

Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools

D6.9 – Exhibition, demonstration and training activities









Funded by the Horizon 2020 programme of the European Union



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Disclaimer

The views and opinions expressed in this document are solely those of the project, not those of the European Commission.

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Approved by	 Pablo González-de-Santos (CSIC) * Report; Prototype; Demonstrator; Other. **Public; Restricted to other programme participants (including the Commission Services); Restricted to a group specified by the consortium (including the Commission Services); Confidential, only for members of the consortium (including the Commission Services).



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EXECUTIVE SUMMARY

This deliverable provides a detailed overview of the exhibition, demonstration and training activities carried out during the project to allow end-users, professionals, authorities and students to "touch" the prototype in different events, from international fairs to demonstration field days and specialised training activities like the WeLASER Summer School.



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1. PLAN FOR EXHIBITIONS AND DEMONSTRATION

A plan for exhibition, demonstration and training activities was discussed and elaborated taking into account the availability of crops for the field days and the trade fair dates to attend to maximise the impact and to optimise the dissemination of the result of the project and to obtain feedback from endusers and professionals to adapt the development of the prototype to the real user needs.

Regarding the demonstration activities, after internal discussions and several proposals, a modification to the tentative dates indicated in the DoA for Field and Demo Days was agreed in the Steering Committee meeting in Hannover on October, 20th 2022. Those modifications were based on the final integration dates of the prototype, the availability of crops and the preferences of the partners in charge of the organisation of the different events to take into account adequate attendance to the events. After this decision, fine-tuning of the dates was needed to adapt some of the events to specific national or regional conditions and, regarding the final demo, to accommodate the attendees' participation. Therefore, the final dates can be summarised as:

- Intermediate demonstrations:

- Field and Demo Day on July 26, 2023, in Madrid, Spain, organised by COAG.
- Field and Demo Day on August 18, 2023, in Taastrup, Denmark, organised by UCPH.
- Field and Demo Day on August 24-26, 2023, in Reusel, The Netherlands, organised by VDBP.

- Final demonstration:

- Final Field and Demo Day on September 28, 2023, in Madrid, Spain, organised by CSIC and COAG.

Regarding the participation in fairs and exhibitions, the consortium agreed that participation in national and regional fairs was in line with the target of allowing the end-users to get in touch with the evolution and results of the project. Several proposals of participation in this kind of fairs were attended during the project's lifespan and, after an evaluation, a decision was made. Regarding international fairs, participation in SIMA and Agritechnica was finally considered because of their importance in machinery and innovation and because they provide an adequate opportunity to show the results of the WeLASER project to end-users and all other dissemination targets.

2. EXHIBITIONS AND FAIRS

The WeLASER consortium participated in several exhibitions and fairs. International trade fairs were the main objective, but other relevant national and regional fairs and exhibition events were considered.

2.1.EIMA 2021

The EIMA 2021 event, previously held in 2020 and postponed-, was finally held on 19-23 October

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2021. More than 200,000 visitors, each dressing his/her mask— proved the wish to escape from the closure of the previous period, while the 1300 companies occupied every space of the Bologna expo centre. Most of the expo was oriented to traditional field machinery, with a trend toward electric engines and an increasing interest in security. Most robotic applications are given by garden mowers, some re-branding other's products (e.g. Husqvarna), others produced directly (several in Italy). Their market seems to be in good health and growth, and they are looking at other robotic applications in landscape management with interest. Some autonomous vehicles for field crop management were presented at EIMA. UNIBO delegated had the opportunity to distribute WeLASER flyers and speak with people selected from those involved in Robotics and Software applied to Agriculture (e.g. In4Agri, Elaisian, Evogreen, IBF), and interact with other EU projects, namely EU "interreg" Transfarm 4.0.

2.2.FIRA 2021

WORLD FIRA is a world expert event in Agricultural Robotics held in Toulouse, France, on December 7-9, 2021, with more than 3.000 physical or online attendees, including researchers, engineers, robot manufacturers, agricultural businesses, investors, suppliers, producers and entrepreneurs from around the world. The event consisted of conferences, round tables, pitches, an exhibition zone, and a scientific conference.

