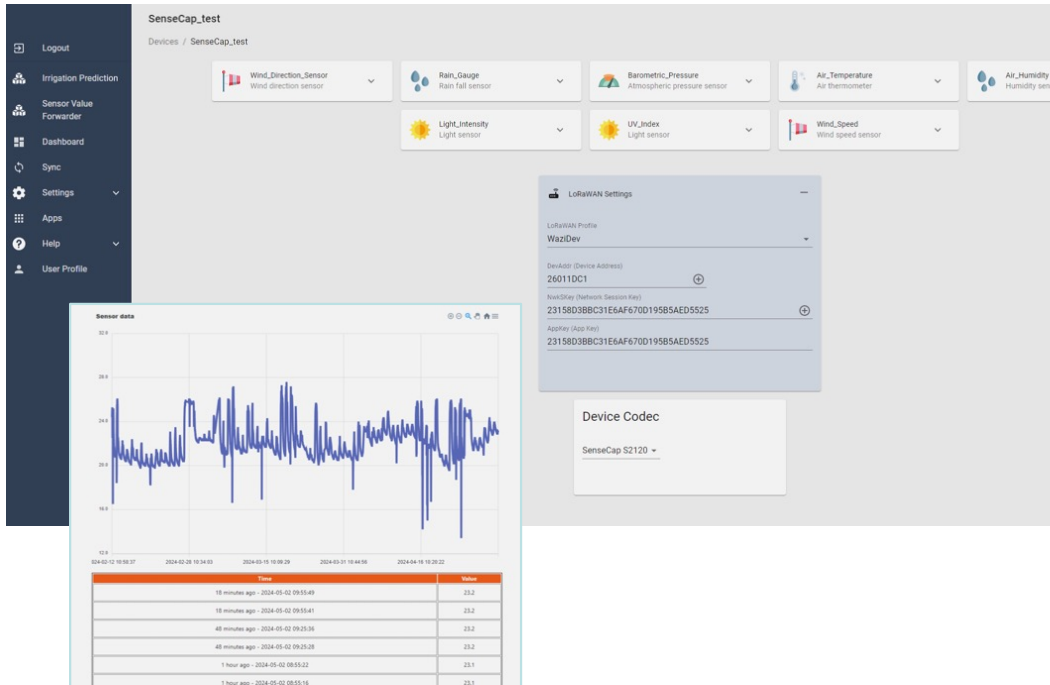


**EASILY ACCESSED FROM A SMARTPHONE**

# Integration of other sensors

- ⦿ The gateway dashboard can be extended to receive, decode and display data from third-party sensors
- ⦿ e.g. the SenseCAP S2120 8-in-1 LoRaWAN Weather Sensor

<https://github.com/Waziup/WaziGate-SenseCap-S2120-integration>

The dashboard shows the following configuration for the SenseCap S2120 sensor:

- Wind\_Direction\_Sensor (Wind direction sensor)
- Rain\_Gauge (Rain fall sensor)
- Barometric\_Pressure (Atmospheric pressure sensor)
- Air\_Temperature (Air thermometer)
- Air\_Humidity (Humidity sensor)
- Light\_Intensity (Light sensor)
- UV\_Index (Light sensor)
- Wind\_Speed (Wind speed sensor)

The dashboard also displays LoRaWAN settings for the device:

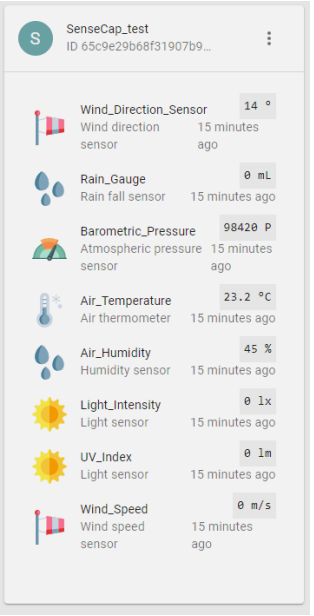
```

LoRaWAN Profile
WaziDev
DevAddr (Device Address)
26011DC1
NwkIDKey (Network Session Key)
23158D3BBC31E6AF670D195B5AED5525
AppKey (App Key)
23158D3BBC31E6AF670D195B5AED5525
    
```

Device Codec: SenseCap S2120

The sensor data graph shows a fluctuating signal over time, with a table below it:

Time	Value
18 minutes ago - 2024-05-02 09:55:49	23.2
18 minutes ago - 2024-05-02 09:55:41	23.2
48 minutes ago - 2024-05-02 09:25:36	23.2
48 minutes ago - 2024-05-02 09:25:28	23.2
1 hour ago - 2024-05-02 08:55:22	23.1
1 hour ago - 2024-05-02 08:55:16	23.1

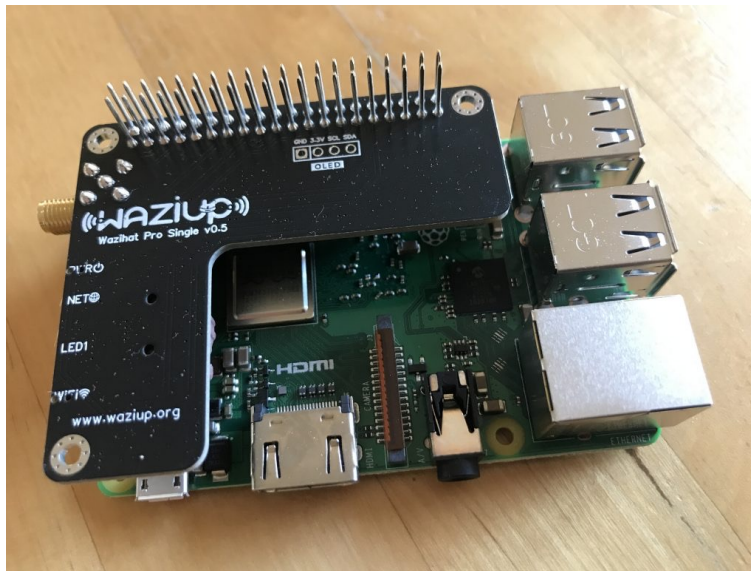


The dashboard also displays a list of sensor data for the SenseCap S2120 sensor (ID: 65c9e29b68f31907b9...):

- Wind\_Direction\_Sensor: 14 ° (Wind direction sensor, 15 minutes ago)
- Rain\_Gauge: 0 mL (Rain fall sensor, 15 minutes ago)
- Barometric\_Pressure: 98420 P (Atmospheric pressure sensor, 15 minutes ago)
- Air\_Temperature: 23.2 °C (Air thermometer, 15 minutes ago)
- Air\_Humidity: 45 % (Humidity sensor, 15 minutes ago)
- Light\_Intensity: 0 lx (Light sensor, 15 minutes ago)
- UV\_Index: 0 lm (Light sensor, 15 minutes ago)
- Wind\_Speed: 0 m/s (Wind speed sensor, 15 minutes ago)

# The latest gateway version

- ⦿ New LoRa radio hat
  - ⦿ With embedded Real Time Clock for full edge-mode operation
  - ⦿ On-board OLED connectors
  - ⦿ LED indicator for Internet connectivity
- ⦿ New casing with open-source 3D design



