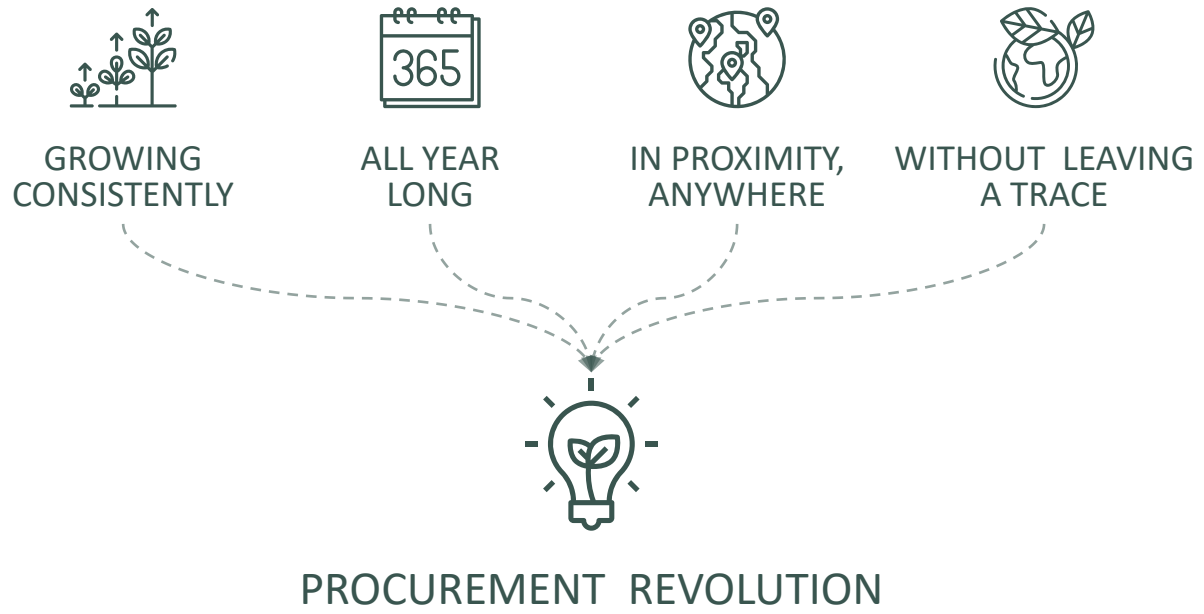
Planet Farms

LAYMAN'S REPORT

FEBRUARY 2023

PLANET FARMS **LIFE PROJECT**

Innovative air treatment, hydroponic irrigation and automated systems for the first industrial vertical farm in EU



INTRODUCTION

WHY CONTROLLED ENVIRONMENT AGRICULTURE?

Climate change, water scarcity and biodiversity loss are putting pressure on the agricultural sector to innovate. Traditional food systems alone will struggle to feed 10bn people by 2050, which experts estimate will require a 70% increase from current levels of global food production, while lowering CO_2 emissions by 67% from 2010 levels (World Resources Institute).

This will be a particular challenge considering increasingly limited land availability, decreasing productivity gains in crop yields and extreme weather events, all of which are also negatively affecting the nutritional content of food. Furthermore, agriculture accounts for approximately 70% of global water use, and for as much as 95 % of water use in predominantly agriculture-based economies. The problem is not so much related to the number of resources needed but how they are used and, above all, why they are wasted. In Italy alone, approximately 100 million m^3 of water are used in agriculture each year. Despite the challenges ahead, the agriculture sector has traditionally been data-dumb and completely reliant on climatic conditions. New technologies are coming to life to help improve efficiency in the food production value chain, both upstream and downstream. Planet Farms' end-to-end industrial approach has set a new paradigm for crop growth, combining hardware, software and agronomy to help tackle the industry's challenges.

AGRICULTURE TODAY

SITUATION BEFORE PROJECT START

The industry standard for horticulture has evolved from open-field to production in greenhouses of varying technological development. While greenhouses can at best partially control growing environments, thus shielding crops from climate shocks, yields remain threatened by pathogens meaning that crops still require chemical treatment, which affects human health and product quality while requiring higher labour costs. Furthermore, water usage remains high, caused not only by the imprecise irrigation systems but also by washing cycles required as a result of pesticide and fertiliser use - according to FAOSTAT, 486.253,72 tonnes of pesticides have been used in Europe in 2016.