WeLASER was represented in the exhibition zone by AGREENCULTURE (see its booth in Fig. 1) and at the scientific conference by Christian Andreasen (UCPH) and Jesus Herrara-Diaz (CSIC), who gave two talks on WeLASER.



Figure 1. AGREENCULTURE booth at FIRA-2021.



2.3.OEKO-FELDTAGE 2022

LZH presented the WeLASER project at their own booth at Öko-Feldtage 2022 in VillmarAumenau, Germany. Approximately 11,500 visitors – among them the German federal minister for Food and Agriculture Cem Özdemir – attended this largest German field day event in a 20-hectare area from the 28th to the 30th of June 2022. The attendees included farmers, researchers, politicians, and the general public interested in organic agriculture. LZH showed roll-ups, videos and a live demo of laser weeding as one of 20 innovation examples invited to the fair (Fig. 2).



Figure 2. LZH booth at OEKO-FELDTAGE-2022.

2.4. SIMA 2022

The Salon international des solutions et technologies pour une agriculture performante et durable (SIMA) is an international forum that celebrated its centenary this year. SIMA 2022 took place from November 6 to 10, 2022, in Paris Nord Villepinte. With attendees from all areas of the profession, this trade fair strengthened its position as an industry leader with a new focus, expanded content, and an enhanced display of innovations across the agricultural sector.

AGREENCULTURE (AGC), with its own booth to exhibit its products, also disseminated the WeLASER status and its preliminary project results through the projection of several videos and the distribution of flyers (Fig. 3). AGC also received comments and answered questions about the project at their booth.

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Figure 3. AGREENCULTURE booth at SIMA-2022.

2.5. DATAGRI 2022

WeLASER project was presented at the DATAGRI-2022 event by COAG. The main characteristics of the project and its progress were explained, focusing on the possibilities for farmers as a non-chemical alternative tool to deal with weeds. The DATAGRI Forum, held in El Ejido, Almeria, Spain, on November 10-11, 2022, had the objective of bringing digitisation closer to farmers. After five editions, it is consolidated as the meeting point for the most relevant actors. From the producer to the consumer, DATAGRI brings together all the agents of the agri-food chain to present technological innovations, establish new synergies and generate opportunities to work for sustainable, safe, and high-quality agriculture.



Figure 4. Alvaro Areta (COAG) introducing WeLASER at DATAGRI.



The V edition of the DATAGRI Forum was closed with a global audience of 15.3 million impacts (11.8 on social networks, streaming with 900 hours of viewing from 17 different countries, 2,275 tweets during the event, and 3.5 million through the media). In addition, more than a thousand professionals met personally to analyse the present and future of the digital transformation of the agri-food sector (800 people during Forum Day and 400 on Green House Day).

During the DATAGRI event, Alvaro Areta, the COAG beneficiary representative, presented the WeLASER Project to the attendees (Fig.4). He explained the main project objectives, the characteristics of the prototype and the results obtained at that moment. He also described the multiactor approach applied in the project, detailing the possibilities for the attendees to participate and collaborate in the WeLASER project.

2.6. Agritechnica 2023

Agritechnica is one of the main world fairs for agricultural machinery with the principal market leaders at one location. Exhibitors from around the world show solutions and visions for modern crop production. More than 400,000 visitors from 144 countries and more than 1,400 journalists and bloggers from 50 countries. Agritechnica 2023 took place from November 9 to 15, 2023, in Hannover (Germany).



Figure 5. LZH booth at Agritechnica-2023 exhibiting a WeLASER prototype.

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(a)





Figure 6. (a) LZH team; (b) WeLASER beneficiary representatives from UNIBO (G. Vitali) and LZH (M. Wollweber).

(b)

Laser Zentrum Hannover (LZH), with its own booth to exhibit its products, disseminated the WeLASER project. Specific information about the project results were disseminated through the presentation of videos and the distribution of leaflets. LZH received comments and answered questions about the project at their booth. Also, UNIBO representatives were participating at the fair to disseminate the results of WeLASER to colleagues for future collaboration and companies for product exploitation.