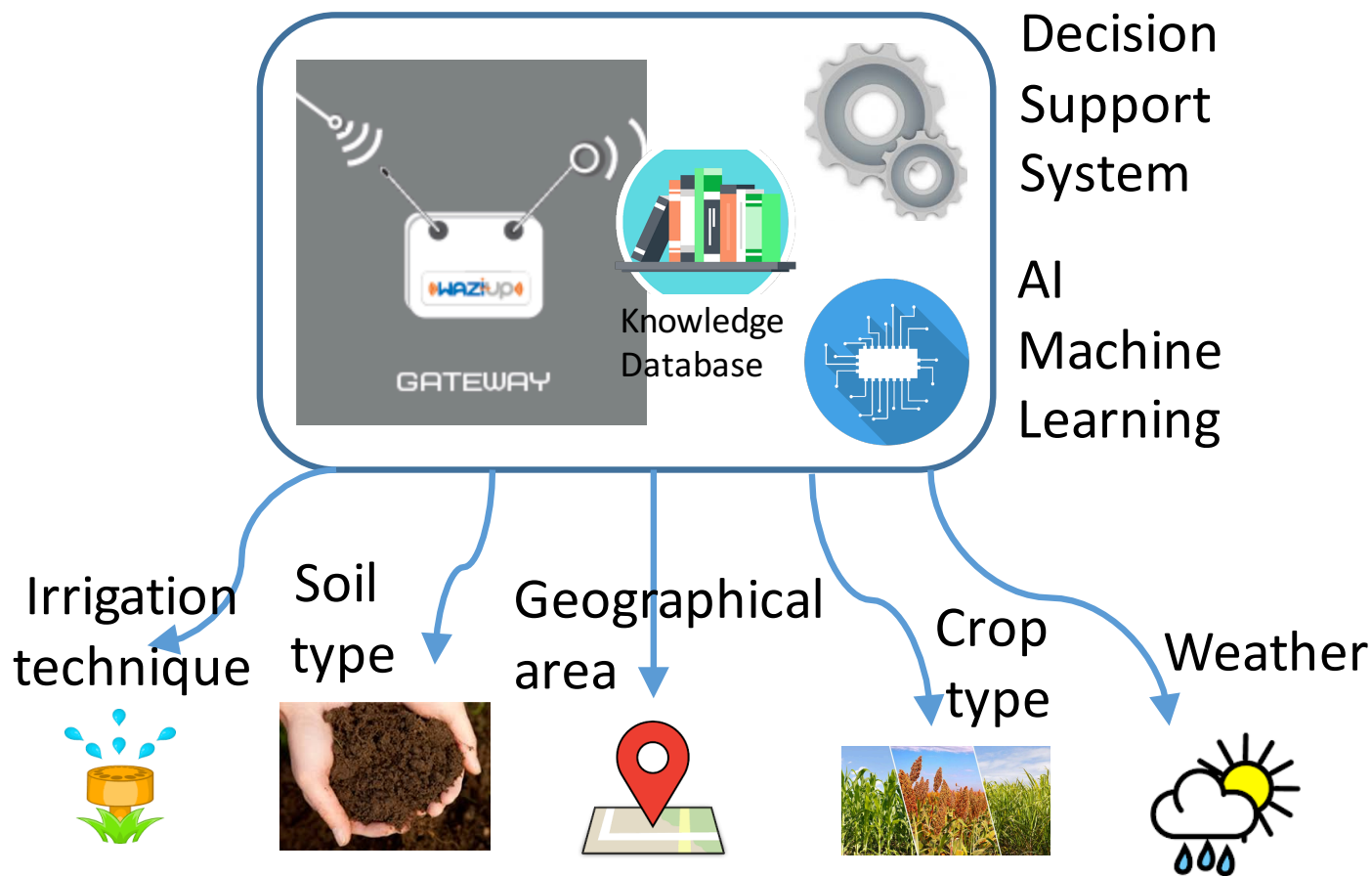
A young green plant with several leaves is growing in a field. In the foreground, a black irrigation pipe is visible, with a small droplet of water on its surface. The background is a blurred field of similar plants and soil.

# INTEL-IRRIS

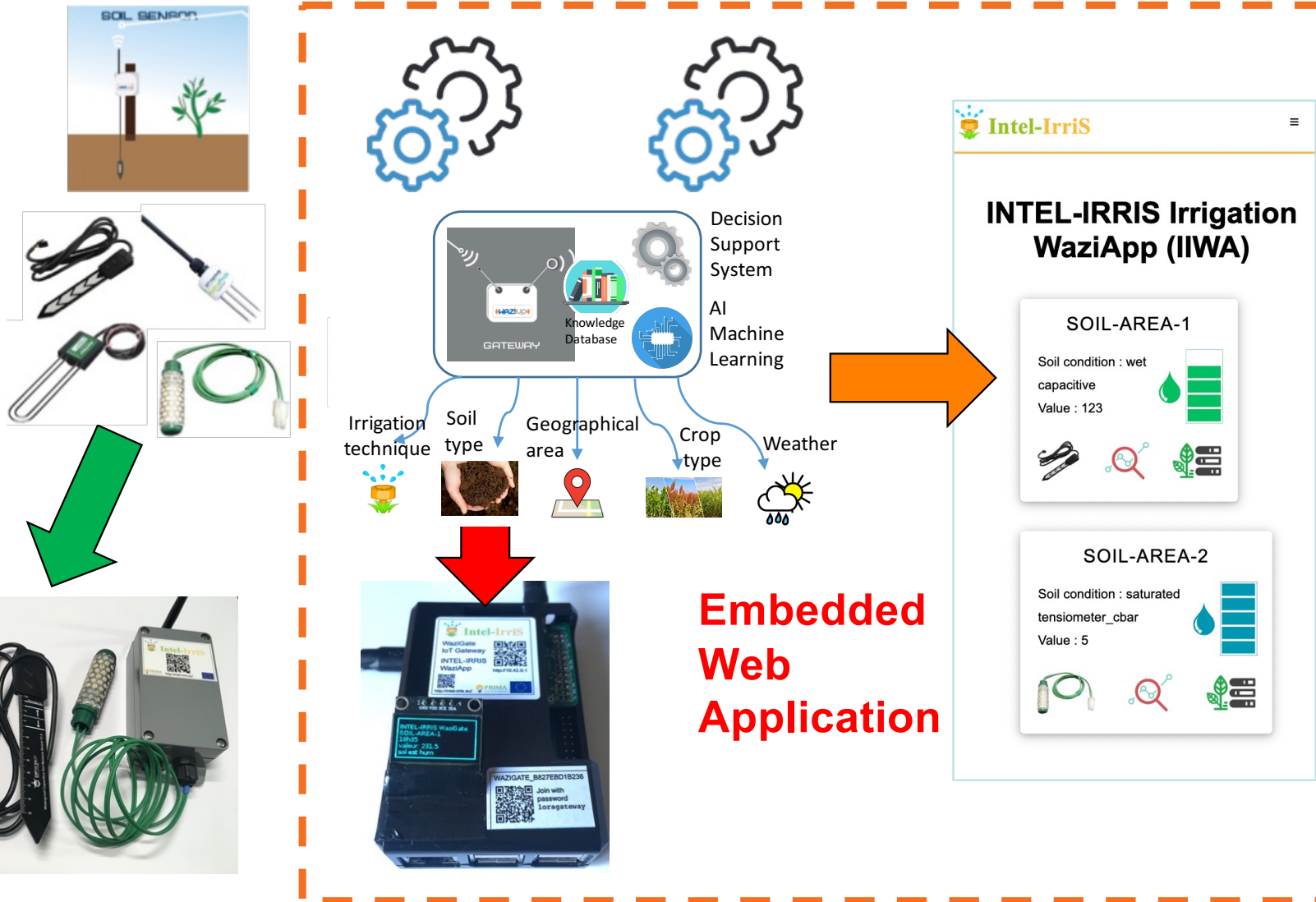
Intelligent Irrigation System for Low-cost Autonomous Water Control  
in Small-scale Agriculture

