



AGRICULTURE, HOME GARDENING AND UBIQUITOUS

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INTRODUCTION





The eternal need of every human being in this world is **oxygen**.

Plants play a **vital role** in maintaining the carbon dioxide and oxygen content in the air.

This is one of the main reasons that ubiquitous computing is applied to agriculture: to **reduce** waste of water, resources and **improve** the plant growth and renewable energies.



ECOSUSTAINABILITY

WASTEWATER

The agricultural sector accounts for 70% of all water consumption posing a great pressure on ground water resources.

Therefore, evaluating agricultural water consumption is highly important as it allows supply chain actors to identify practises which are associated with unsustainable water use, which risk depleting current water resources and impacting future production.



IL CONSUMO DI ACQUA NEL MONDO

Fonte: SIWI

L'uso globale



70% agricoltura



20% industria



10% uso domestico



I Paesi che ne consumano di più



Nel 2030 il 47% della popolazione mondiale vivrà con problemi di scarsità d'acqua

L'aumento dei consumi per il 2025

Paesi in via di sviluppo

+50%

+18%

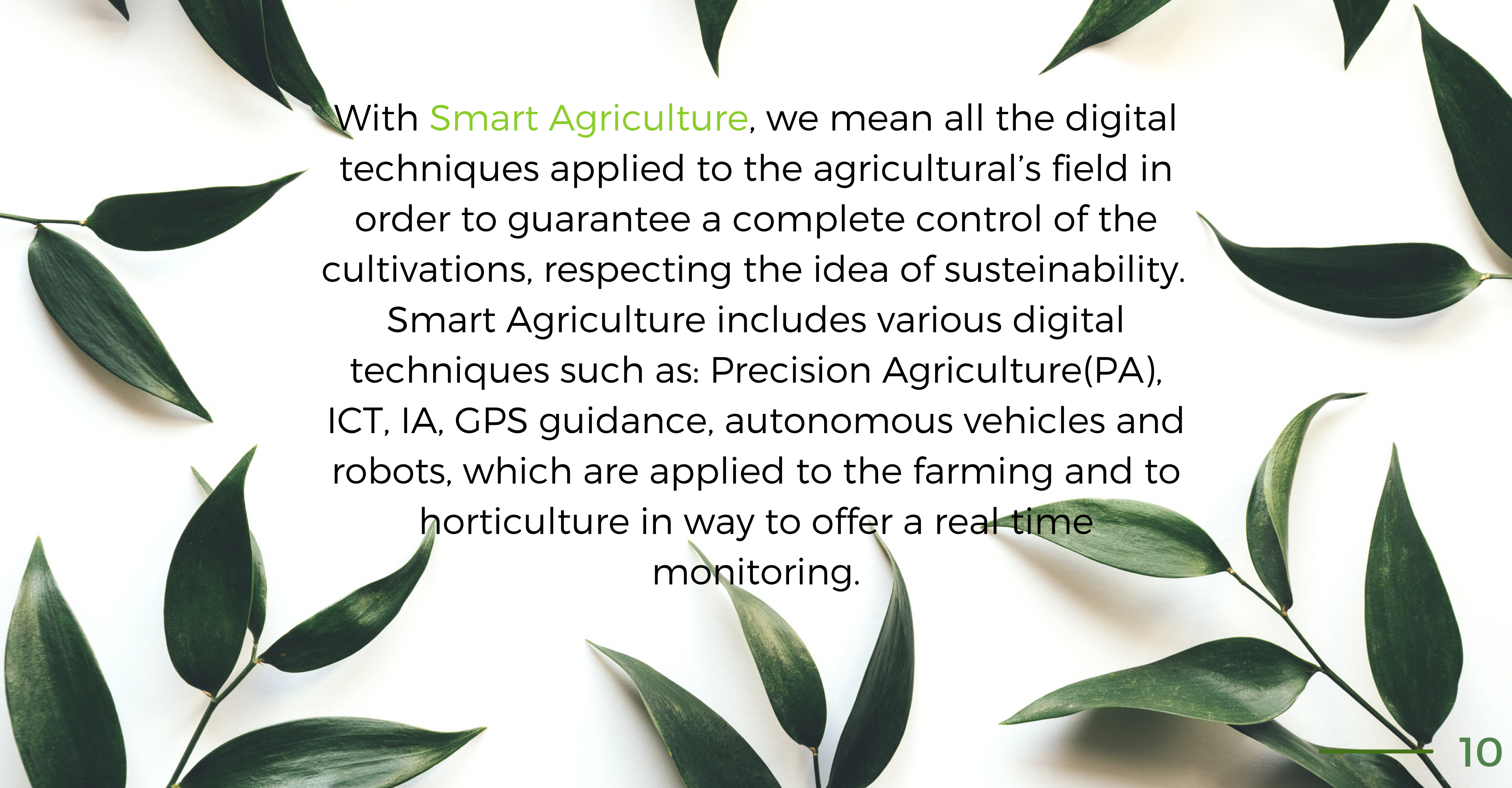
Paesi industrializzati

From the previous graph we could see that the 70% of the global volume of water is used by the agricultural sector. So, wastewater is an important problem that we have to solve right now. In fact, within 2050 we will see drought increase and rains decrease by 20%.



SMART AGRICULTURE



The background of the slide is white, decorated with several green leaves of varying shapes and sizes, some with prominent veins, scattered around the text.