The WeLASER project was very well received by the audience: producers of agricultural machinery and farmers inquired on launch dates, cost and performance of the WeLASER device as a product and some European SMEs active in plant protection and even laser weeding sought for possible future collaboration for exploitation of components (laser weeding modules) or future R&D support.

3. DEMONSTRATIONS

The WeLASER consortium organised intermediate demonstrations at real scenarios in Spain, Denmark, and The Netherlands. These demonstrations had the format of "field day" for professionals and "demonstration" for broader audiences, including government representatives, academia and mass media. The main aim of these activities was to allow end-users, professionals and authorities to get in touch with the equipment and obtain their feedback about its functionality and possibilities.

The people who participated in the events were asked to complete a questionnaire about the WeLASER weeding system. The questionnaire form is included in Annex A, and the responses are analysed in Deliverable D5.3, which covers the integration, testing, evaluation, and impact of the



equipment on crops and soil.

3.1. First Field & Demonstration Day (Madrid, Spain)

COAG organised the first Field Day in the facilities of the Centre for Automation and Robotics (CAR-CSIC), Arganda del Rey (Madrid, Spain) on July 26th, 2023.

The main objective of this Field Day was to introduce end-users, professionals, authorities and students to the equipment. Experts from European institutions, national authorities, NGOs, the crop protection industry and farmers' associations were able to see the prototype in action. An exchange about its functioning and possibilities was established. Helpful and high-value comments were provided by participants to improve the development of the prototype and to prepare the final demonstration, scheduled for 29 September 2023, taking into account their recommendations and ideas.

The agenda of the event is included in Section 3.1.1.1. The event started at 10:00 a.m. and finished at 1.30 p.m. The list of attendees is included in Section 3.1.1.2. The slides of the presentations were collected and distributed to the attendees. Simultaneous translation (English – Spanish – English) was provided to ensure the proper participation of Spanish attendees, especially of farmers and final users. Some photographs of the session are included in Section 3.1.1.3.

A detailed description of the Field Day is provided below:

Project overview (Auditorium)	After a short welcome and introduction of the purpose of the	
	Field Day by Álvaro Areta (COAG), Pablo Gonzalez de	
	Santos (CSIC, Project coordinator) explained the general	
	objective and achievements of the WeLASER project. He	
	presented the consortium and the principal roles of each	
	member, providing a general overview of the project.	
	Participants were briefed on relevant risks prevention	
	regarding using machinery and laser equipment.	
Explanation of the	The explanation was developed in the following order:	
components of the prototype	Pablo Gonzalez de Santos and Luis Emmi (CSIC)	
(Laboratory)	began this section with a presentation of the generic	
	characteristics of the platform (load capacity, power,	
	speeds, etc.).	
	Luis Emmi (CSIC) also explained to participants how	



the robot configuration and integration process works.

- The presentation of the distribution of high-power laser units was given by Karsten Scholle (FUTONICS)
- Hendrik Sandmann (LZH) introduced the weeding implement.
- Matteo Golfarelli and Giuliano Vitali (UNIBO) presented about IoT sensors.

Throughout the explanation, the participants were very active, expressing their questions and opinions to the different presenters, for instance, regarding the workload capacity or the possible power sources.

After the coffee break, the robot travelled in autonomous mode from the High Bay Laboratory to the demonstration fields (the robot was stopped before starting treatment).

Demonstration of the	The demonstration took place in CSIC's experimental fields	
prototype (Experimental	on sugar-beet and maize crops. The participants arrived at	
Field)	the field and positioned themselves in the observation area.	
	 Luis Emmi (CSIC) showed how to power up the robot 	
	and access the user interface.	
	 Marco Arru (UNIBO) demonstrated the launching of a 	
	mission for the first time to the participants.	
	Participants could observe the execution of the	
	mission in a maize field (one way and one return)	
	through the observation area.	
	 Merve Wollweber (LZH) explained the laser's effects 	
	on the crop when the mission ended. The attendees	
	approached the field.	
	Moreover, Merve's colleague, Hendrik Sandmann,	
	explained the precision of the targeting system with	
	the prototype in static at high power.	
	 A second demonstration of launching a mission was 	
	carried out by Marco Arru (UNIBO). In this case,	
	participants could observe the robot executing a	
	mission in a sugar beet field (a going and a return).	
	The attendees stayed in the observation area.	
	After returning to the high hey leberatery nerticinents were	

After returning to the high bay laboratory, participants were



trained on using the user interface and creating maps and missions by Luis Emmi (CSIC) and Giuliano Vitali (UNIBO).