While vertical farming, as a form of controlled environment agriculture, has existed for some time, at the start of the project there was no farm in Europe using end-to-end automation to deliver high quality products at scale while achieving significant water, pesticide and fertiliser savings.

PLANET FARMS LIFE PROJECT

The goal of the Planet Farms Life project was to build and operate, for the first time in the EU, an industrial vertical farm with a net growing area of 10.000 m_2, dedicated to the production of leafy greens and aromatic herbs.

By building, operating and selling products at scale, Planet Farms has demonstrated that technology can be used to supplement today's agricultural practices with growing processes that are less resource intensive.

From project kick-off, Planet Farms, as lead for the project, gathered data to optimise the farm's operations, making use of their innovative automation, air treatment and irrigation systems to demonstrate the achievements listed to the side, in line with the LIFE programme's priorities.

The Planet Farms Life project started on 1 September 2019.

88% (vs greenhouse)
95% (vs open field)
REDUCTION IN WATER USAGE

95% (vs greenhouse)
96% (vs open field)
REDUCTION IN FERTILISER USE

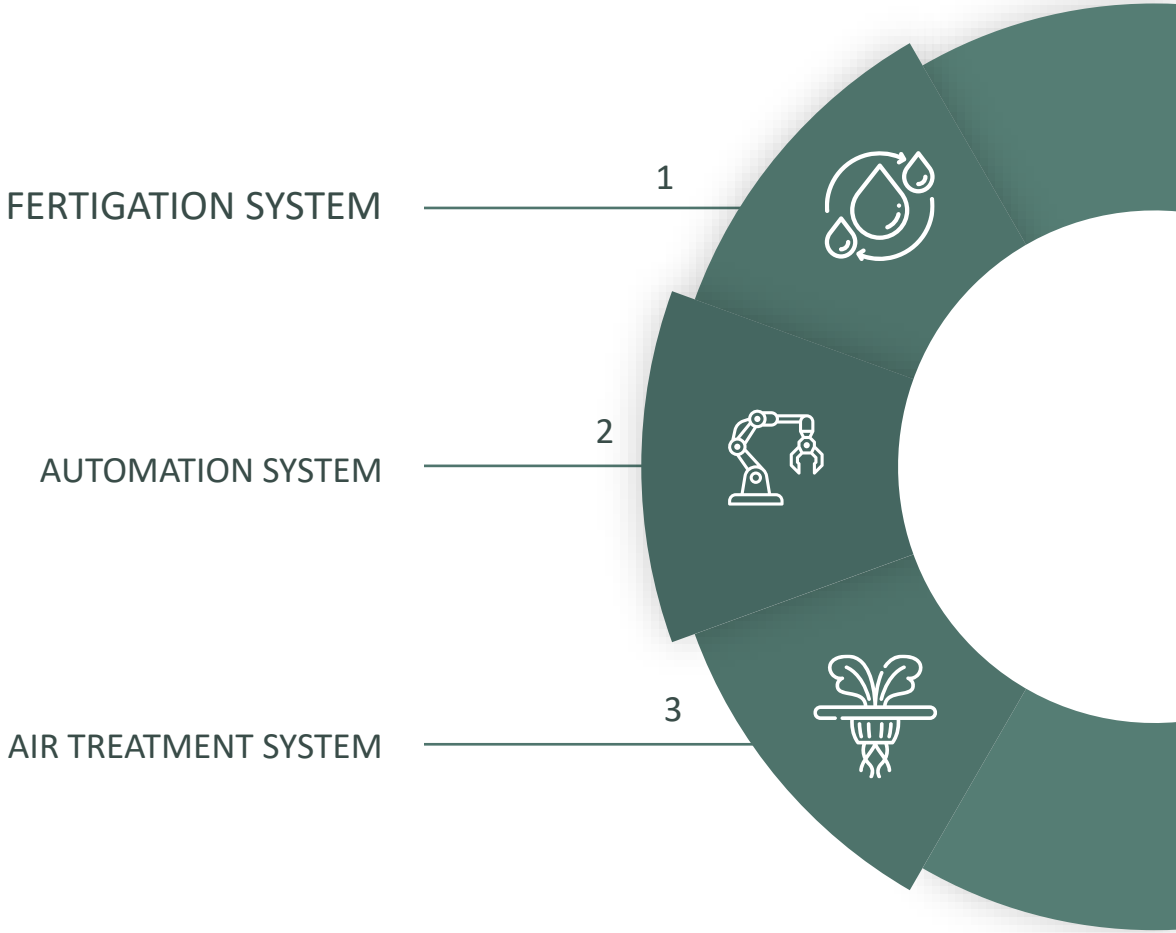
100%
REDUCTION IN PESTICIDE / HERBICIDE USE

