Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools

WeLASER
Eco-innovative weeding with laser

Sustainable agriculture and natural resources: WeLASER

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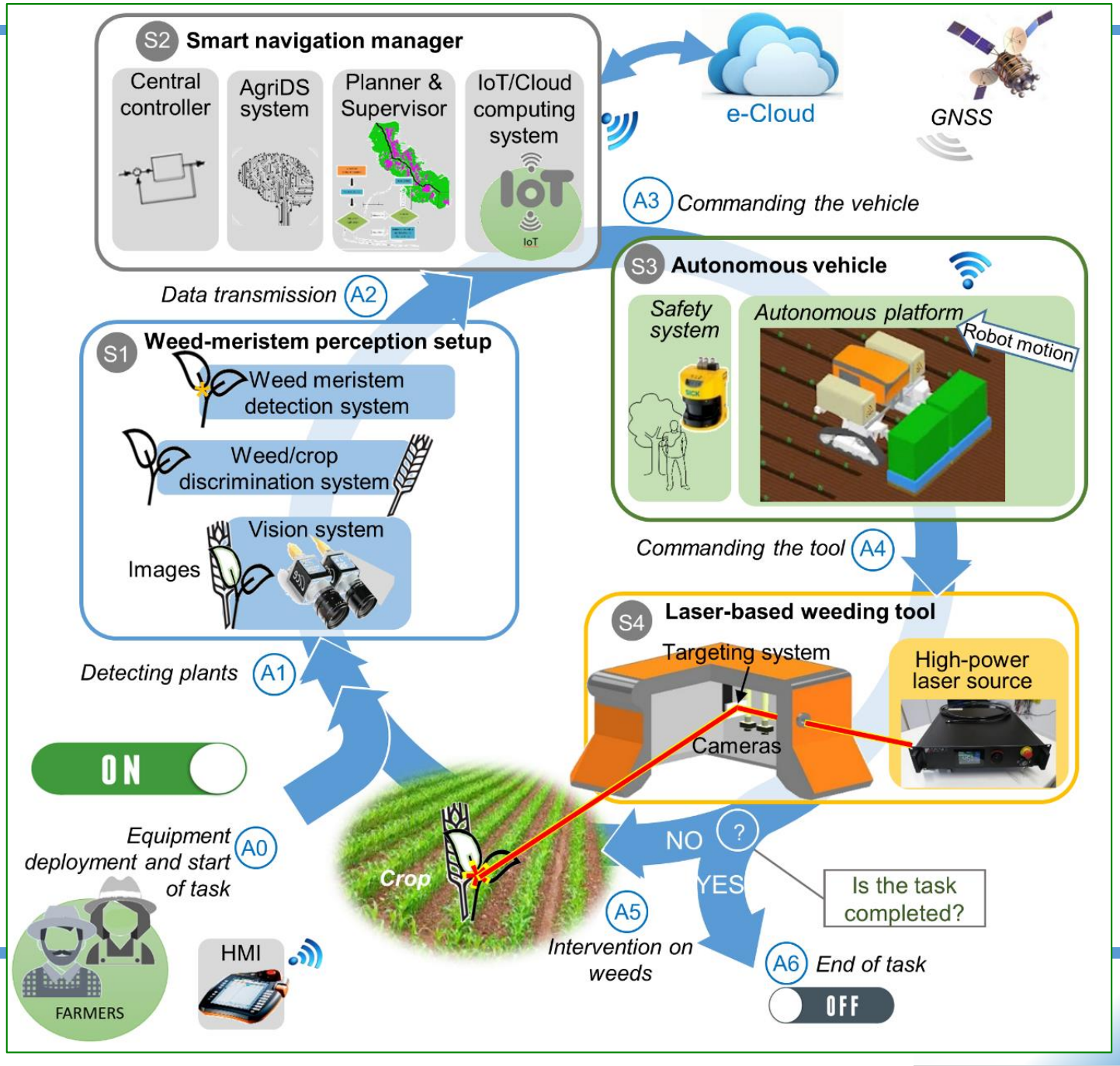
CSIC Consejo Superior de Investigaciones Científicas
FUTONICS
LZH Laser Zentrum Hannover e.V.
University of Copenhagen
AGREENCULTURE Smart robots for smart farming
COAG
Alma Mater Studiorum Università di Bologna
IETU Instytut Ekologii Terenów Uprzemysłowionych
Ghent University
van den borne aardappelen