With **Smart Agriculture**, we mean all the digital techniques applied to the agricultural's field in order to guarantee a complete control of the cultivations, respecting the idea of sustainability.

Smart Agriculture includes various digital techniques such as: Precision Agriculture(PA), ICT, IA, GPS guidance, autonomous vehicles and robots, which are applied to the farming and to horticulture in way to offer a real time monitoring.

FARMING 4.0

During the last few years, agriculture is undergoing a fourth revolution (**Farming 4.0**) by integrating Information and Communications Technologies (ICT) in traditional farming practices.

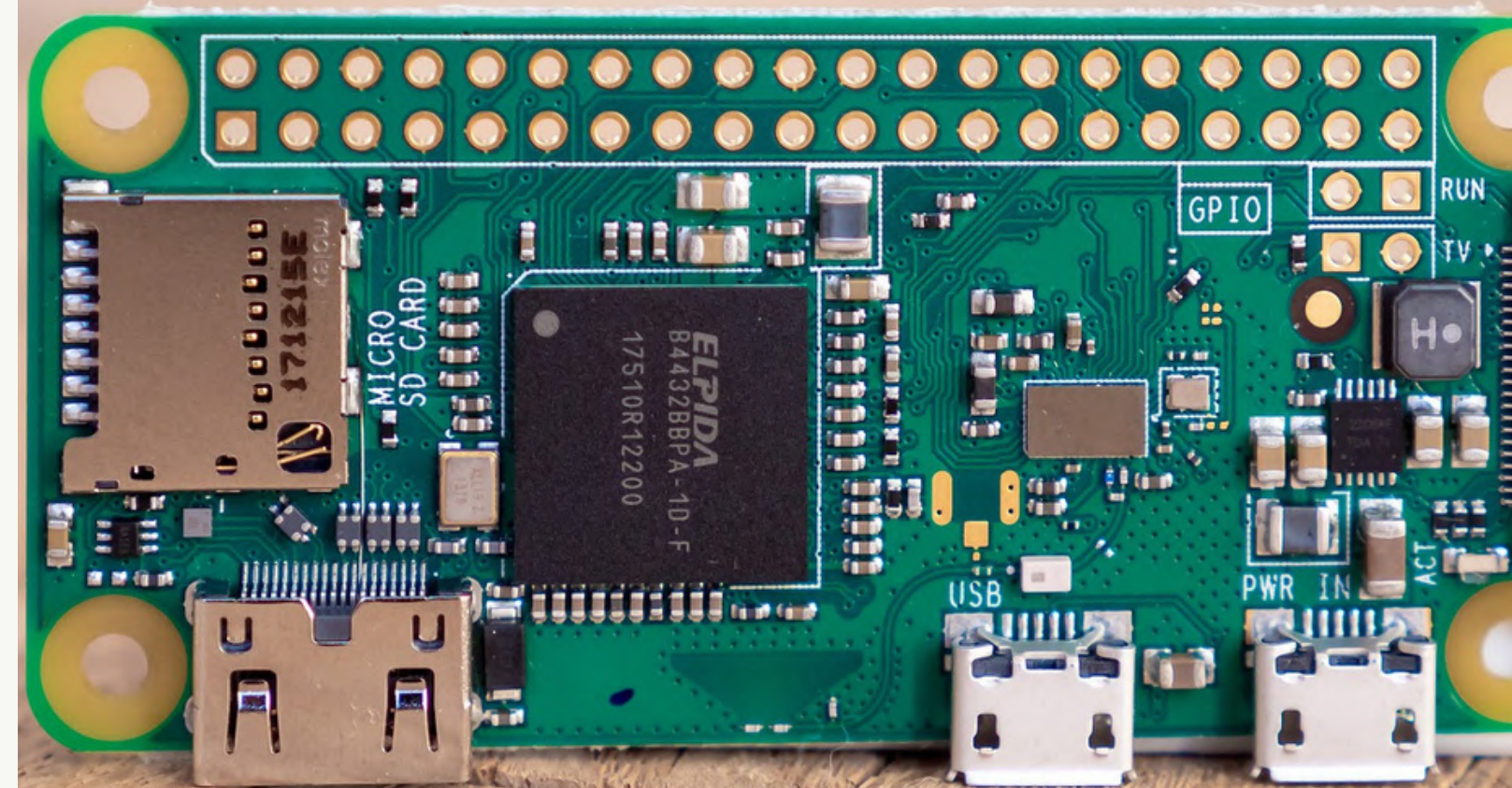
Technologies, like Remote Sensing, Internet of Things (IoT), Unmanned Aerial Vehicles (UAVs), Big Data Analytics (BDA) and Machine Learning (ML) are particularly promising and they can give a **new breakthrough** in agricultural practices.