THE INSTALLED TECHNOLOGY

SETTING UP THE CORE GROWING TECHNOLOGY

In Planet Farms' facility, the crops enter as seeds and are then sown, grown and harvested automatically - exiting as bagged, ready-to-eat produce. They are cultivated in vertically stacked racks, within growing rooms that are designed to provide them with the optimal growing conditions - shielding seedlings from externalities that affect their nutritional content and deliciousness.

Planet Farms' innovation brings together three technological systems that together guarantee low-impact growth of specific crops, as shown on the side.



THE INSTALLED TECHNOLOGY

FERTIGATION SYSTEM

The fertigation system is responsible for providing plants with water and nutrients. In order to reduce water consumption, the system targets only the roots of the plants, thanks to micro-perforated trays through which the roots can absorb nutrient-enriched water directly from their containers.

Excess water is drained into special tanks and is then filtered and sterilised with UV lamps. Once treated, the water is replenished with the missing nutrients (which have been absorbed by the plants) and is ready to be reintroduced into the circuit.

THE INSTALLED TECHNOLOGY

AUTOMATION SYSTEM

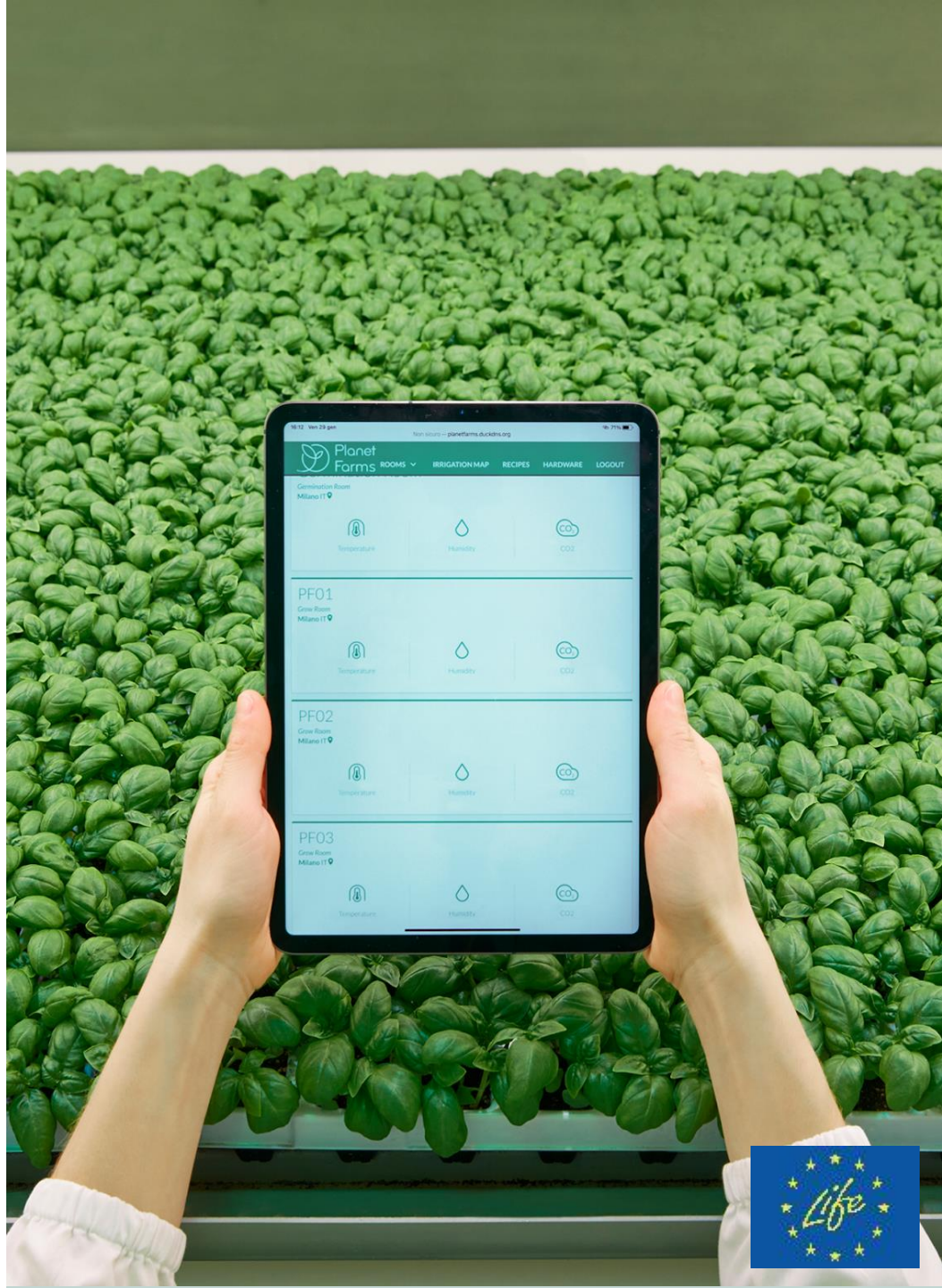
The second growing technology to be installed was the automation system. This system guarantees an efficient transition from seed to ready-to-eat product without compromising on food safety and quality. Furthermore, the automation system plays a crucial role in delivering water savings, as no employees need to come into contact with the product, meaning no washing steps are required.