**MAKE IT SMARTER?**

# Added value: embedded intelligence!



# INTEL-IRRIS: add intelligence



# IIWA advanced parameters



Basic

**Moisture sensor parameters**

Sensor Type

- Capacitive
- Tensiometer (cbar)
- Tensiometer (raw)

**Soil parameters**

**Plant parameters**

Basic

**Moisture sensor parameters**

**Soil parameters**

Soil Type

Soil Irrigation Type

- Submersion
- Furrow
- Sprinkler
- Drip
- Subirrigation

Basic

**Moisture sensor parameters**

**Plant parameters**

Plant type

Planting Date

Basic

**Moisture sensor parameters**

**Weather parameters**

Region



Advanced

**Moisture sensor parameters**

Sensor age

Maximum sensor value

Minimum sensor value

**Soil parameters**

Advanced

**Moisture sensor parameters**

**Soil parameters**

Soil Salinity

Soil Bulk Density

Soil Field Capacity

Advanced

**Moisture sensor parameters**

**Plant parameters**

Plant category

Plant Variety

Advanced

**Moisture sensor parameters**

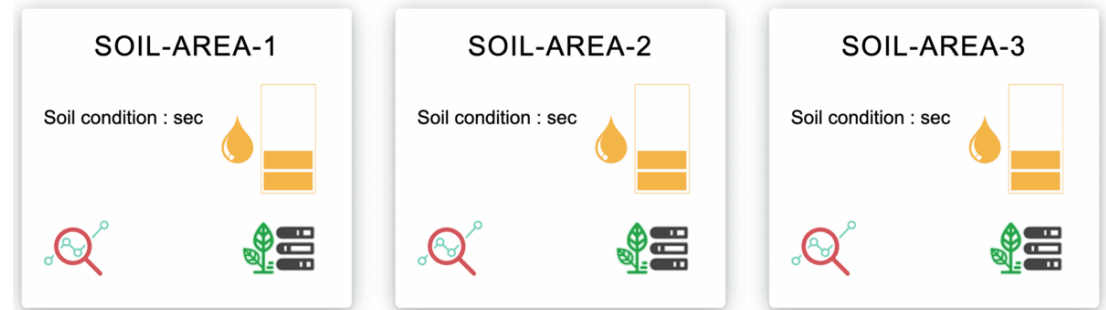
**Weather parameters**

Weekly evaporation (in mm)

Weekly pluviometry (in mm)

# First IIWA demo at Mostaganem event

- March 7th, 2023
- Real-time demo of soil sensor + IIWA



<https://intel-irris.eu/presentation-of-intel-irris-starter-kit-for-smallholder-farmers-in-mostaganem-algerie>



NEW! Arabic language is supported in IIWA!

**INTEL-IRRIS Irrigation WaziApp (IIWA)**

**SOIL-AREA-1**

Soil condition : wet  
capacitive  
Value : 123

**SOIL-AREA-2**

Soil condition : saturated  
tensiometer\_cbar  
Value : 5

**IIWA Device Manager**

WaziGate devices added to IIWA

DEVICE ID	DEVICE NAME	SENSORS
6638d61d...	SOIL-ARE...	1 capacitive
6638d61fc...	SOIL-ARE...	1 watermark

Add a WaziGate device to IIWA

Select a device by name | ▾

Sensor(s) Structure | ▾

**WaziApp INTEL- (IIWA) ربي ال IRRIS**

**SOIL-AREA-1**

حالة التربة: رطب  
سعي أو يعمل بالسعة  
123 : قيمة

**SOIL-AREA-2**

حالة التربة: ممتلئ  
قياس القوتر-cbar  
5 : قيمة

**مسير جهاز للتطبيق IIWA**

أجهزة WaziGate المضافة إلى التطبيق IIWA

رقم تعريف الجهاز	إسم الجهاز	أجهزة الإستشعار
...c9acf949d	...IL-AREA-1	capacitive 1
...c9acf94a2	...IL-AREA-2	watermark 1

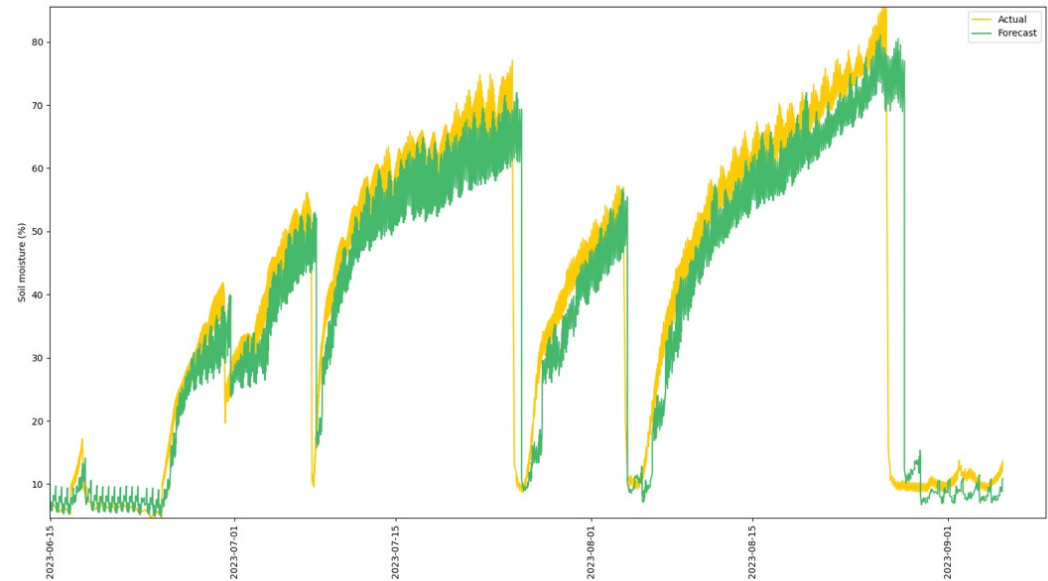
أضف جهاز WaziGate إلى التطبيق IIWA

حدد الجهاز حسب الإسم | ▾

بنية جهاز أو أجهزة الإستشعار | ▾

# Embedded AI forecast

- The INTEL-IRRIS gateway can embed advanced AI processing on real-time sensor data
- **Current techniques:** sliding windows pre-treatment and LSTM Neural Networks (Long Short-Term Memory)





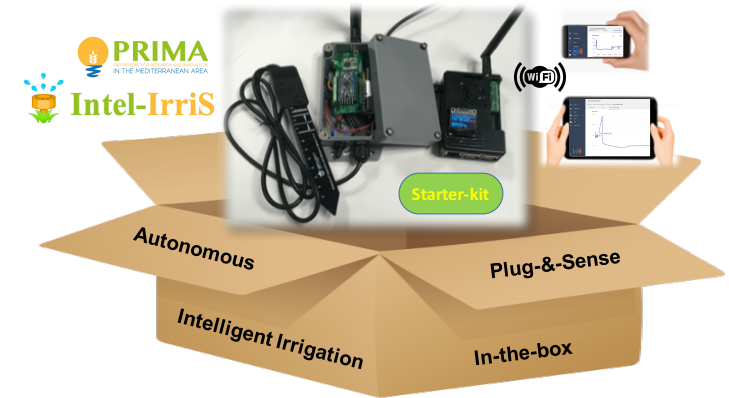
# INTEL-IRRIS

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

## PILOTING WITH FARMERS & USERS

# Smallholder Piloting Program

- ⦿ Participatory approach to co-design & test the innovative solutions in fields
- ⦿ Benefit from smallholders' expertise to improve efficiency of the irrigation system
- ⦿ Take into account region-dependent technical, agricultural, social, climatic and environmental aspects
- ⦿ Will run for 24 months to ensure that the proposed irrigation systems are well tailored for the specificities of the regional context



# Piloting farms, visits, deployment, ... Intel-IrriS





**FEEDBACK AND RESULTS FROM**

**SMALLHOLDER PILOTING PROGRAM**

→ next presentation



A young green plant with several leaves is growing in a field. In the foreground, a black irrigation pipe runs horizontally across the frame. The ground is covered with small, light-colored rocks or mulch. The background is a blurred field of similar plants.

