



Smart soil irrigation system as an example of smart agriculture

STEM4inclusive schools
WP2 – Toolbox



Inovatif ve Girişimci Toplum Derneği

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Structure of the activity

A Introduction

about the topic

What's smart agriculture?

Essential elements for a basic soil irrigation system.

B Training phase

about the training

Build your own basic system for smart agriculture

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What's smart agriculture? Essential elements for a basic soil irrigation system.

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Definition!



What is smart agriculture ?

Smart agriculture is the use of advanced technology, such as sensors, IoT devices, and data analytics, to optimize farming practices. It aims to improve crop yield, resource efficiency, and sustainability by providing real-time insights and automated solutions to farmers.

Smart agriculture is crucial today due to the growing need to produce more food sustainably for an increasing global population. It helps farmers optimize resources like water and fertilizers, reducing waste and environmental impact.





Let's have a look at this
youtube video!

The smart agriculture video

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<https://meb.ai/OXmZ1U>



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Sustainable agriculture by smart agriculture

Smart agriculture enhances agricultural sustainability by using technology to optimize resource use, reduce waste, and lower environmental impact. This approach supports efficient water and fertilizer use, improves crop resilience, and helps maintain soil health, contributing to long-term food security in a changing climate.

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A few simple and funny examples of smart agriculture

Plant Surveillance Cameras: Cameras in greenhouses monitor plant health, acting like “selfies” to detect issues early.

Wi-Fi for Chickens: Wi-Fi sensors monitor chicken comfort, alerting farmers if chickens seem stressed.

Melon Social Media: In Japan, QR codes on melons reveal their growth story, like a “life story” for each fruit.



AI- Generated



Definition!



How to work smart agriculture?

Smart agriculture operates by gathering data through sensors that monitor soil, weather, and crop health.

This data is analyzed in real-time via cloud-based systems to optimize resource use, predicting exactly when and how much water, fertilizer, or pesticides are needed.

Automated systems then respond to these insights, adjusting irrigation, fertilization, or even activating robotics for planting or harvesting.





A good example of smart agriculture



<https://meb.ai/z7ieDN>



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More examples

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<https://www.youtube.com/watch?v=gjBFtoruO-I>



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What is required for a simple soil irrigation system?

Device Type	Tasks
Moisture Sensor	Measures soil moisture levels
Mini water pump	Transfers water from source to soil
Relay	Drives water pump
Breadbord	Electrically binds all components together
Connecting wires	Transmit electricity and signals
Battery	Supplies power to the system
Tinkercad	For Drawing circuit and block coding





Let's have a closer look at:

Relay

Moisture Sensor

Water Pump

Wires & Battery

Breadbord

Tinkercad

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How to work Soil Moisture Sensor?

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https://www.youtube.com/watch?v=K_jfj4Krj7M



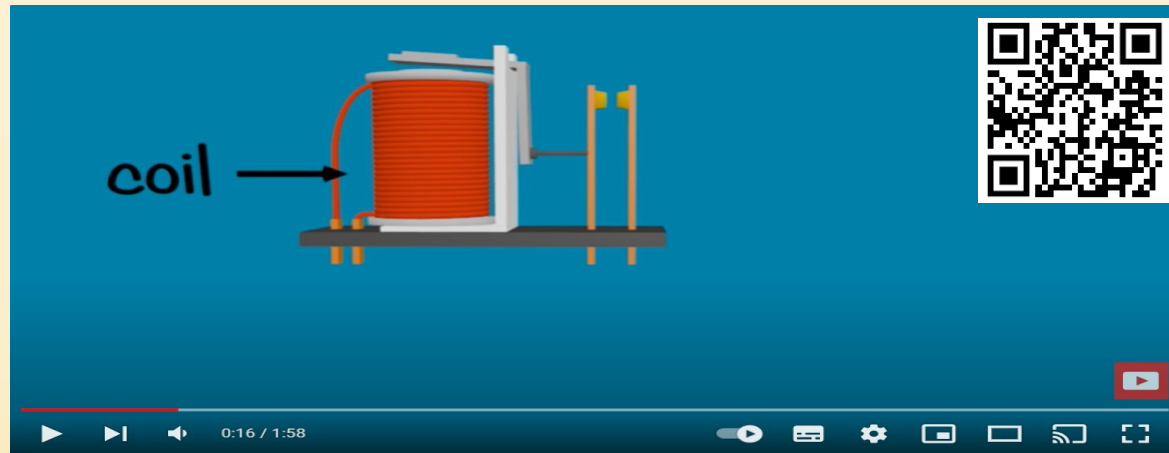
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What is electrical relay?

An electrical relay is a switch that uses an electric current to control the opening and closing of another circuit, enabling the control of high-power devices with a low-power signal.