The automation system can be divided between the ‘horizontal’, conveyor belt machinery (production lines for sowing, cutting, tray washing and packaging) and the ‘vertical machinery’ (robots that travel between racks to take photos of the plants and handle the insertion and removal of trays in the growing rooms).

THE INSTALLED TECHNOLOGY

AIR TREATMENT SYSTEM

The third and last system to be installed was the climate control system. Planet Farms' air treatment units are the core of its differentiating technology - they allow for precision control of key parameters such as CO_2 concentration, temperature and humidity within the growing chambers. The air is constantly recirculated, filtrated and enriched with CO_2 necessary for plant growth, ensuring the environment meets the most stringent ISO standards.



MEASURING **PROJECT IMPACT**

KEY RESULTS INCLUDE

ENVIRONMENTAL IMPACT

- **WATER CONSUMPTION: 16 LITRES / KG** (-95% vs open field and -88% vs greenhouse)
- **FERTILIZERS USE**: **0,0032 KG / KG** (-96% vs open field and -95% vs greenhouse)
- **NO PESTICIDES AND HERBICIDES USE**

SOCIAL-ECONOMIC IMPACT

- **28 PEOPLE HIRED DURING PLANET FARMS LIFE PROJECT**
- **MORE THAN 500 STORES, RESTAURANTS AND CANTEENS SERVED**

AWARENESS **RAISING**

- **329 PEOPLE SIGNED NDA TO ACCESS THE PLANET FARMS FACILITY DURING PLANET FARMS LIFE PROJECT**
- **2,4 K WEBSITE VIEWS**

LOOKING AHEAD TO PLANET FARMS' FUTURE

HOW THE EU LIFE PROGRAMME FUELLED OUR GROWTH

Without the support of the EU Life Programme Planet Farms could not have launched production at the speed and scale it did. The team is proud to, for the first time in Europe, present a fully automated, industrial vertical farm that can bring nutritious, sustainable and delicious produce close to consumer hubs.

Planet Farms is now focusing on replicating the model in new countries, at even larger scale, while achieving impressive efficiency gains both on space and energy use. With the collaboration and current and new partners, the journey to provide sustainable, healthy greens to ever growing population segments is only beginning.

VISIT OUR LIFE **PROJECT WEBSITE** AT

LIFE.PLANETFARMS.AG