# INTEL-IRRIS

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

**CAPACITY-BUILDING  
& TRAINING**

# Tutorial materials

INTELLIGENT IRRIGATION SYSTEM  
FOR LOW-COST AUTONOMOUS  
WATER CONTROL  
IN SMALL-SCALE AGRICULTURE



Building the Intel-IrriS LoRa IoT platform  
Part 1: soil sensor device



INTELLIGENT IRRIGATION SYSTEM  
FOR LOW-COST AUTONOMOUS  
WATER CONTROL  
IN SMALL-SCALE AGRICULTURE



Building the Intel-IrriS LoRa IoT platform  
Part 2: edge-enabled gateway (WaziGate)



INTELLIGENT IRRIGATION SYSTEM  
FOR LOW-COST AUTONOMOUS  
WATER CONTROL  
IN SMALL-SCALE AGRICULTURE



Building the Intel-IrriS IoT platform  
Annex-1: ordering PCBs



INTELLIGENT IRRIGATION SYSTEM  
FOR LOW-COST AUTONOMOUS  
WATER CONTROL  
IN SMALL-SCALE AGRICULTURE



Building the Intel-IrriS LoRa IoT platform  
Part 3: the INTEL-IRRIS starter-kit



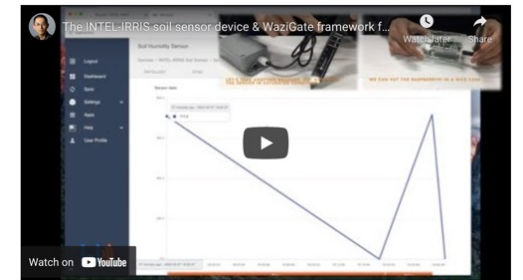
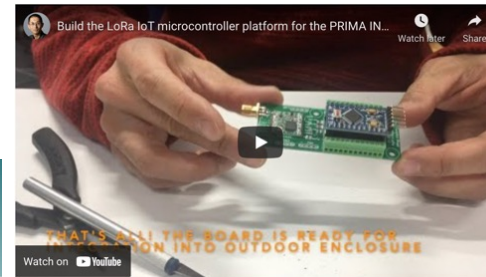
Irrigation : concepts et état des lieux



Présenté par : **Dr. BOUZZAMA Bassou**  
Chercheur et Ingénieur en Génie Rural  
[Bassou.bouzzama@irra.ma](mailto:Bassou.bouzzama@irra.ma)

Webinaire (1<sup>ère</sup> édition)  
**Irrigation : concepts et état des lieux**  
Intel-IrriS

**L'eau dans le sol et les contraintes de l'irrigation**  
Pr BENKHELIFA Mohammed (UMAB)



LES CAPTEURS FAIBLE COÛT POUR MESURER L'EAU DANS LE SOL: CONTRAINTES, LIMITATIONS ET PERSPECTIVES



**Dr. Christian Hartmann**  
**M. Jean-François Printanier**  
M. Mamadou Gueye  
M. Lotfi Smaili



INTEL-IRRIS's interview video presenting the project and ben...  
Barriers to IoT Solutions  
• Technology Cost  
• Internet Challenges  
• Vendor Lock  
• Complexity of Deployed Solutions  
**Intel-IrriS and Edge-Computing Technologies**

**Intel-IrriS**  
Technologies de capteurs de mesure de l'humidité du sol pour le pilotage de l'irrigation:  
**Principe de fonctionnement, Calibrations et Performances**  
EL Aissaoui Abdellah (Ing. PhD)  
Institut National de La Recherche Agronomique  
Centre Régional de La Recherche Agronomique de Serrat  
Laboratoire des Agroéquipements et Energie  
30 Mars 2022