Project & main aim

- **Title**
  - **Sustainable weed management in agriculture with laser-based autonomous tools (WeLASER)**
- **Call/Type**
  - H2020-SFS-04-2019-020, "**Integrated health approaches and alternatives to pesticide use**" / **Innovation Action (2020-2023)**
- **Main aim**
  - WeLASER aims to merge current technologies to build and push close to the market a precision weeding system based on irradiating the weed meristems with a high-power laser source with the main objective of eliminating the use of herbicides and their health and environmental adverse effects

System breakdown



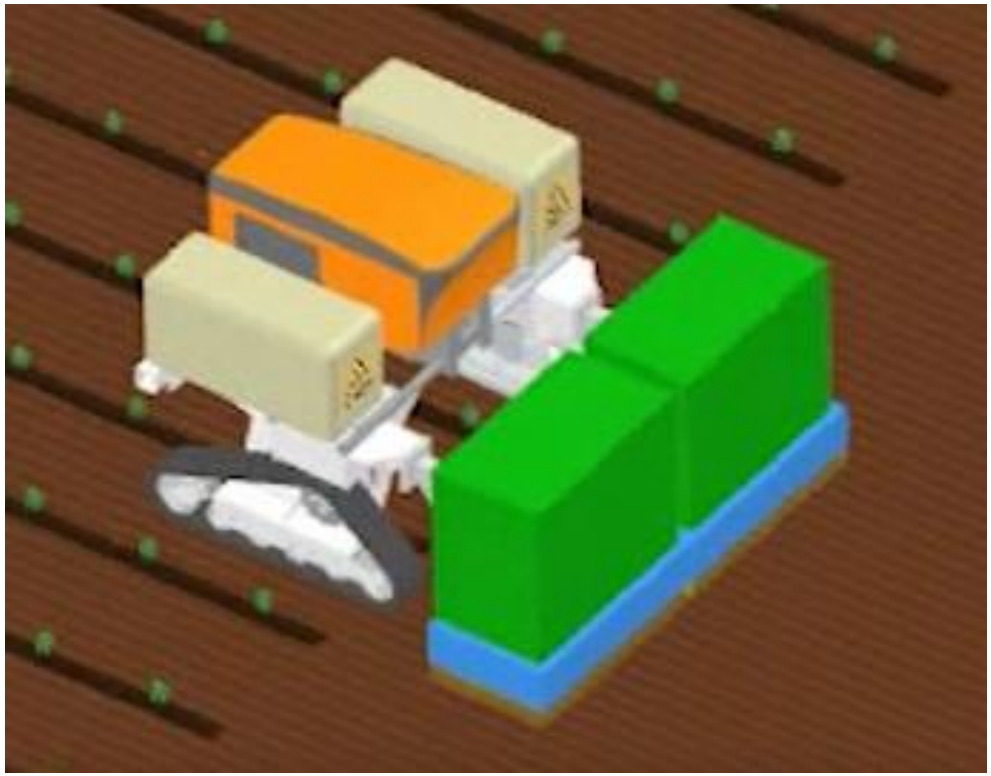
Consortium

1- Spanish National Research Council (CSIC)
2- Futonics (FUT)
3- Laser Zentrum Hannover (LZH)
4- University of Copenhagen (UCPH)
5- Agreenculture (AGC)
6- Coordinator of Farmer Organizations and Livestock Rural Initiative of Spain (COAG)
7- University of Bologna (UNIBO)
8- Institute for Ecology of Industrial Areas (IETU)
9- Ghent University (UGENT)
10- Van den Borne Projects (VDBP)

