smart skills
smart sustainable agriculture

Course 2: Smart Irrigation and Fertilisation

M2: Implementing IoT for Smart Irrigation

Co-funded by the European Union

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What will you learn?

This module aims to familiarize you with the practical application of IoT technology in smart irrigation. You will learn what conditions to meet to properly install **soil moisture sensors** that help to precisely determine the water needs of plants. You will also learn how to monitor water consumption in real time. Finally, you will learn what are the most **common problems** you may encounter with the operation of IoT systems in agriculture. This module is an ideal guide for anyone who wants to combine agriculture with modern technologies.

Understand…

…the principles of proper installation of soil moisture sensors, the principles of their installation and integration with IoT systems.

Identify…

… problems related to IoT irrigation systems.

Explain…

…what real-time monitoring and regulation of water consumption is.

contents

This module guides learners through the practical steps of setting up soil moisture sensors and integrating them with IoT systems for smart irrigation. It explains how to monitor and adjust water usage in real time, and troubleshoot common issues—empowering farmers to save water, boost yields, and manage irrigation more precisely.

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01

SETTING UP & MANAGING SOIL MOISTURE SENSORS

What is a soil moisture sensor?

A soil moisture sensor is a device used to measure the moisture or water content of the soil. It provides information about the amount of water contained in the soil that is necessary for effective irrigation and plant health management. A soil moisture sensor works by measuring the electrical conductivity or resistance of the soil, which is directly related to the moisture content.

Types of soil sensors

- ✓ **Tensiometers –** a non-electronic device that measures water tension in the soil
- ✓ **Capacitive sensors –** measure humidity levels based on dielectric changes
- ✓ **Resistance sensors –** detect changes in the electrical conductivity of the soil

How to adjust the soil moisture sensor to your needs?

- ✓ Check the soil type
- ✓ Determine the measurement range
- ✓ Check IoT compatibility
- ✓ Pay attention to the resistance of elements to weather conditions

Principles of correct installation of soil sensors

Choosing the right installation location

Avoiding extreme conditions, e.g. shady places, places where water can accumulate naturally
Representativeness of the area – places that best reflect the soil conditions of cultivation

Installation depth and method

Adjusting the depth to the type of crop
Precise placement of the sensor in the soil - vertically or at a slight angle, force the sensor – it is best to dig a hole of sufficient depth and place the sensor

Proper soil contact

No air voids between the sensor and the soil

Preservation of the natural structure of the soil, so as not to alter its natural ability to retain water.

Sensor Protection and Maintenance

Protection against damage
Cable protection
Regular calibration and maintenance

Learning from Others…

Watch the video that shows how to properly install sensors so that they work properly.

Use the knowledge of professionals!

Installing Soil Moisture Sensors in the Field

02

REAL-TIME WATER USAGE MONITORING & ADJUSTMENTS

Monitor and adjust water usage in real time

Hydro-optimization (the process of maximally efficient use of water resources) is the foundation of intelligent irrigation systems. With the use of professional controllers, we can control the amount of water supplied to plants with unprecedented precision. These systems can analyze weather forecasts and automatically adjust the watering schedule (saving water in the event of forecast rainfall).

Data collection

Real-time analysis

Automatic irrigation adjustment

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Principles for monitoring and adjusting water consumption

