smart skills
smart sustainable agriculture

Course 2: Smart Irrigation and Fertilisation

M1: Fundamentals of Smart Irrigation

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What will you learn?

This module aims to provide you with a comprehensive introduction to the basics of smart irrigation, which is the modern **method of managing** water in agriculture. You will learn how important it is to save water in today's world and how agriculture can be more environmentally friendly and efficient. You will learn the differences between **drip and sprinkler irrigation systems and understand** how IoT (Internet of Things) technologies help in automatic and precise water delivery to plants. This material will help you understand how science, technology and agriculture are joining forces to create a more environmentally friendly future.

Understand…

…the importance of water efficiency in agriculture and basic water-saving farming practices.

Identify…

…differences in the functioning and use of irrigation systems.

Explain…

…what role IoT plays in irrigation management.

contents

Module 1 introduces the essentials of water-efficient farming, comparing drip & sprinkler irrigation systems while highlighting how IoT technologies enable precise, data-driven water management. Learners explore how smart irrigation boosts yields, reduces waste, and supports sustainable agriculture in the face of climate change.

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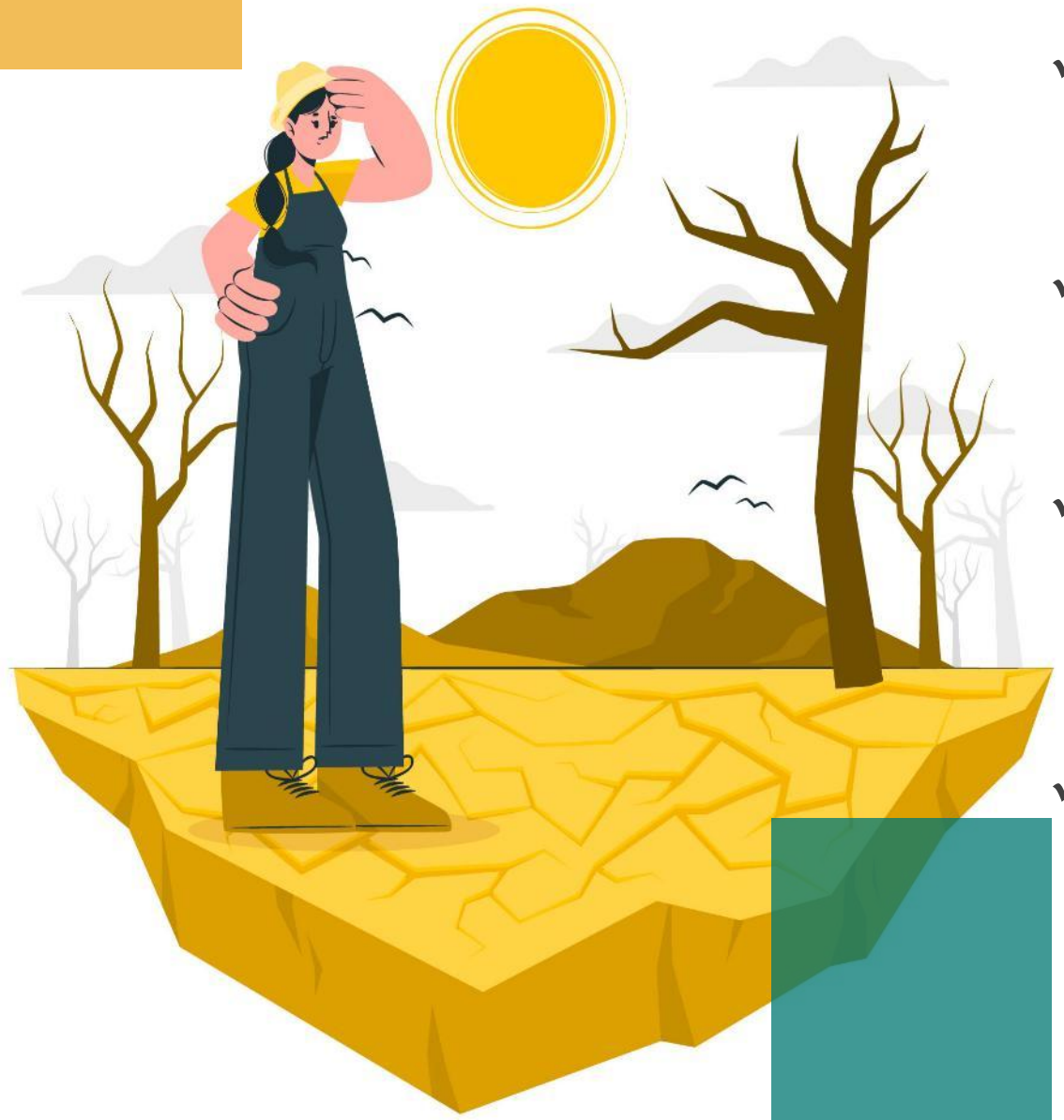
01