Status

Technical characteristics

- Total weight: ~1243 Kg
- Treatment efficiency: ~65%
- Treatment speed: ~2 Km/h
- Treatment rate:
  - ~4.8 Ha/day – 1st phase
  - ~9.6 Ha/day – 2nd phase
- Position accuracy: ±3 mm
- (2+2)-row wide
- Clearance: > 25 cm
- Treatment speed: ~ 2 Km/h



Strategies for system implementation

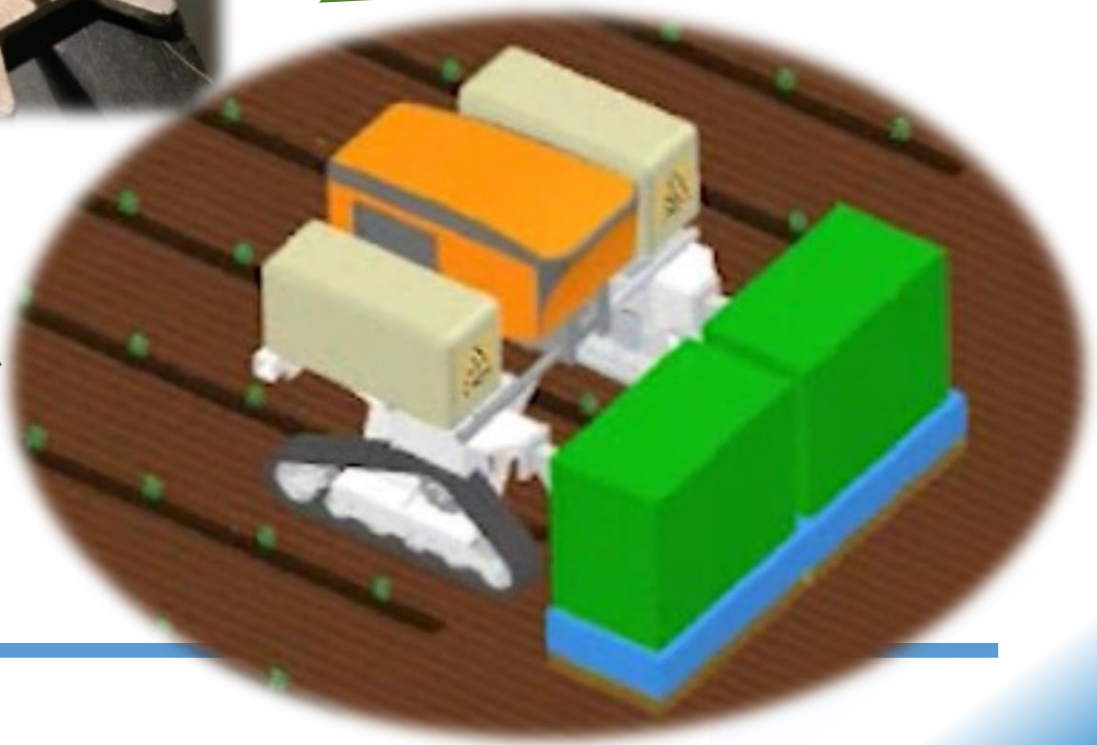
- Safety requirements
- Operational constraints
- Economical / business matters
- Legal issues

Status

Futonics (February 2021)

UCPH & LZH

Agreenculture (June 2021)



Additional information: Practice Abstracts

Practice Abstract 1
An efficient and profitable weeding system friendly with the environment and health -WeLASER project is on its way
English | Español
by CSIC

Practice Abstract 2
Stakeholders help defining the WeLASER system specifications
English | Español
by COAG/CSIC

Practice Abstract 3
Selecting target crops for laser weeding testing
English | Español
by UCPH

Practice Abstract 4
Selecting plants for the initial lase-weeding
English
by UCPH

Practice Abstract 5
Strategies for weeding with laser
English | Dansk
by UCPH

Practice Abstract 6
IoT in robotic systems for agriculture
English | Italiano
by UNI

Practice Abstract 7
Cloud Computing in robotic systems for agriculture
English | Italian
by UNIBO

Practice Abstract 8
Laser technology for weed management
English | Deutsch
by LZH

Practice Abstract 9
Weed management – safety requirem for laser outdoor usage
English | Deutsch

WeLASER
Eco-innovative weeding with laser

Practice Abstract N. 4

Selecting plants for the initial laser-weeding test

Why Laser?