3.1.1. Agenda of the 1ST FIELD & DEMONSTRATION DAY

July 26th, 2023

Address: CENTRE FOR AUTOMATION AND ROBOTICS (CAR-CSIC), Ctra. De Campo Real KM 0,200 (28500) Arganda del Rey. Madrid (Spain) <u>https://www.car.upm-csic.es/contact/</u>

FIELD & DEMONSTRATION DAY		
10:00 – 10:30	WELCOME AND REGISTRATION	COAG
10:30 – 10:45	PROJECT OVERVIEW (Auditorium)	Pablo GONZALEZ-DE-SANTOS (CSIC) - Project coordinador
10:45 – 11:15	EXPLANATION OF THE COMPONENTS OF THE PROTOTYPE (Laboratory)	CSIC, LZH, FUTONICS, AGREENCULTURE, UNIBO
11:15 – 11:30	COFFEE BREAK	
11:30 – 13:30	DEMOSTRATION OF THE PROTOTYPE (<i>Experimental Field</i>)	CSIC, LZH, FUTONICS, AGREENCULTURE, UNIBO
13:30 – 14:30	Lunch	

3.1.2. List of attendees

External Participants

Name	Country	Company / Organization	Role
Michele Pasini	Switzerland	IseppiFrutta	Stakeholder
Damian Kacperek	Poland	The Institute of Precision Agriculture	Stakeholder
Joran Barbry	Belgium	INAGRO	Stakeholder
Lambertus Van Loon	The Netherlands	Weed Control	Stakeholder
Luís López	Spain	ACOR	Stakeholder
Joaquín Ortiz	Spain	ACOR	Stakeholder
Esther Ciria	Spain	Unión de Agricultores y Ganaderos de Aragón	Stakeholder
Joaquín Castillón	Spain	Unión de Agricultores y Ganaderos de Aragón	Stakeholder
Pablo Franco	Spain	Unión de Agricultores y Ganaderos de Aragón	Stakeholder
Ricardo Guillén	Spain	Unión de Agricultores y Ganaderos de Aragón	Stakeholder
Ivanna Martínez	Spain	Asociación de Ganaderos Independientes de Madrid	Stakeholder
Pablo Anido	Spain	Asociación de Ganaderos Independientes de Madrid	Stakeholder
Andrés Góngora	Spain	COAG	Stakeholder& Speaker
Carlos Romero	Spain	МАРА	Stakeholder& Speaker

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Evelyne Alcázar	EU Level	IFOAM	Stakeholder& Speaker
Carlos Palomares	EU Level	CROPLIFE EUROPE	Stakeholder& Speaker
Patricia de Almandoz	EU Level	COPA-COGECA	Stakeholder& Speaker
Jose Manuel Roche	EU Level	European Economic and Social Committee	Stakeholder& Speaker

Stakeholder attendance by professional competence



WeLASER Consortium participants

Name	Consortium member
Roemi Fernández	CSIC
Luis Emmi	CSIC
Pablo Gonzalez-de-Santos	CSIC
Pedro M. Martín	CSIC
Ruth Córdova	CSIC
Eloida Cortiñas	CSIC
Manuel Linares	COAG
Mari Carmen García	COAG
Cristina Sanz	COAG
Álvaro Areta	COAG
Juan Yuri	COAG
Hendrik Sandmann	LZH
Malte Worzischek	LZH
Merve Wollweber	LZH
Janusz Krupanek	IETU
Paul Van Zoggel	VDBP
Paul Colleague	VDBP



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Marco Arru	UNIBO
Matteo Golfarelli	UNIBO
Guiliano Vitali	UNIBO
Karsten Scholle	FUTONICS

3.1.3. Photographs of the event

Introducing the event



Welcome (A. Areta, COAG)



Introducing the WeLASER project (P. Gonzalez, CSIC)