WATER-EFFICIENT FARMING PRACTICES

The importance of water in agriculture

Water is the main resource for plant and animal production. Climate change is generating fluctuations in temperature and rainfall, forcing farmers to rethink their farming and livestock strategies in conditions of periodic water shortages.



Water-saving practices

- ✓ **Monitoring soil moisture –** the use of sensors allows to precisely determine the water needs of plants.
- ✓ **Efficient irrigation –** drip irrigation systems and precision sprinklers to reduce water loss.
- ✓ **Leveraging IoT and automation –** Intelligent irrigation control optimizes water consumption based on real-time data.
- ✓ **Drought-resistant crops –** a selection of plants adapted to water scarcity conditions.

02

DRIP & SPRINKLER IRRIGATION SYSTEMS

Drip irrigation and sprinkler systems

Smart irrigation is a key element of modern agriculture, enabling water savings, optimization of consumption and ensuring the right conditions for plant growth. One of the most effective solutions is a drip irrigation system, which supplies water directly to the roots of plants, minimizing water losses associated with evaporation or surface runoff.

Drip systems

They are one of the most effective ways of irrigation. They consist in supplying water directly to the root zone of plants using a network of pipes and drippers. This ensures that water is used as efficiently as possible, minimizing losses and providing optimal growth conditions for plants. Drip systems can be automated with soil moisture sensors and controllers, allowing for precise irrigation management.

Sprinklers

Water is distributed to the surface of the soil in the form of tiny droplets that mimic natural rain. The sprinklers can be programmed to work at specific times and adapted to different types of crops. They are particularly useful for irrigating lawns, pastures and large agricultural areas.

Comparison of efficiency

Factor	Drip irrigation	Sprinklers
Water efficiency	Very high (90-95%)	Average (60-80%)
Installation cost	Medium/High	Medium
Use	Row crops, orchards, greenhouses	Lawns, farmlands
Impact on soil erosion	Minimal	Possible erosion
Automation capability	Yes	Yes