The fast development in laser technology seems to open up new opportunities for weed control based on electricity. Laser beams can deliver high-density energy on selected spots, which warm up the plant tissue and may result in plant death.

When to control weeds with a laser?

Laser weeding should be done early in the growing season when weeds only have developed a few leaves for monocots and 2–4 permanent leaves for dicots. The smaller the weeds are, the more sensitive they are to the laser treatment. However, if treatments are done too early in the growing season, some weeds may escape the treatments because they germinate later. In such cases, the treatment has to be done several times to reduce weed pressure significantly. Therefore, it is essential to decide the right time to control the weeds and that depends on factors such as the weed flora composition, crop type and the weather.


Common chickweed (*Stellaria media*) at three stages of development

The weed flora

In WeLASER, we study in detail how different types of weeds react to the laser treatment. We study the dose-response relationship by treating weeds with lasers with different energies in different time periods at different growth stages. We focus on common annual grass weeds, dicots and some perennial weed species (*Chenopodium album, Stellaria media, Poa annua, Alopecurus myosuroides, Viola arvensis, Sonchus arvensis, Cirsium arvenses*). optimizing the control using as less energy as possible.

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Date: 25 January 2021

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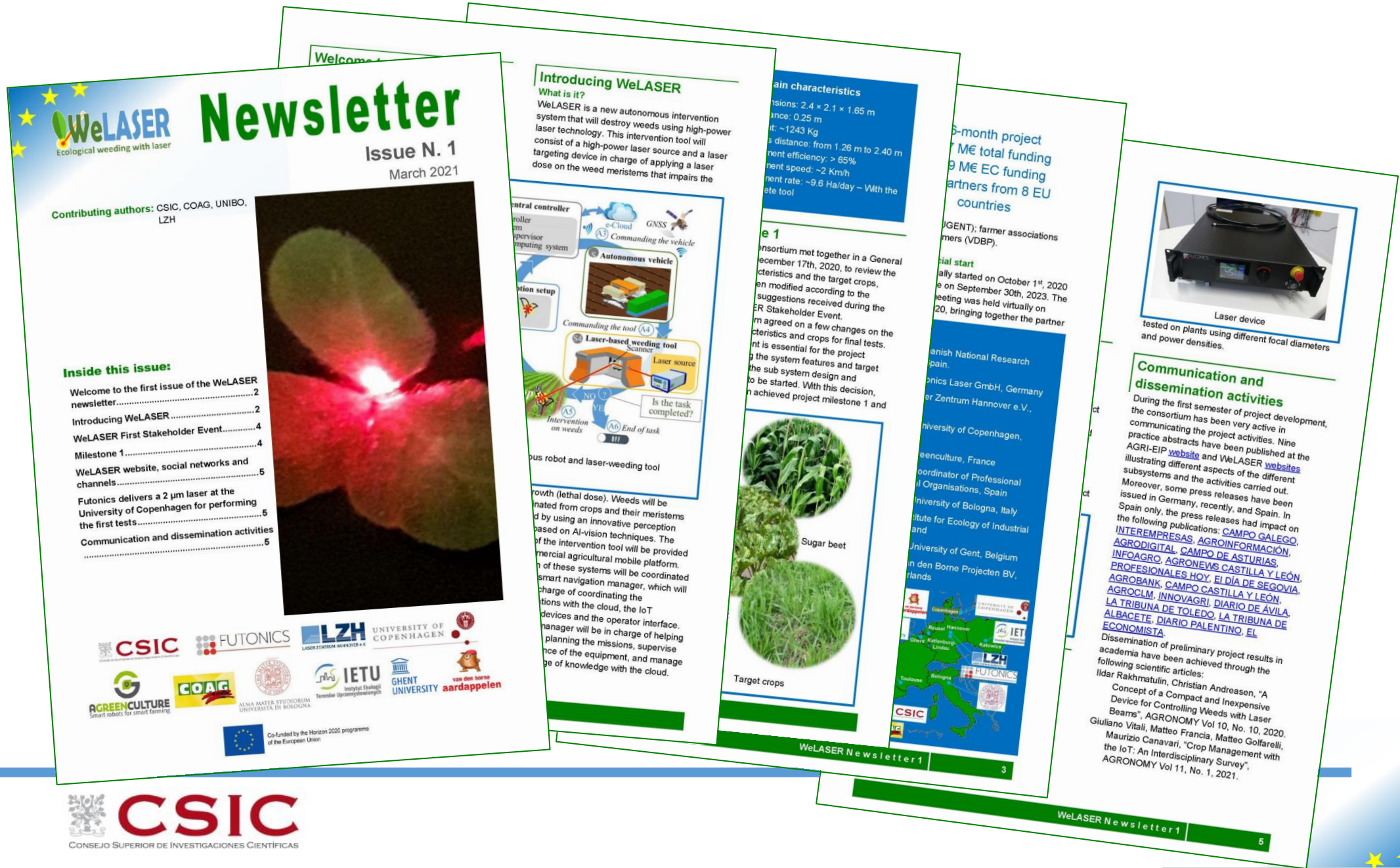
Additional information: Newsletter