Introducing WeLASER system



L. Emmi (CSIC) – General Overview and Main Controller





H. Sandmann (LZH) - Perception system and G. Vitali (UNIBO) - IoT sensor network targeting system

K. Scholle (FUT) – High-power laser source







M. Golfarelli (UNIBO) – Cloud Computing System



Overall discussion

In the experimental field



L. Emmi (CSIC) - Introducing the demo



Following the mission on the screens



WeLASER system carrying out a mission (a)



WeLASER system carrying out a mission (b)







M. Wollweber (LZH) commenting on the perception/targeting system



Observing the laser shots

3.2. Second Field & Demonstration Day (Taastrup, Denmark)

University of Copenhagen organised the second Field Day on August 18th, 2023, in the research facility Højbakkegaard, Taastrup, belonging to the University of Copenhagen.

Stakeholders from all over Denmark were invited to the demonstration, and about 45 people from seed and horticultural industries, farm advisory services, agricultural innovators, farmers, and researchers finally attended the event. The main objective of this Field Day was to introduce end-users, professionals, authorities and students to the equipment, and they could see the prototype in action.

The agenda of the event is included in Section 3.1.2.1. The date started at 09:30 a.m. and finished at 11.30 a.m. The list of attendees is included in Section 3.1.2.2. Some photographs of the session are included in Section 3.1.2.3.

and welcomed the participants to the auditorium. He presented the program and introduced Pablo Gonzalez de Santos (project coordinator) to the guests.Project Overview (auditorium)Pablo Gonzalez de Santos presented a short overview of the WeLASER project. He gave a 20-minute briefing about: • The key points of the project (objective, duration, consortium, etc).• The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).	Welcome (auditorium)	Associate Professor Christian Andreasen opened the event	
presented the program and introduced Pablo Gonzalez de Santos (project coordinator) to the guests.Project Overview (auditorium)Pablo Gonzalez de Santos presented a short overview of the WeLASER project. He gave a 20-minute briefing about: • The key points of the project (objective, duration, consortium, etc).• The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).		and welcomed the participants to the auditorium. He	
Santos (project coordinator) to the guests.Project Overview (auditorium)Pablo Gonzalez de Santos presented a short overview of the WeLASER project. He gave a 20-minute briefing about: The key points of the project (objective, duration, consortium, etc).The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).		presented the program and introduced Pablo Gonzalez de	
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 WeLASER project. He gave a 20-minute briefing about: The key points of the project (objective, duration, consortium, etc). The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts). 	Project Overview (auditorium)	Pablo Gonzalez de Santos presented a short overview of the	
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 consortium, etc). The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts). 		• The key points of the project (objective, duration,	
The strategic part: agricultural knowledge (farmers, farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).		consortium, etc).	
farmers associations, agronomists), stakeholder involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).		• The strategic part: agricultural knowledge (farmers,	
involvement (specialists not represented in the consortium), and commercialisation strategies (economy, social science experts).		farmers associations, agronomists), stakeholder	
consortium), and commercialisation strategies (economy, social science experts).		involvement (specialists not represented in the	
(economy, social science experts).		consortium), and commercialisation strategies	
		(economy, social science experts).	

A detailed description of the Field Day is provided below:



	• The technical and scientific part: AI perception	
	system, autonomous robot/navigation manager,	
	high-power laser source, targeting system, smart	
	navigation system, IoT and cloud computing	
	(technical part), the impact of laser doses on living	
	organisms (scientific part).	
	Throughout the explanation, the participants were very active,	
	expressing their questions and opinions to Pablo.	
Field demonstration of the	Afterwards, the attendees went to the field, where Luis Emmi	
prototype (experimental field)	(WP5 leader) introduced the robot to the guests, and Hendrik	
	Sandmann explained the precision of the targeting system	
	with the prototype static at high power.	
	The autonomous vehicle started controlling the weeds in the	
	sugar beet and maize fields. The guests could walk out in the	
	field to see how the laser beam has hit and damaged the	
	weeds.	
	Much discussion was going on in the area between the	
	WeLASER staff and stakeholders.	
	After the demonstration, Giuliano Vitali (UNIBO) presented	
	the IoT equipment developed to support farmers in collecting	
	field data and decision-making concerning laser weeding.	
	WeLASER staff and stakeholders returned to the auditorium	
	to discuss the concept and future work.	
Close and conclusions	The attendees were very interested in the next steps,	
	especially after the end of the project.	
	They were interested in knowing how the activities with field	
	experiments and the commercialisation of the autonomous	
	vehicle would continue after the end of the project.	
	The participants' attitude was positive, expressing their clear	
	alignment with these technological and sustainable	
	alternatives. They insisted on continuing the research and	
	getting the laser robot on the market as soon as possible, at	
	an affordable price for the farmer, given the great need to	
	replace herbicides.	