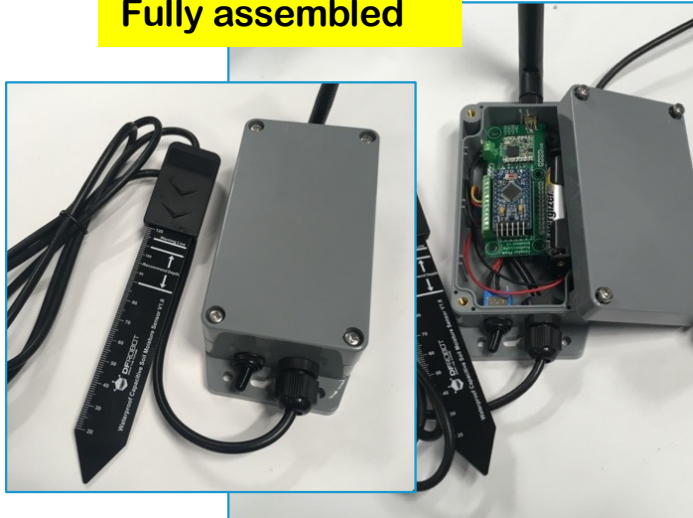


# Training & capacity-building sessions

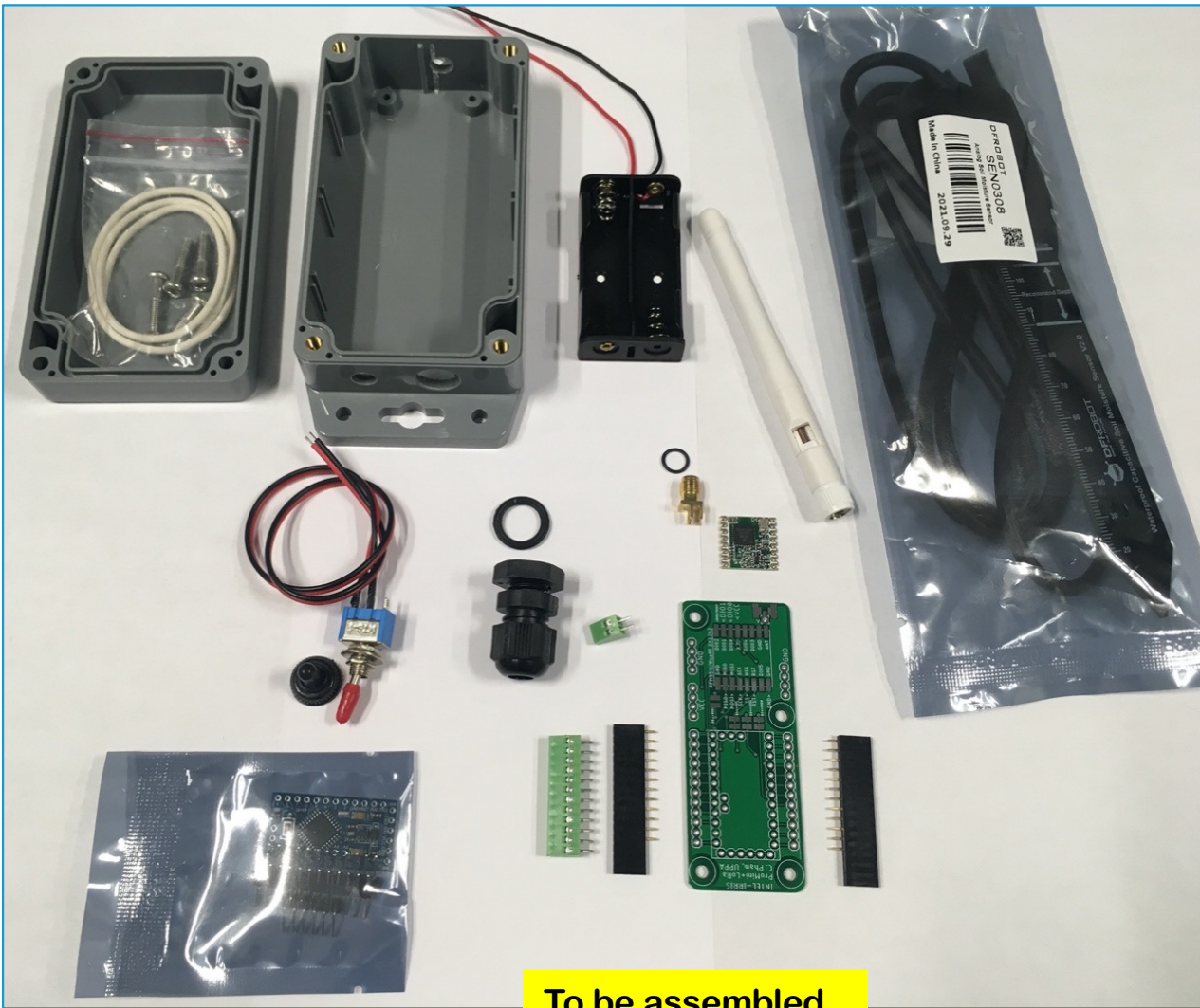


# Starter-kit...in kit!

Fully assembled



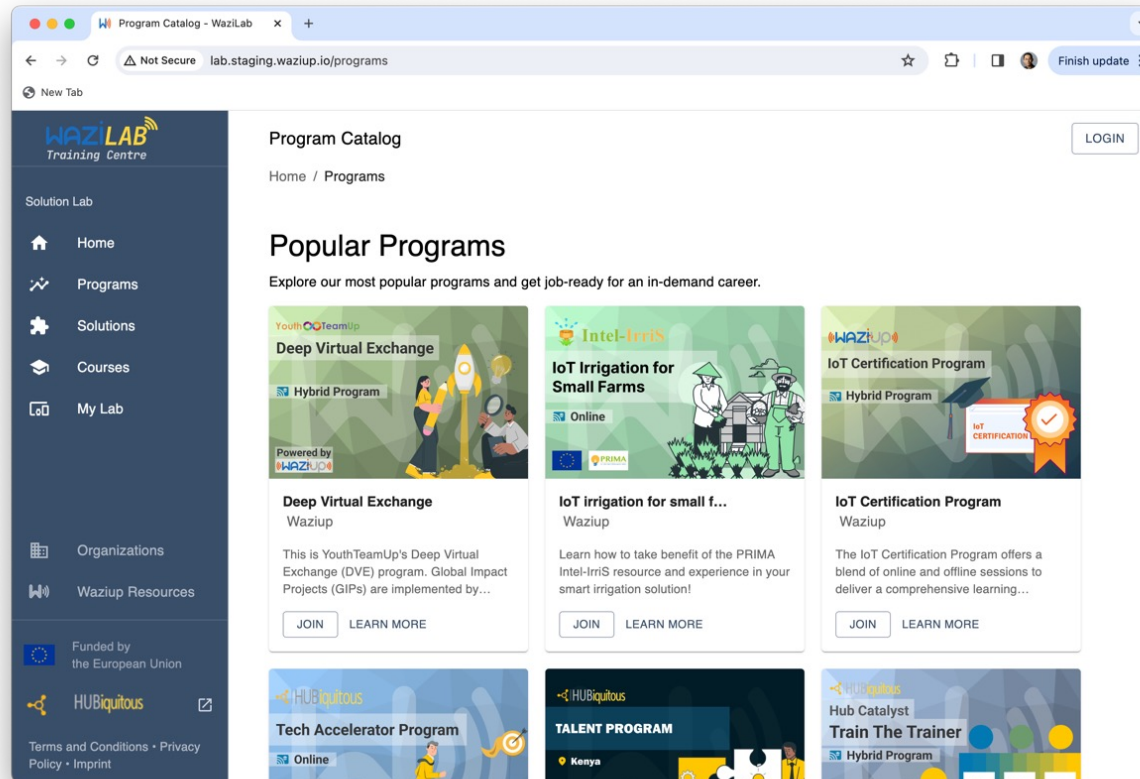
Packaging in enclosure



To be assembled

# Capacity-building program

- Integrated into the WaziLab Training Center platform  
→ testing phase: <http://lab.staging.waziup.io/programs>



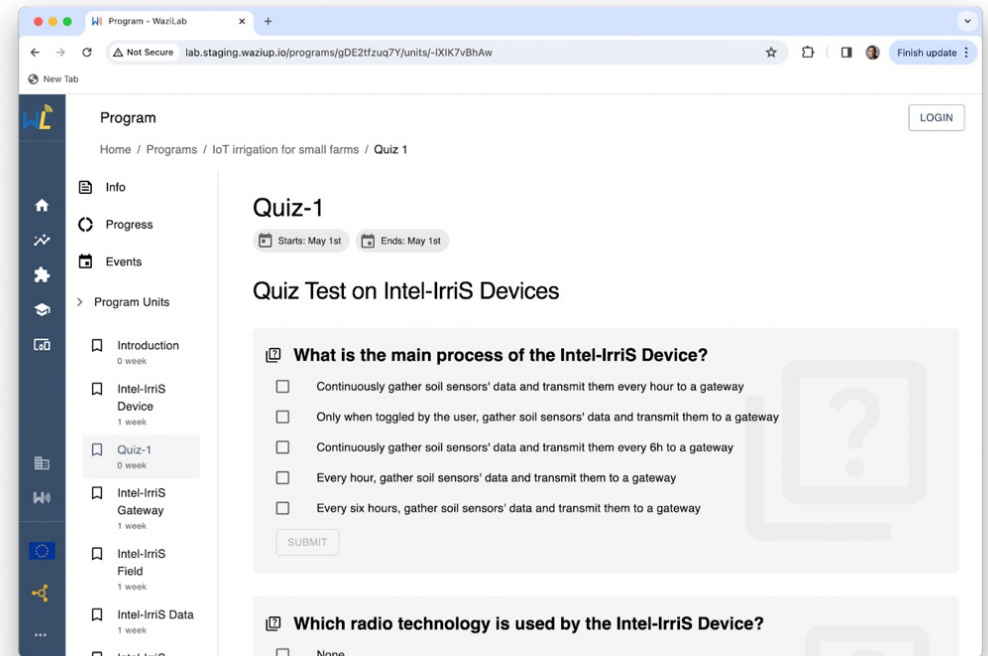
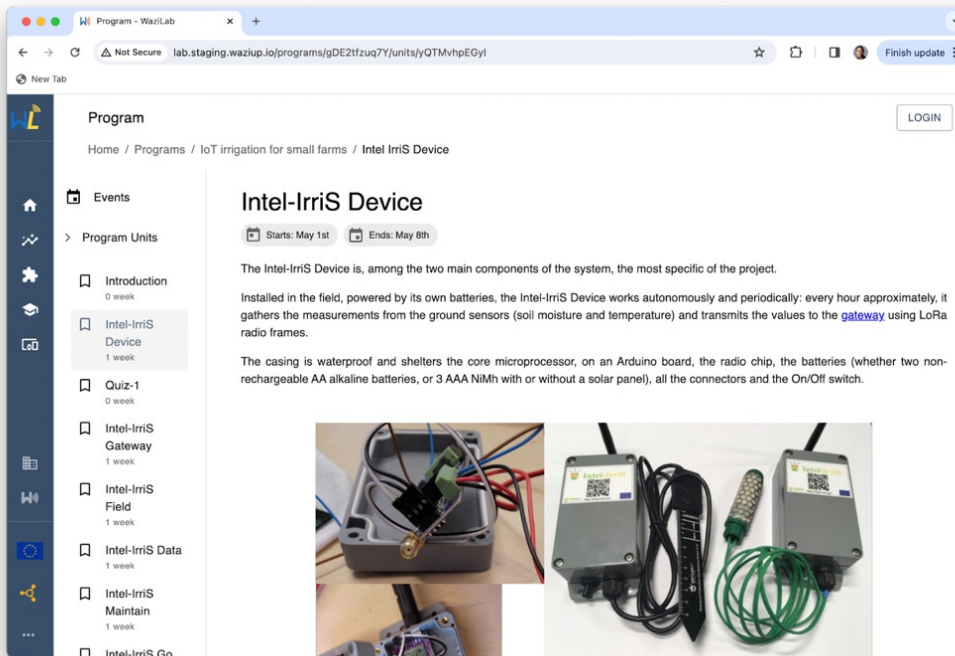
The screenshot shows a web browser window displaying the 'Program Catalog' page on the WaziLab Training Center platform. The page features a dark blue sidebar with navigation options: Home, Programs, Solutions, Courses, My Lab, Organizations, and Waziup Resources. The main content area is titled 'Program Catalog' and 'Popular Programs'. It lists several programs, including 'Deep Virtual Exchange', 'IoT Irrigation for Small Farms', 'IoT Certification Program', 'Tech Accelerator Program', and 'Talent Program'. Each program card includes a brief description, a 'JOIN' button, and a 'LEARN MORE' button. The 'IoT Irrigation for Small Farms' program is highlighted with a green background and features an illustration of two farmers in a field.