<https://www.youtube.com/watch?v=Ca20ktPygY8>

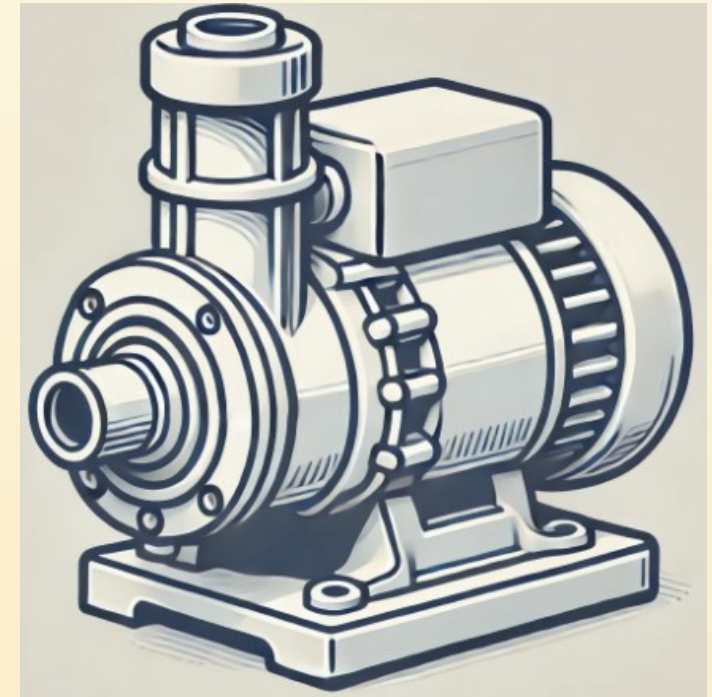


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How does a water pump work?

A mini water pump works by creating a pressure difference to move water. It typically uses a small impeller (centrifugal), a flexible diaphragm, or rotating gears. The spinning or movement draws water in and pushes it out through the outlet, ideal for small-scale tasks like fountains, aquariums, and cooling systems due to its compact size and low power consumption.



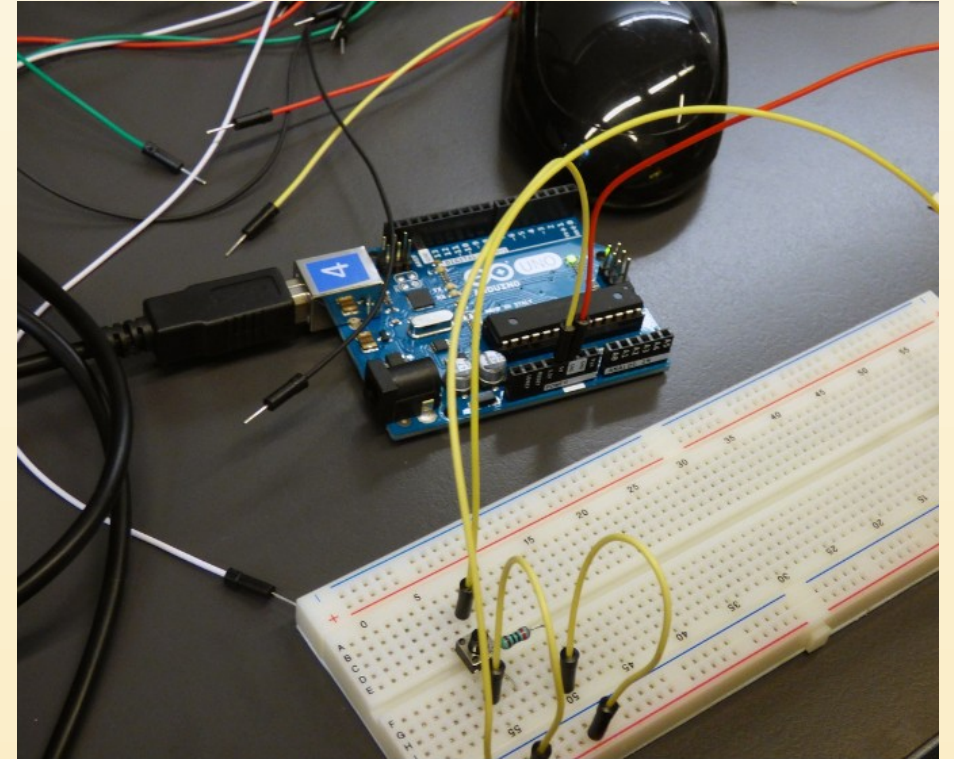
AI vector image-free licence



Breadboard and jumper wires

Breadboard is a reusable board with holes for quickly prototyping electronic circuits without soldering.

Jumper Wires with connectors at each end, used to make temporary connections on a breadboard or between components.



Pixabay-free licence





Batteries

Batteries provide power to the controller, water pump and other electronic parts.