03

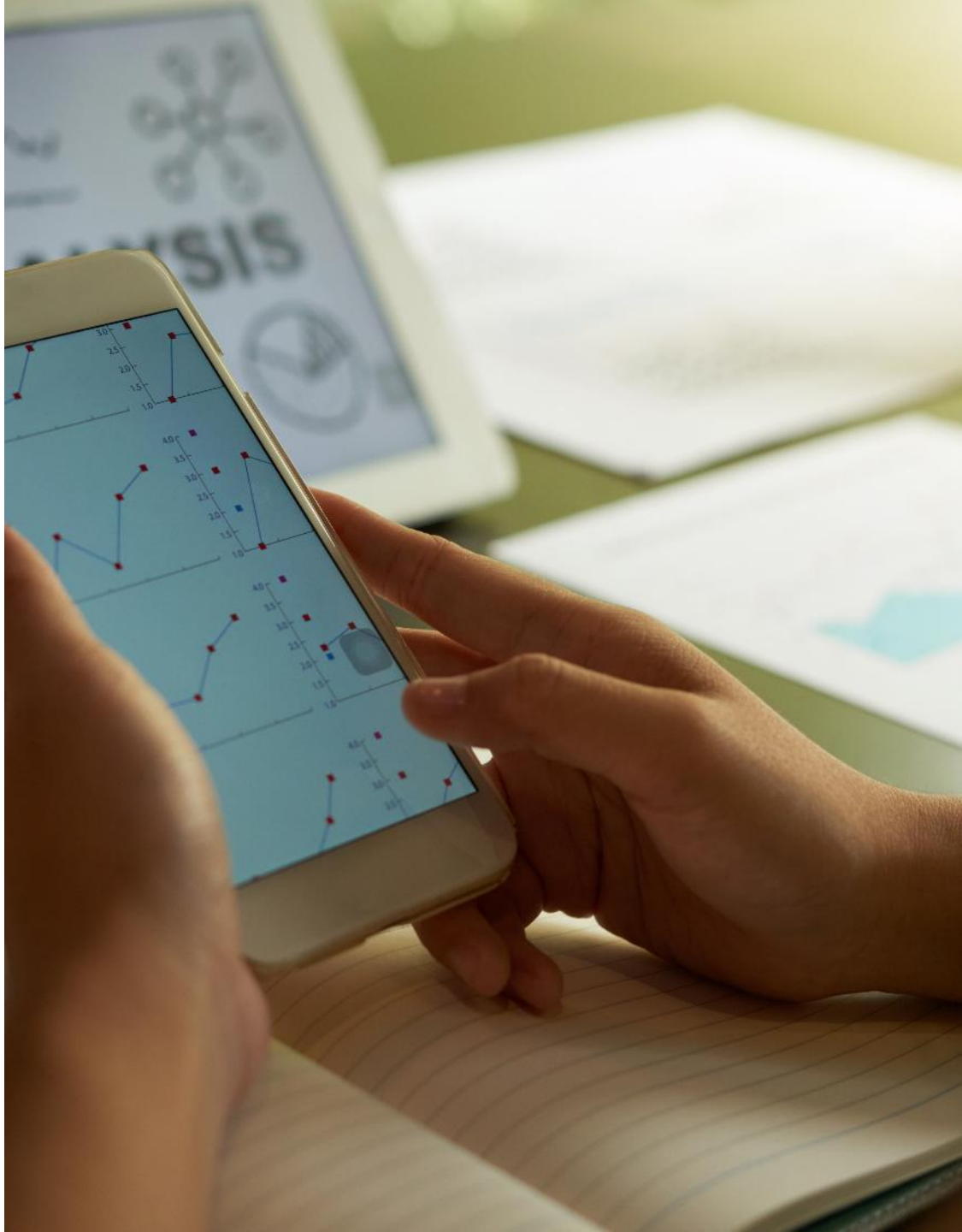
ROLE OF IOT IN IRRIGATION MANAGEMENT

The role of IoT in irrigation management

Combined with Internet of Things (IoT) technology, these systems become even more efficient. With soil moisture sensors, temperature sensors, as well as integration with weather data, farmers can monitor the condition of the soil in real time and irrigate only when necessary. In this way, water consumption is closely matched to the current needs of the plants, which results in financial savings and contributes to the sustainable development of agriculture

Key elements of a smart irrigation system:

- ✓ **Soil moisture sensors** – measure the current water level in the soil and send the data to the system.
- ✓ **Weather Sensors** – Forecast rain and evaporation, helping you optimize your watering schedule.
- ✓ **Controllers and mobile apps** – allow farmers to remotely control irrigation based on the data collected.
- ✓ **AI and Big Data systems** – analyze crop history and climate forecasts to further optimize water use.



How does an IoT irrigation system work?

An IoT-based irrigation system typically consists of several components: sensors, a control system (e.g., a smartphone or computer), an irrigation system (e.g., drip irrigation), and access to weather data. Sensors installed in the soil measure moisture levels and temperature and then transmit this data to the control system. If the soil moisture drops below a certain level, the system starts irrigation.

Benefits of using IoT in irrigation

Precision and savings in water management

Based on accurate sensor data, the irrigation system delivers water only when it is needed. Less water consumption leads to cost savings.

Enhanced growth cycles

Automation can also help in better manage plants growth cycles, making it possible to achieve maximum yields at every stage of their development

Sustainable development

Thanks to this technology, it is possible to manage resources more efficiently, which allows to minimize the negative impact on the environment.