This is a detailed view of the 'IoT Irrigation for Small Farms' program card. It features the Intel-IrriS logo at the top, followed by the program title 'IoT Irrigation for Small Farms' and an 'Online' badge. Below the title is an illustration of two farmers in a field. The card also includes the logos of the European Union and PRIMA. The text below the illustration reads: 'IoT irrigation for small f... Waziup'. A description follows: 'Learn how to take benefit of the PRIMA Intel-IrriS resource and experience in your smart irrigation solution!'. At the bottom, there are 'JOIN' and 'LEARN MORE' buttons.

# Learn & validate competencies

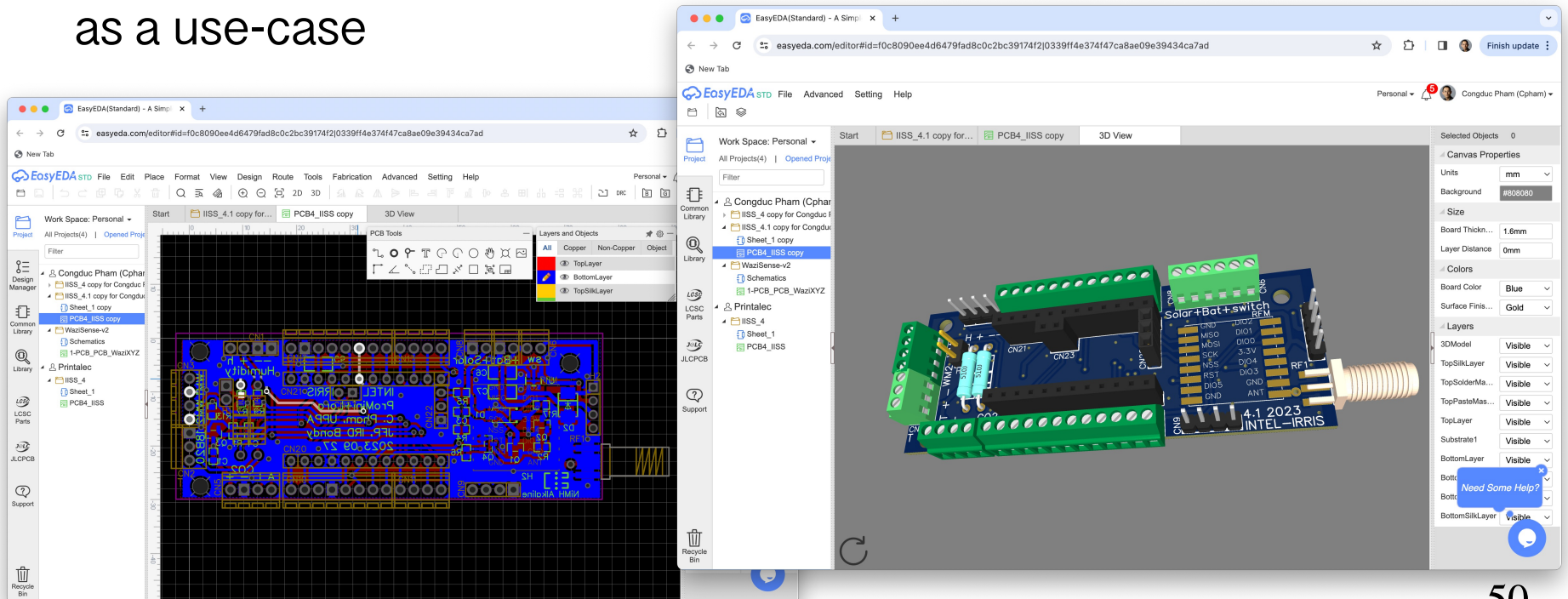
🕒 At your own pace!



# Capacity-building in PCB design

- ⦿ A workshop will take place on May 14-15, 2024 in Oran, animated by J.-F. Printanier from IRD
- ⦿ The INTEL-IRRIS PCB will serve as a use-case

**Workshop on Electronic and Starter kit Assembly for the INTEL-IRRIS project**  
**(Atelier sur l'assemblage de kits électroniques: application aux kits de démarrage pour le projet INTEL-IRRIS)**  
**Le 14 et 15 mai 2024**  
**Organisé par le Laboratoire en Informatique Industrielle et Réseaux (RIIR)**  
**Université d'ORAN1, ALGERIE**  
**Lieu : Salle de réunion - Auditorium du Campus Taleb. Mourad**



A young green plant with several leaves is growing in a field. In the foreground, a black drip irrigation pipe is visible, with a small droplet of water on its surface. The background is a blurred field of similar plants and soil.

# INTEL-IRRIS

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

## DISSEMINATION & PARTNERSHIPS

# Dissemination & partnerships

- for testing/using starter-kit
- scientific collaborations

- ⦿ **Collaboration with PRIMA projects:** WATERMED 4.0, OurMED, NatMED, MED-WET, DROMAMED, ReCROP
- ⦿ **"spin-off" projects:** S2IEA PNR Algeria
- ⦿ **Collaboration with research organizations/institution:** INDICATIC AIP Panama, IICA Panama, iEES Paris, NECTEC Thailand, U. Laos Vientiane, CNRS GRDI CompactSol, U. Angers – IPPN network, U. Côte d'Azur – Satellite LoRa
- ⦿ **Collaboration with companies:** CALESA Panama, NTPC – Nam Theun 2 Laos, MounoyDev Laos, MakerBox Laos, EGM France, Senseen France,
- ⦿ **Participation in project consortiums:** HE ZepoBox, HE NureBox, HE LEAAF, PRIMA S1 AgriMedWise, PRIMA S1 NexMed



- 🕒 <https://intel-irris.eu/publications>
- 🕒 2 journals, 4 international conferences

**INTEL-IRRIS**  
June 2021-2024

**A PRIMA 2020 project developing**

*Intelligent Irrigation Systems for Low-Cost Autonomous Water Control in Small-Scale Agriculture*

**Cutting-edge technologies Made simple for smallholders**

**Low-cost sensors**      **Edge-Computing**  
**Advanced calibration**      **Edge-IoT**

**Agricultural knowledge**      **Embedded AI**

**Smart Irrigation Application**      **Machine Learning**

**Deployment of starter-kits for the Smallholder Piloting Program**

PRIMA, Intel-Irris, and various partner logos are listed at the bottom.