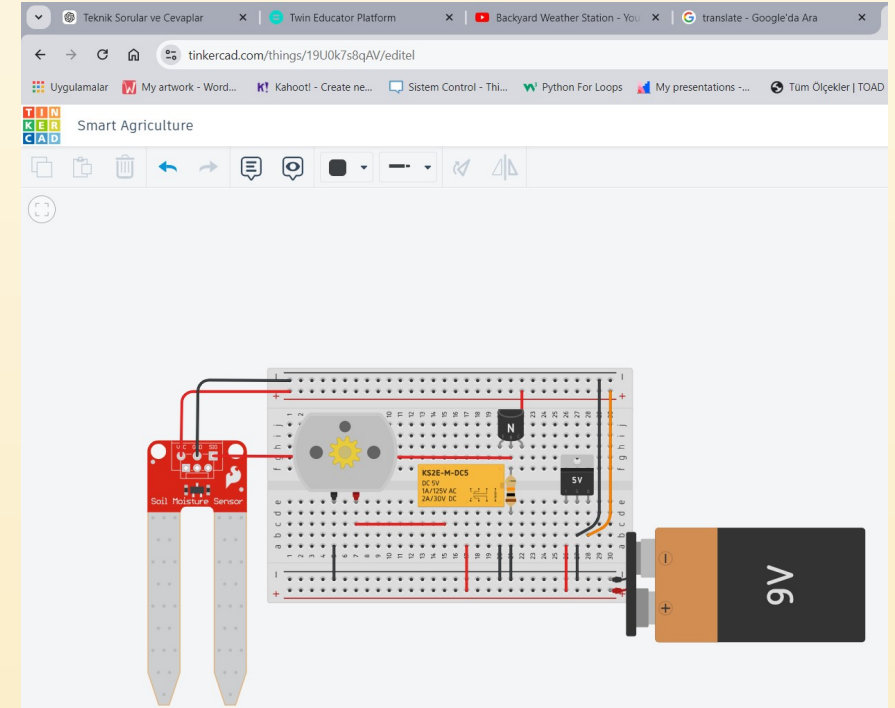
We will use lithium ion batteries in our work. These batteries are easy to obtain and inexpensive.





Tinkercad

Tinkercad is a free licensed, easy-to-use 3D modeling, circuit design and coding platform developed by Autodesk. Ideal for beginner users and educational applications. Since it is a web-based platform, it can be used via an internet browser without installing any software.



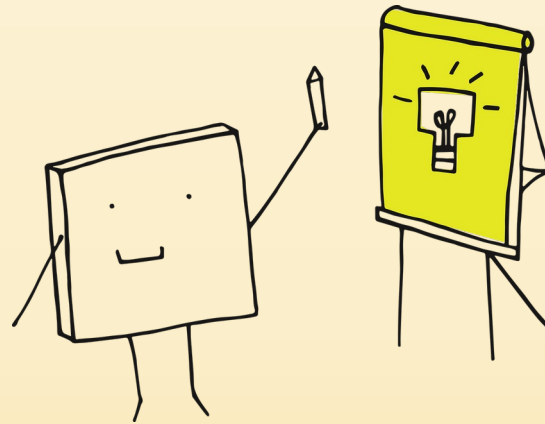
https://www.youtube.com/watch?v=9RF_BZ1Cg4k



B: About the training



Training phase



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Task 1:

Work in **pairs** to complete the task. If the physical materials are available, you will build the circuit physically. If the materials are not available, you will use **Tinkercad** to simulate the circuit and perform the necessary operations on a computer.



You have **20 minutes** to design and create the soil irrigation system, either physically or virtually on Tinkercad. If there are learners with special needs in your group, you will receive an additional **10 minutes** to ensure that their contributions and ideas are fully integrated, while other groups work on refining their solutions.



Ensure that you collaborate effectively with your partner. Support learners who may have visual or physical impairments, ensuring everyone has the opportunity to contribute.



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Task 2:

Here is a DIY smart soil irrigation video



<https://www.youtube.com/watch?v=nY1SSn16jHo>

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Describe what you saw in a video. Please work together with other persons or record an audio about your ideas with your mobile phone.



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Task 3:

- Design Your Own Smart Soil Irrigation System
- Design your smart soil irrigation system and test it for one week. Each day, observe how the system performs and write down your observations in the observation protocol.
- At the end of the week, meet with your group to share your observations and experiences. Ensure that everyone is involved and that discussions follow the agreed-upon classroom norms and community guidelines.





H5P- Tasks 1: about smart agriculture – Climate change

Smart agriculture can be effective in reducing the effects of climate change.

☐ True

☐ False

☒ Submit

H5P Reuse

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H5P- Tasks 2: about basic smart soil irrigation- Instruments

Drag the words into the correct boxes

A soil moisture sensor, relay and mini pump are required for a simple system. The moisture sensor the relay according to the amount of moisture in the soil. energized by the relay and flows water into the ground.

Arduino

Soil

smart irrigation

The water pump

triggers

Battery

✓ Submit

H5P Reuse

I am confused

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H5P- Tasks 3: about smart agriculture-sustainable agriculture

Which is the positive impact of smart agriculture on sustainable agriculture? (you can choose more than one)

- ☐ Increased Efficiency
- ☐ Efficient Use of Resources
- ☐ Over water consumption
- ☐ Accelerate climate change
- ☐ Accurate and Real-Time Decision-Making

✓ Submit

H5P Reuse

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H5P- Tasks 4: about smart agriculture-Tinkercad

Tinkercad is an open source platform for 3D modeling and electronic circuit simulation.

☐ True ☐ False

☒ Submit

H5P Reuse

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Congratulation!

You mastered the activity smart agriculture and the creation of a smart soil irrigation system.

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