Weather stations

Water Usage Monitoring

Precise soil moisture sensors

Intelligent irrigation systems

Integration with weather

The use of AI and IoT

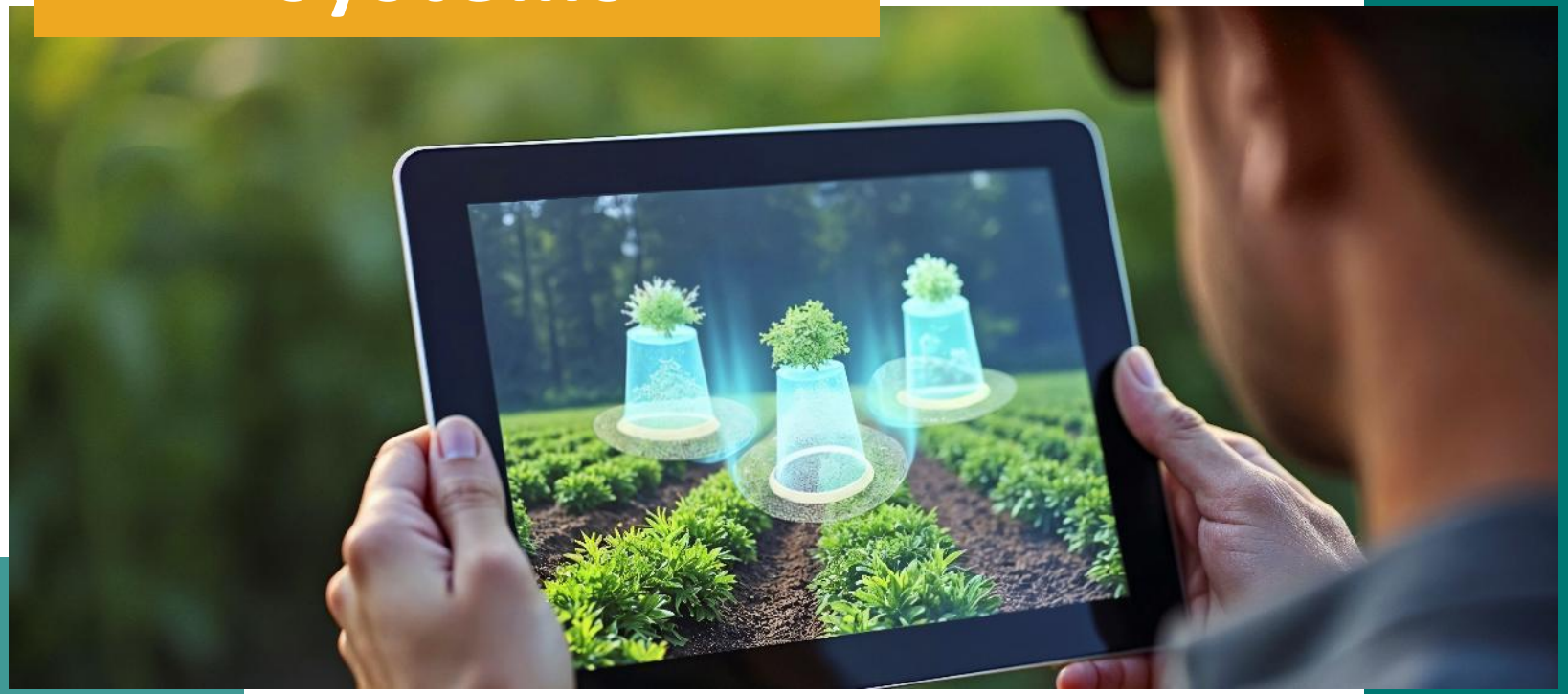
Benefits of smart irrigation systems

By using these technologies, you can **save up to 30-50%** of water compared to traditional irrigation methods, while improving yields and plant health.

[WittFlow: smart water timer with intelligent irrigation system]

Troubleshooting IoT irrigation systems

03



Possible problems

Although IoT irrigation systems are precise methods, problems with their proper use may arise. The main problems/issues include:

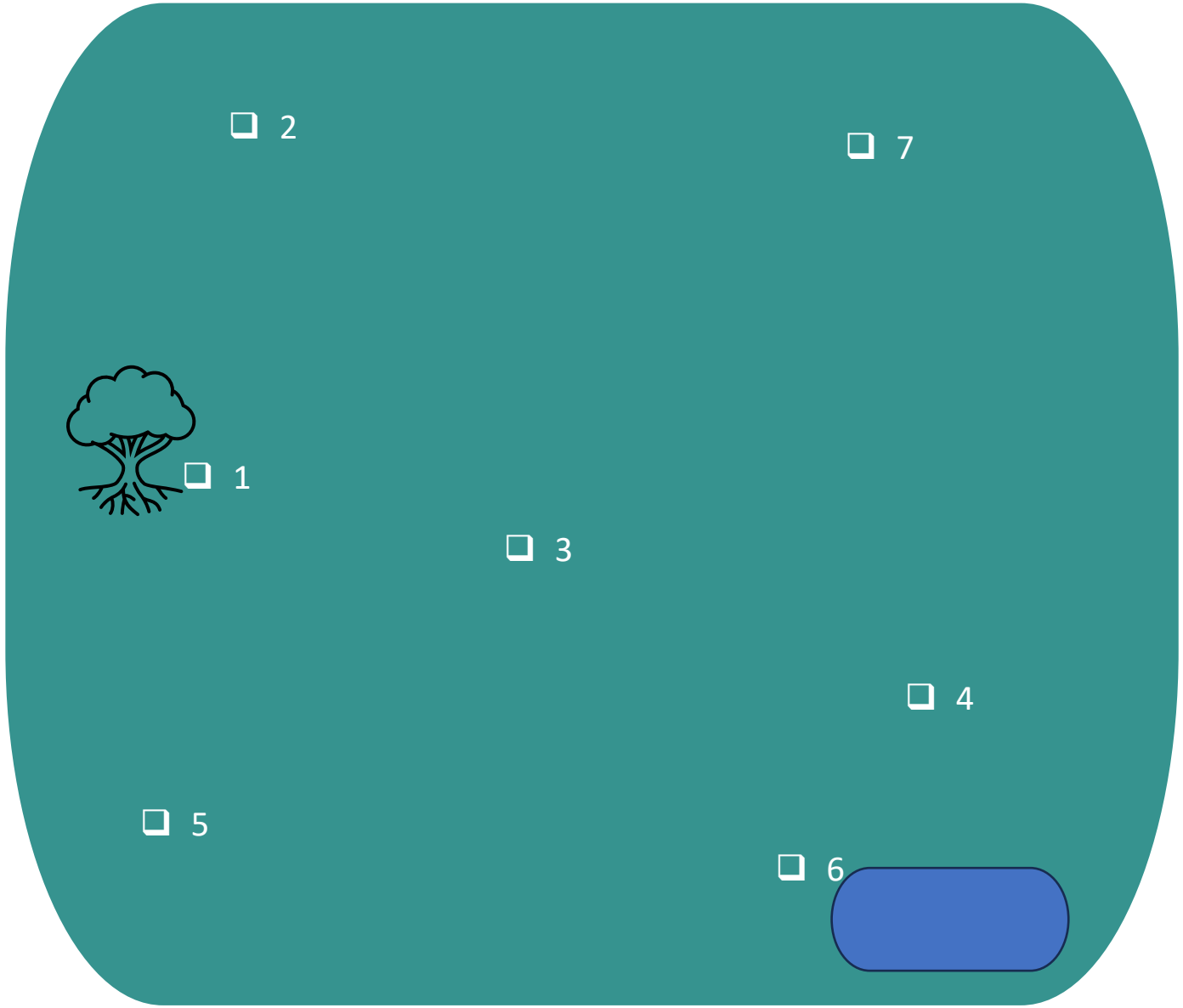
1. **Connectivity issues** where commands are not responded to or are delayed
   - Usually due to a weak Wi-Fi signal, which needs to be strengthened or NB-IoT technology should be used
2. **Failure of sensors** or valves resulting in erroneous humidity readings, leaks, or lack of water in the system
   - Regular maintenance, cleaning, and replacement of worn components will prevent the system from malfunctioning
3. **Software issues** with malfunctions and bugs in the app
   - This can be prevented by performing regular software updates
4. **Improper settings**, or a lack of integration with the weather forecast
   - A good solution is integration with the real-time weather forecast and the implementation of AI algorithms for the analysis of weather data and soil moisture

04

LET’S PRACTICE

Learner Exercise:
Scenario

You design an automatic irrigation system. You need to deploy the humidity sensors. You have 5 sensors at your disposal. Select the best located sensors (ie. Those in the most suitable places.)



Feedback on answers

❑ 1 Incorrect
Too shady place

❑ 2 Great choice

❑ 3 Great choice

❑ 4 Great choice

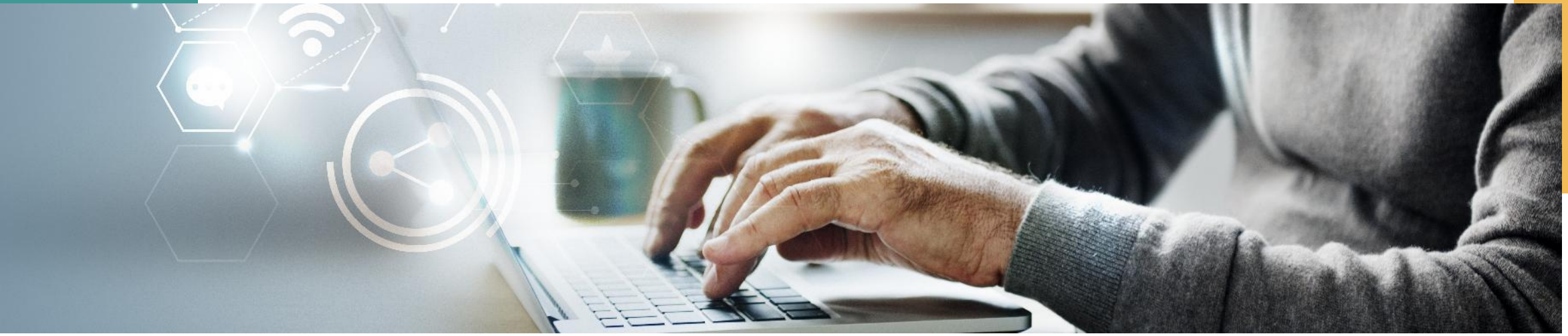
❑ 5 Great choice

❑ 6 Incorrect
A place where water accumulates naturally

❑ 5 Great choice

GREAT JOB!

You now know the importance of properly installed soil moisture sensors and how IoT supports monitoring and proper irrigation. It's time to learn about precision fertilization and the use of chemicals in agriculture.



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