TECHNOLOGIES

There are different technologies that are used in agriculture but now there are two more prominent:

- Ground sensing technologies
- Remote sensing technologies



GROUND SENSING TECHNOLOGIES

Collect data on field and process conditions via fixed or mobile ground **sensors**. There are different types of sensors (Optical, Mechanical), but the most used are **wireless**.



SENSORS

Soil water content sensor

Soil Electrical Conductivity Sensor

Soil Moisture Content Sensor

pH Sensor

Temperature Sensor

Wind Speed Sensor



COOL FARM

WHAT IS IT?

The Cool Farm Tool Water (CFWT) is a software, realized in 2018, that combines tested algorithms with a database of climate, soil and crop data on a global scale in order to provide metrics for greenhouse gas emissions, water, and biodiversity for non-expert users such as farmers, easily on their smart devices.



COOL FARM MISSION

The Cool Farm Tool Water's mission is to enable millions of growers more informed on farm decisions in order to reduce significantly their environmental impact. The results are outstanding. In fact, in all the cultivation's fields, in which this tool was implemented, greenhouse gas emissions are decreased by nearly 25% in the last three years.



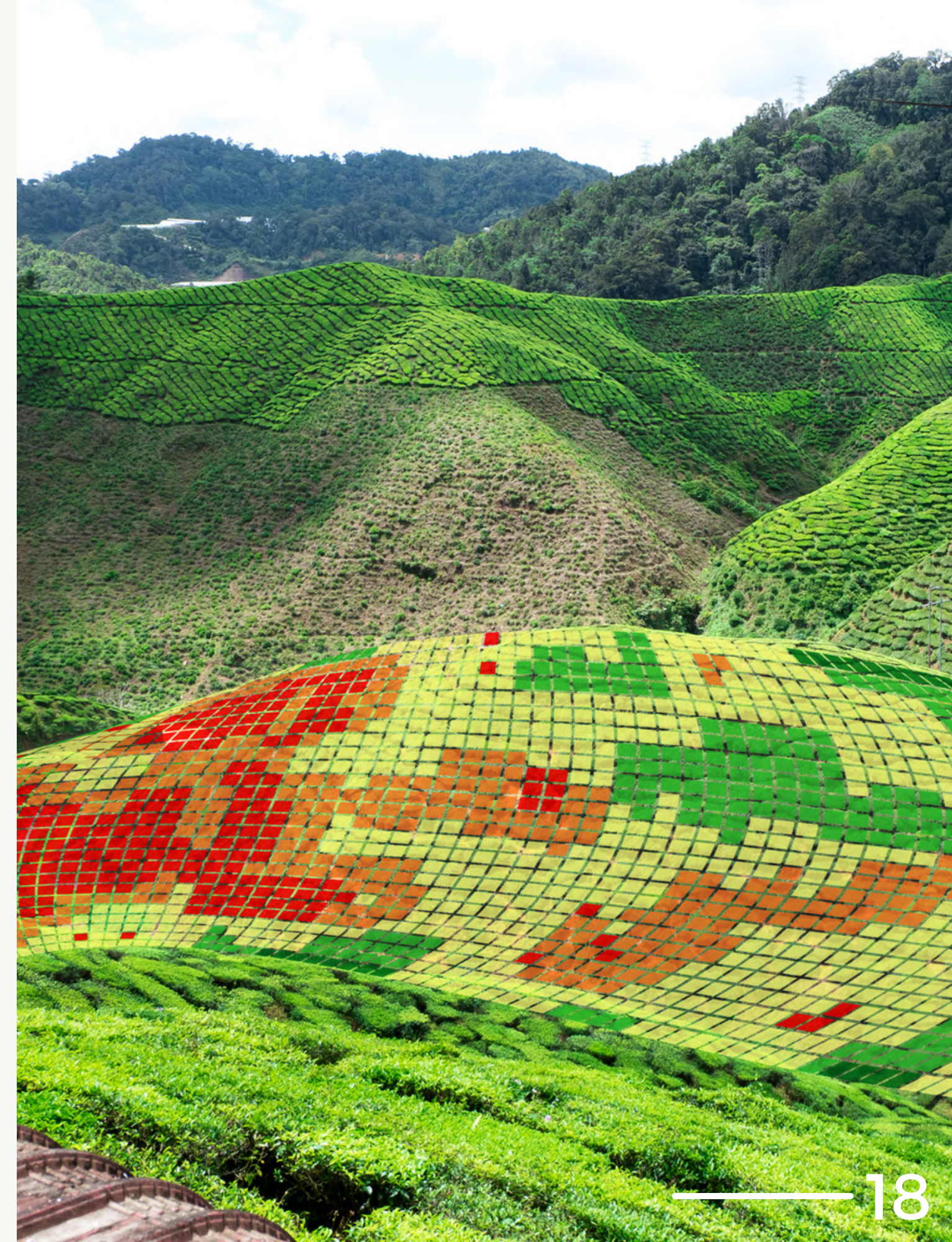
ORTI GENERALI

A first experiment in Italy involving smart agriculture was realized by **Orti Generali**. This project uses in the fields a control unit that detects weather, humidity, local temperature and activates a centralized irrigation system for all gardens.



REMOTE SENSING TECHNOLOGIES

Unlike ground sensing technologies, **remote sensing technologies** use optical satellite sensors, airborne or drone-mounted, which generate multispectral images of fields.



UAVs & MEMS

UAVs

Unmanned aerial vehicle is an aircraft without any human pilot, crew or passengers on board.

MEMS

Microelectromechanical systems are made up of components between 1 and 100 micrometers in size.



WHO?

In Italy remote sensing technologies are made available to farmers by **EGM96** and **italdron**, which also offers basic courses on how to use all the useful tools.



OTHER TECHNOLOGIES

TECHNOLOGIES

BENEFITS IN AGRICULTURE

Cloud Computing

Easy collection and management of data gathered from cloud computing services like agriculture fields maps, cloud storage, etc.