**نظام ري ذكي - النموذج الإبتدائي-**

**PRIMA Intel-Irris**

إقرأ رمز الاستجابة السريعة (QR) لشبكة WiFi المعروض على شاشة WaziGate

يتم تسليمها مع بوابة واحدة ومستشعر سموي أو مقياس رطوبة التربة

لم إقرأ رمز الاستجابة السريعة (QR) الموجود على لوحة القيادة التي تعرض بيانات المصنع الأصلية لأجهزة الاستشعار

عرض آخر قيمة مستلمة وحالة رطوبة التربة

المحرك المزيد من الميزات مع تطبيق INTEL-IRRIS IRRIGATION WAZIGATE! الذي تم تشويحه على

**نظام ري ذكي - النموذج الإبتدائي-**

**PRIMA Intel-Irris**

عرض آخر قيمة تم رطوبة التربة

يتم تسليمها مع بوابة واحدة ومستشعر سموي أو مقياس رطوبة التربة

**تفسير القيم المقاسة وعرض أوضاع التربة**

255 : بدون جهاز استشعار

0 - 83	مُرْتَوِي	0 - 10
84 - 166	رطب	11 - 30
167 - 249	رطب	31 - 60
250 - 333	جاف	61 - 100
334 - 416	جاف	

نطاق الري المعتاد      نطاق الري المتعد

المزيد من الميزات مع تطبيق INTEL-IRRIS IRRIGATION WAZIGATE! الذي تم تشويحه على

المزيد من الميزات مع تطبيق INTEL-IRRIS IRRIGATION WAZIGATE! الذي تم تشويحه على

<https://www.irrometer.com/basics.html#using>

**المهتجة**

**للإتصال بنا**

www.intel-irris.eu  
@Intel\_Irris  
congduc.pham@univ-pau.fr

سيتطور مشروع INTEL-IRRIS أجهزة استشعار رطوبة التربة منخفضة التكلفة مع إجراء معايرة متطورة لزيادة دقة القياس. الأخذ في الحسبان العلاقة المعقدة بين الماء والتربة والنبات والتقسيم لتوسيع مواءمة التوصيات.

**Consortium**

PRIMA, Intel-Irris, and various partner logos are listed at the bottom.

**الأهداف INTEL-IRRIS**

توفير نظام تحكم أمثل للري بتكلفة منخفضة، متخفضة، وأنظمة اتخاذ القرار والذكاء الاصطناعي (AI). "EDGE" يسمح باستخدام تقنية من نوع "EDGE" للمعالجة الكمية وإمكانية الحصول على مجموعة بوابات - مستشعر مستقلة تمامًا وقادرة على العمل حتى بدون الربط بالإنترنت.

تقديم التعاون والتبادل بين المتعلمين وتعزيز الابتكار على المستوى المحلي.

يقترح نظامًا جاهزًا للاستخدام باستخدام أجهزة (IoT) وتقنيات متقدمة جدًا مثل إنترنت الأشياء (AI). "EDGE" يسمح باستخدام تقنية من نوع "EDGE" للمعالجة الكمية وإمكانية الحصول على مجموعة بوابات - مستشعر مستقلة تمامًا وقادرة على العمل حتى بدون الربط بالإنترنت.

توفير تكامل مصادر البيانات المتعددة والنظر فيها سيجعل من الممكن تكيف التوصيات على أفضل وجه مع الظروف والممارسات المحلية، وأنواع المحاصيل ومراحل تطورها المختلفة.

**INTELLIGENT IRRIGATION SYSTEM FOR LOW-COST AUTONOMOUS WATER CONTROL IN SMALL-SCALE AGRICULTURE**

PRIMA, Intel-Irris, and various partner logos are listed at the bottom.



# Open-source, GitHub

- ⦿ All PCB resources & all software

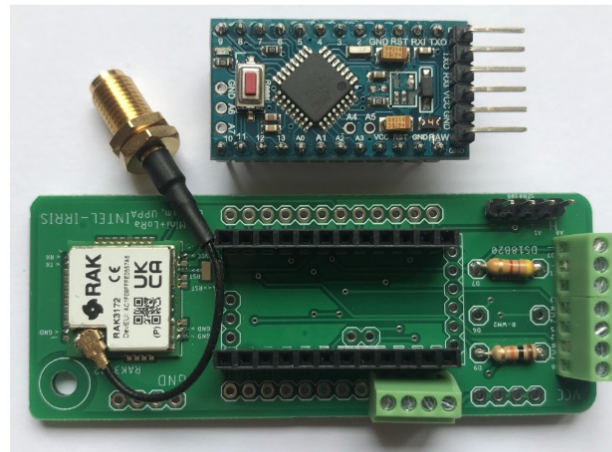
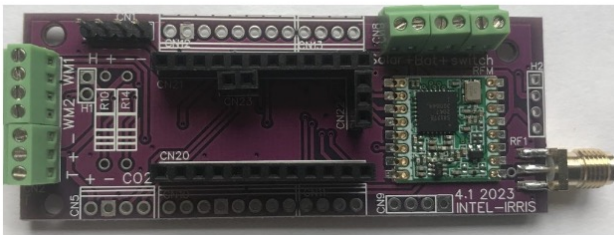


[INTEL-IRRIS GitHub](#)

this is where all the source code, the Gerber files for the PCBs and all the tutorials slides can be found to build your own INTEL-IRRIS platform!

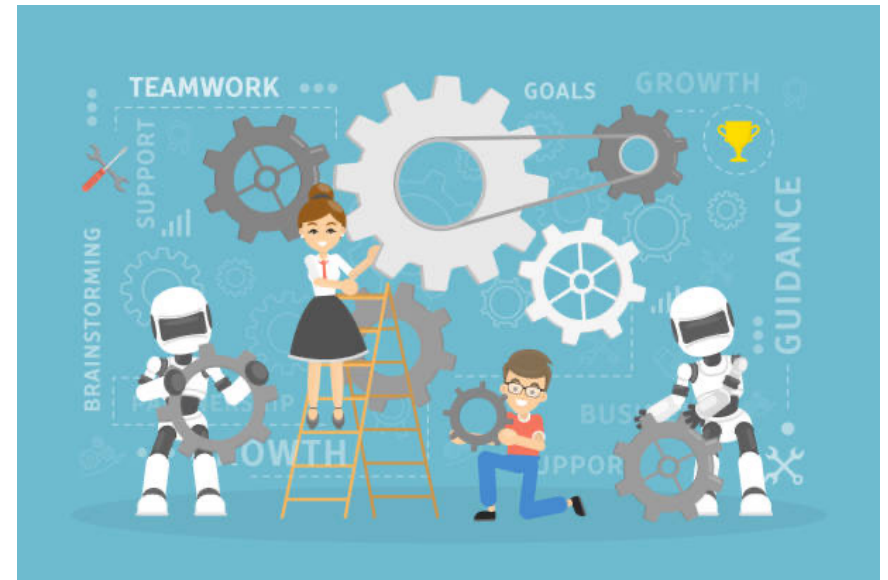
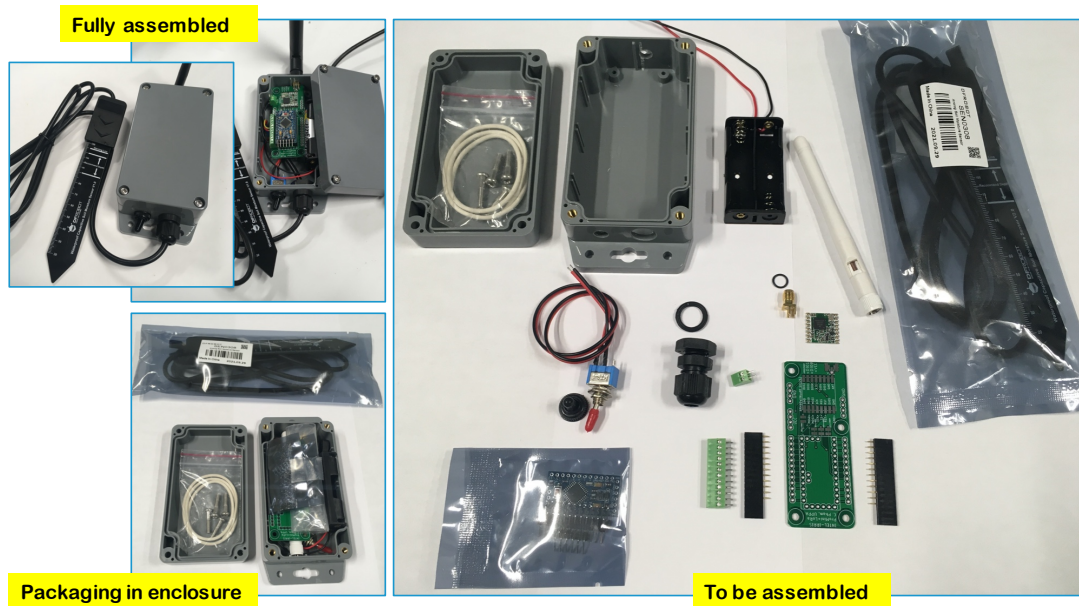