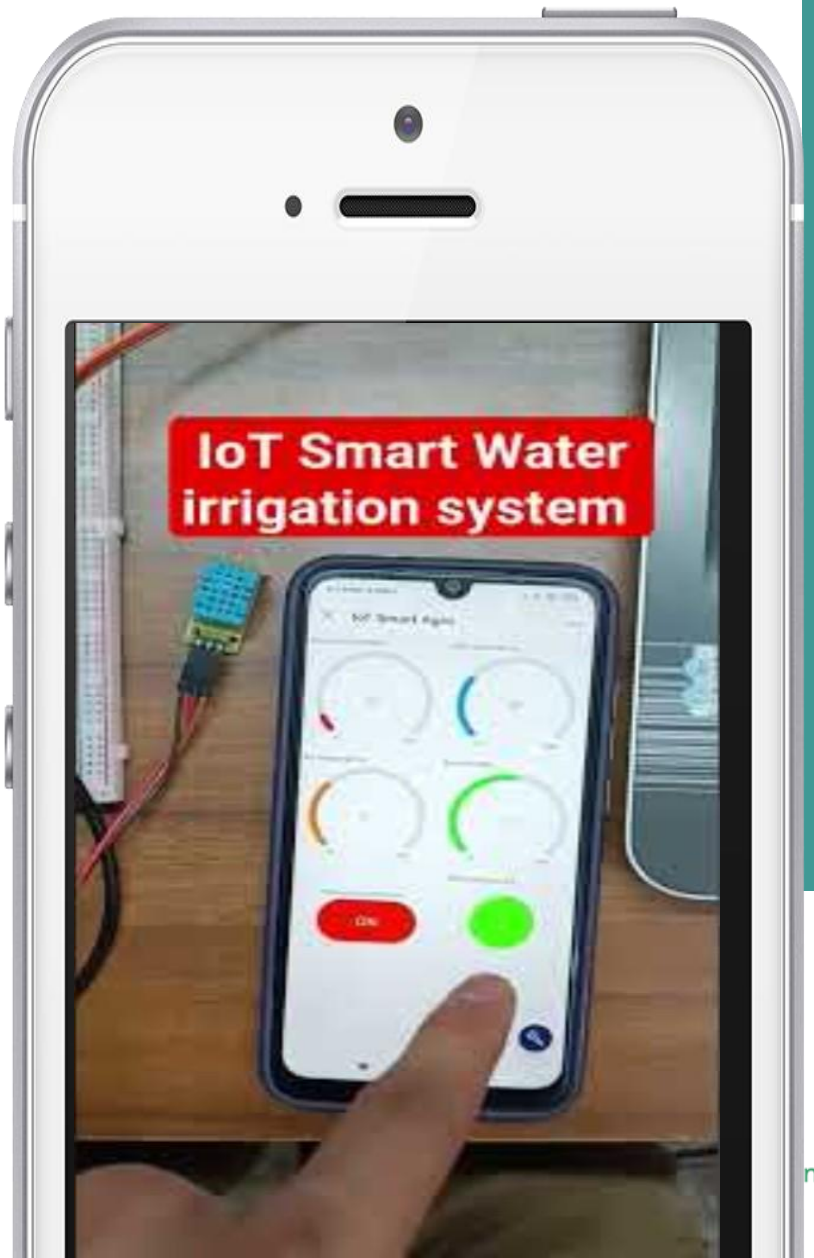
Increase in yields

Optimal water supply to plants translates into better growing conditions and higher yields. Plants watered in a precise way are healthier and more resistant to environmental stresses, such as drought or excess water.

How Smart Irrigation Works

Watch the video and learn the basics of how an IoT-based irrigation system works properly

[IoT smart water irrigation monitoring system Automatic Plant Watering System Blynk cloud]



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Be Inspired:
Practical application of drip irrigation on the farm of Szymon Leszczyński:

- 8ha of potato plantations
- 100% increase in yield in the first year of application
- reducing disease pressure
- Improved crop quality