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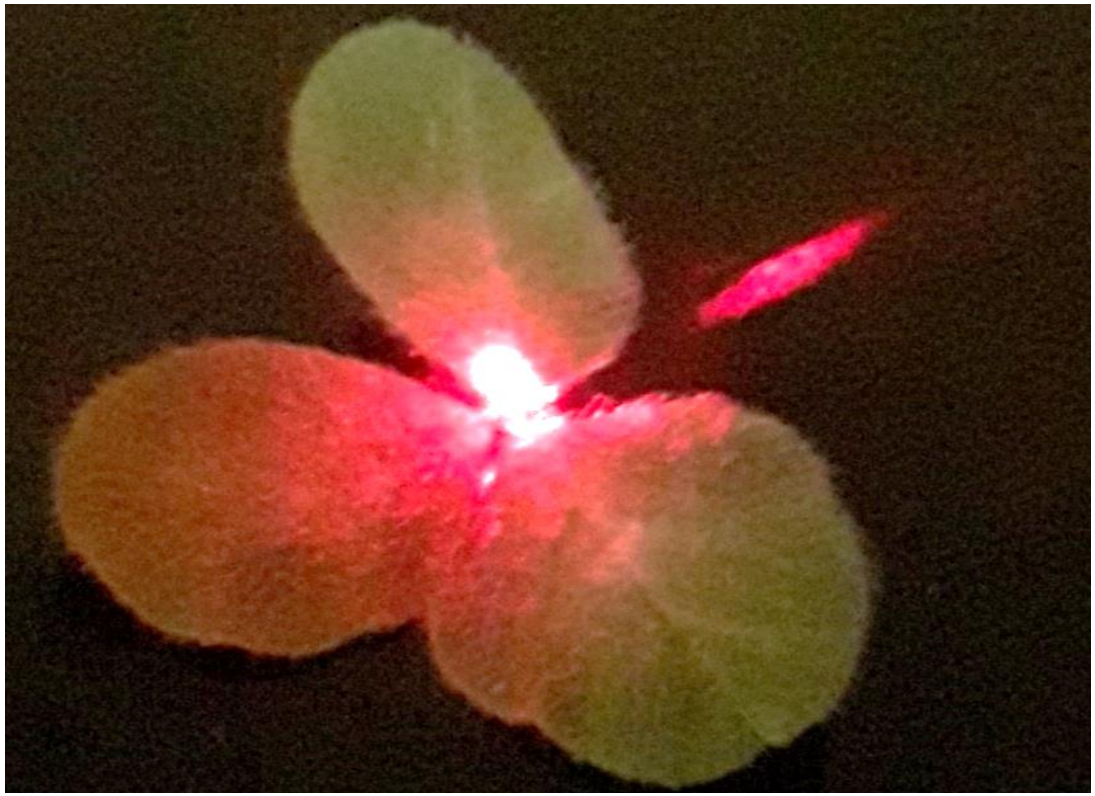

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