**INTEL-IRRIS GITHUB**



# INTEL-IRRIS's SolutionLab

- Provide access to technologies developed by INTEL-IRRIS  
SolutionLab = FabLab + INTEL-IRRIS's technologies
- Hardware + all software frameworks
- Learn, Prototype, Develop, Improve, Innovate & Tests



# IT IS A TEAM WORK!



**AUA:**  
Agricultural  
University of  
Athens



T. Bartzanas  
D. Giannopoulos  
G. Chatzipavlidis  
A. Giakoumatos  
S. Fountas

**ENSA-Safi:**  
National School  
of Applied  
Sciences – Safi



K. Baraka  
O. Chabouni

**INRA:** National  
Institute of  
Agronomic  
Research



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A. El Assaoui  
A. Harkani  
Y. Bouchiar  
A. El Mghari  
H. Lionbui

**IRD:** Institute  
for Research &  
Development



C. Hartmann  
J-F Printanier

**UMAB:**  
University A.  
Benbadis



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S. Nemmiche  
L. Kradia  
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A. Toiti  
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## ORAN & MOSTAGANEM (ALGERIA)

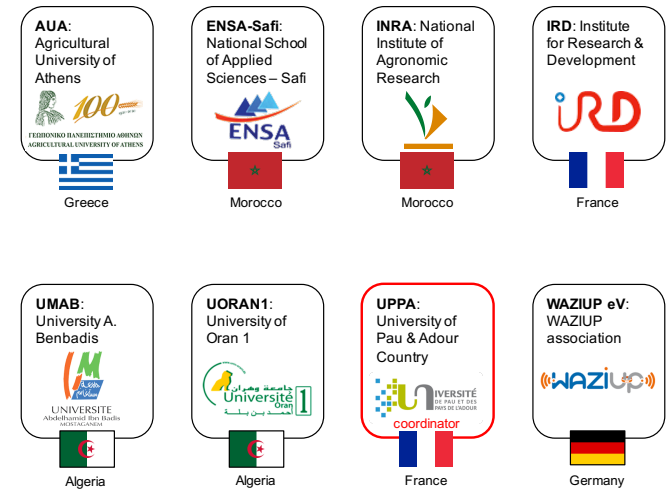
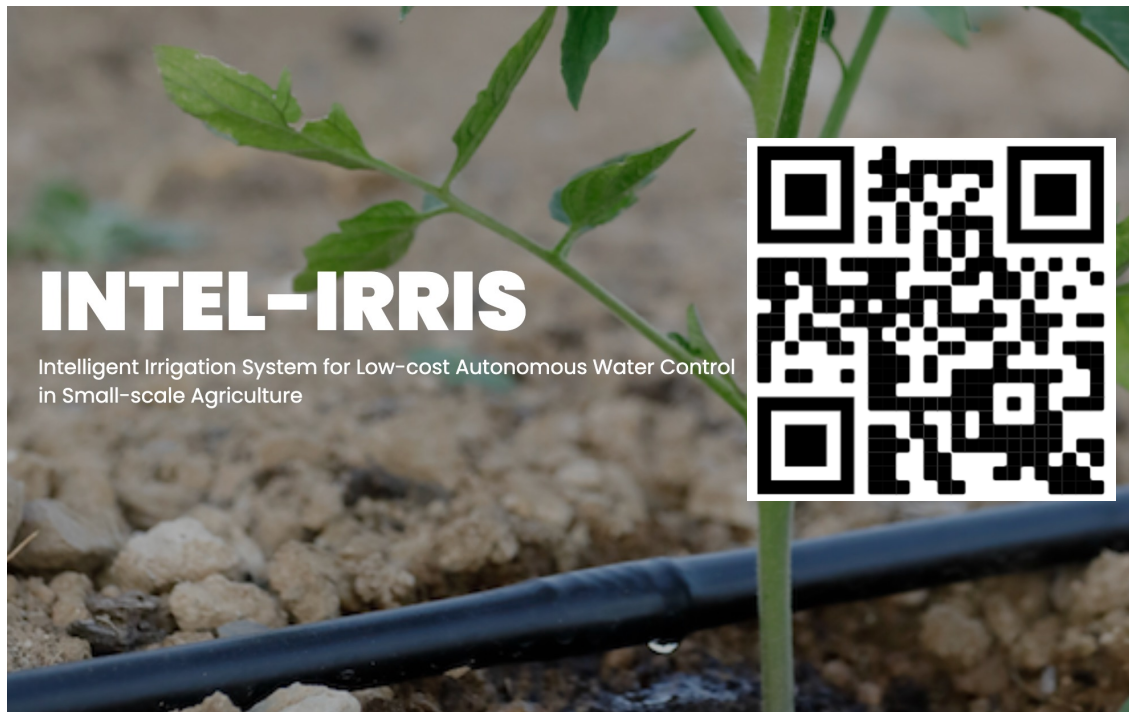
Direction des Services Agricoles de la Wilaya d'Oran  
Chambre d'Agriculture de la Wilaya d'Oran  
L'Association des irrigateurs des eaux traitées de la Wilaya d'Oran  
Direction des Services Agricoles de Mostaganem  
Chambre d'Agriculture de Mostaganem  
Institut National des Sols, de l'Irrigation et du Drainage (INSID El Matmore Relizane)  
Institut National de la Recherche Agronomique d'Algérie (INRAA El Hmadena Relizane)  
Association des Maraichers de Mostaganem

## SETTAT & BERRECHID (MOROCCO)

Office National du Conseil Agricole de Berrichid  
Office National du Conseil Agricole de Settatt  
Direction Provinciale de l'Agriculture de Berrechid  
Direction Provinciale de l'Agriculture de Settatt  
Coopérative Ennahda  
Coopérative Sidi Aidi

# Results, Newsletters, Publications, ... Intel-Irris

◉ Web site: <https://intel-irris.eu>



◉ Twitter: [https://twitter.com/Intel\\_Irris](https://twitter.com/Intel_Irris)



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