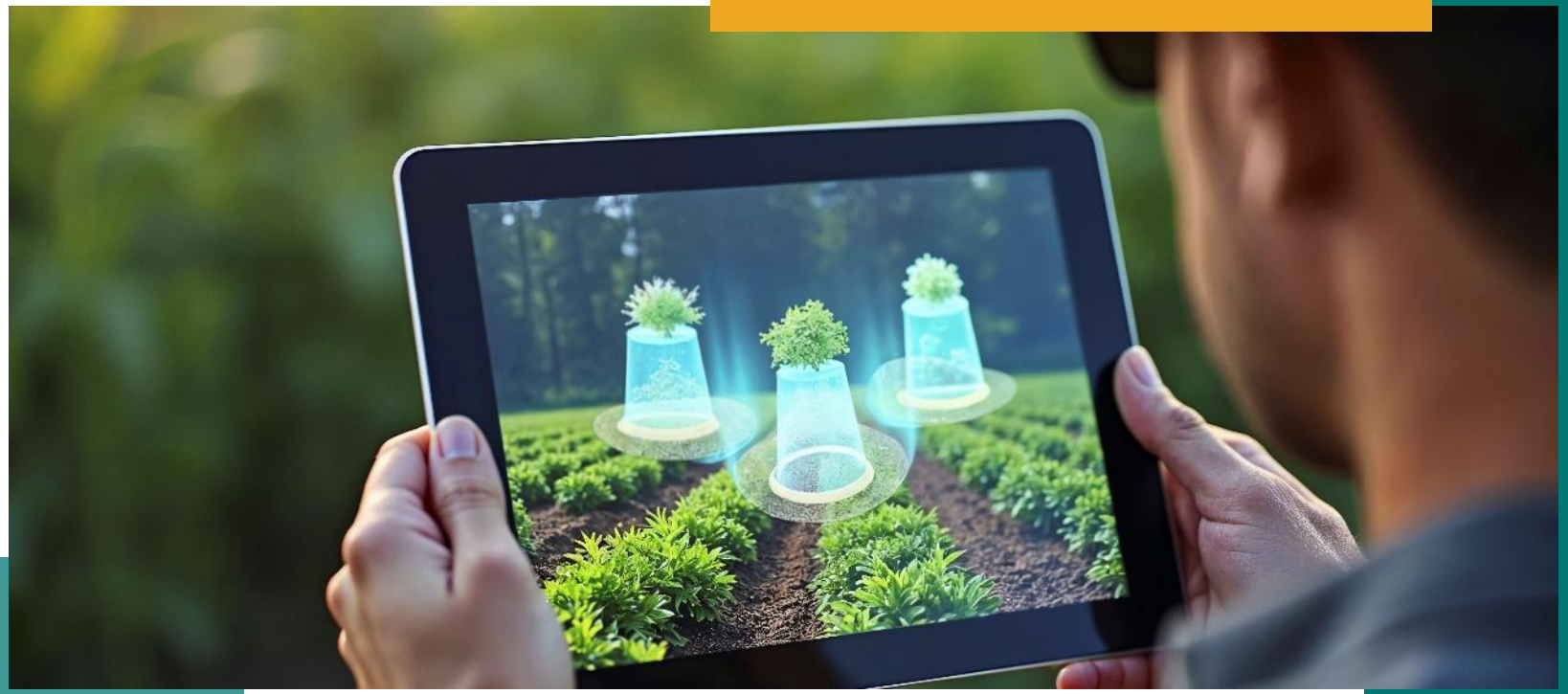
Watch the video and pay attention to:

- Advantages and disadvantages of the droplet system
- what is necessary when setting up and using the system

Nawadnianie kropelkowe w uprawie ziemniaka | RPZ #14 - YouTube

04

LET’S PRACTICE



Learner exercise:
Scenario

You plan to grow cucumbers on the ground. By analyzing climatic conditions and weather forecasts, you find that the amount of rainfall may not be sufficient to meet the water needs of cucumbers. What will you do?

Answer A

Invests in a sprinkler system to ensure the right amount of water

Answer B

I don't do anything. I hope that the yields will be high anyway

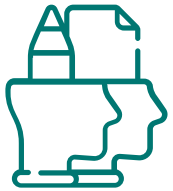
Answer C

I install a drip irrigation system throughout the field

Feedback on answers

Option A

Sprinklers will provide the right amount of water to your crop. But remember!
Cucumbers do not like moisture on the leaves, as it increases the risk of downy mildew and other fungal diseases



Option B

The least expensive idea, but is it profitable? It may turn out that you will not get the right amount and crops to cover the costs.

Option C

Great choice. You will provide the cucumbers enough water and reduce the possibility of fungal diseases

GREAT JOB!

In this module, you have learned about the different ways of irrigation and their advantages and disadvantages. In the next module, you will learn more about IoT supporting smart irrigation systems.

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