Big Data Analytics

Uncover patterns, correlations, market trends, customer preferences, and other useful information

Embedded Systems

Productions costs can be reduced to a remarkable level which will increase profitability and sustainability

Communication Protocols

Easy collection and management of tons of data gathered from sensors and cloud computing services, cloud storage, etc.

A modern home garden featuring a wooden deck, outdoor furniture, and a glass extension. The deck is made of light-colored wood and is furnished with a dark wicker sofa and a matching coffee table. A large potted plant with green leaves stands on the deck. The garden is bordered by a white wall on the left and a glass extension on the right. The sky is blue with white clouds.

HOME GARDENING TECHNOLOGIES



In the field of **home gardening** technologies, many companies are engaging in creating smart solutions for the users.

At the moment, we can find few but relevant solutions of smart greenhouses or “growth boxes” on the market, which are based on an innovative system for growing plants indoor: **LIF**

A glass sphere containing a miniature forest scene, resting on a bed of green moss against a blurred green background.

MARKET PRODUCTS



LIF

LIF, produced by the Danish company Normann Copenhagen, represents a **hydroponic culture**. This means that all the plants grow out of the ground allowing to reduce water consumption. LIF is a modular object that aims to make home gardening easy and intuitive.



OVERVIEW

LIF uses blue and red LED lights, specific for the flowering and photosynthesis of plants.

In addition to the **lamp** LIF is composed of a **stick** that is inserted into the soil to collect information on the health of the plant.

The **OLLA vase** is designed to make soil hydration easy and effortless.



EVO GREENHOUSE

The Evo GreenHouse is built with latest generation hydroponic systems, which significantly reduce cultivation times and the use of nutrients, optimizing the harvest.

It is made up of led lamps, to promote the growth and flowering of plants.

Besides, through the home automation control unit, the customer can remotely control and manage all its parts.



EVO GREENHOUSE

Evo Greenhouse is successful applied for several types of cultivation, including: hemp(employed for pharmaceutical and therapeutic uses), plants, beer, toothpaste, mouthwash and vegetables.

PLANTUI 6

SMART GARDEN

...similar to Alexa, but for plants and food!

A second smart instance of a hydroponic greenhouse, is the Italian **PLANTUI 6**.

The greenhouse works using a cloud system that allows to control by remote, through an app, all the aspects relative to the growth plants.



Plantui 6 Smart Garden

HOW IT WORKS?

PLANTUI 6's app informs the user about the greenhouse's status through two colourful rings. The green one notices the user that all is ok, while the red one warns the user that there are problems. Furthermore, the greenhouse can be activate or disable in every moment, allowing the shut down of lights that helps the plants' growth.






FUTURE DEVELOPMENTS

PLANTUI 6 has been designed with the aim to combine quality and functionality of advanced technologies. The device has been developed with the ambition to provide to users a free access to one's **own domestic garden**, overthrowing space barriers and competence limitations, without preventing from focusing on issues such as sustainability and awareness.

The background of the slide is a photograph of a lush forest. The upper half shows the dense canopy of green trees, with some leaves appearing bright yellow-green due to sunlight. The lower half shows the same forest reflected in a still body of water, creating a symmetrical effect. A semi-transparent dark green horizontal band spans the middle of the image, serving as a backdrop for the title.

CONCLUSIONS

A close-up photograph of vibrant green leaves, likely from a plant like ivy, set against a dark, textured background. The leaves are clustered in the upper right and bottom right corners, with some leaves showing detailed vein patterns and slight imperfections like small holes or brown spots.

At the end of our review, we can surely state that the applications of ubiquitous computing applied to the agriculture and home gardening's fields, are growing day by day. In fact, companies are creating smart solutions in order to reach a new slice of the global market. These ones are trying to win a double challenge: to increase usability optimizing Earth's critical conditions and, at the same time, raise their profits with some appreciate and ubiquitous solutions.

THANK YOU FOR YOUR ATTENTION!

Costantino Federica

Castronuovo Pasquale

Letizia Mattia

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Farming 4.0