3.2.1. Agenda of the 2nd FIELD & DEMONSTRATION DAY

FIELD DAY

9:30 – 10:00 Registration and Coffee (in the canteen)

10:00 – 10:10 Welcome (Auditorium A-18-02) by Associate Professor Christian Andreasen, UCPH

10:10 – 10:30 Project Overview by Professor Pablo Gonzales-De Santos, The Spanish National Research Council (CSIC), Project Coordinator

10:30 - 11:30 Field demonstration of the prototype

3.2.2. List of attendees

External Participants

Name	Institution
Bang, Morten	Jensen Seeds
Coleman, Guy	University Sydney
Jorgensen, Soren Thorndal	Landbrug og Fodevarer
Holst, Thomas	Landbrug og Fodevarer
Elmegard, Nils	Landbrug og Fodevarer
Nissen, Peter Nyegaard	Landbrug og Fodevarer
Falk, Caleb	Dangrow
Hansen, Jens-Olav Host	VIKIMA-seed
Laursen, Carl Hoj	Seges
Krenzen, Asmus	Seges
Larsen, Troels Prior	Bondehoj
Norgaard, Asbjorn Mols	Hortiadvice
Iheanyi Omjemah	Hortiadvice
Jorgensen, Carsten H.	Avlschef
Mikkel Nilars	NBR Nordic Beet
Kristine Haman	Agroroutech
Lazares Nalpantidis	DTU
Guldenring, Ronja	DTU





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Stakeholder attendance by professional competence



WeLASER Consortium participants

NAME	Consortium member
Kaule Malte	Futonics
Neve, Paul	UCPH
Gritte Bech	UCPH
Christian Andreasen	UCPH
Johannen, Kenneth	UCPH
Johannen, Lucas	UCPH
Eleni Vlassi	UCPH
Carla Colqua-Little	UCPH
Cavalieri, Andrea	UCPH
Fischer, Lene	UCPH
Wendelboe, Birgitte	UCPH
Westergaard, Jesper Cairo	UCPH
Streibig, Jens Carl	UCPH
Najmeh Salehan	UCPH
Jesper Suensokard	UCPH
Mathias Hansen	UCPH
Nohil Benita	UCPH
Sarah Hansen	UCPH
Nouhay Yedua	Agreenculture
Sandmann, Hendrik	LZH
Vitali, Giuliano	UNIBO
Matteo Francia	UNIBO
Duc Tran	UGENT
Emmi, Luis	CSIC
Gonzalez de Santos, Pablo	CSIC
Fernandez, Roemi	CSIC
Pedro Martin	CSIC
Linares, Manuel	COAG
Husteelt Michael	LZH



3.2.3. Photographs of the event



C. Andreasen (UCPH) – Welcome to attendees



L- Emmi (CSIC) – Introducing the WeLASER system (a)





L- Emmi (CSIC) – Introducing the WeLASER WeLASER carrying out a mission system (b)



Observing the laser shots



G. Vitali (UNIBO) – Introducing the IoT sensor network

3.3. Third Field & Demonstration Day (Reusel, The Netherlands)

On August 24 to 26, 2023, the third WeLASER Field Day was organised by VDBP within the PRECISION FARMING DAYS (Reusel, The Netherlands), an event where precision machines, sensors, robots, software, and drones for agriculture are exhibited for farmers, professionals,

D6.9 - Exhibition, demonstration and training activities



students, and curious people. Over 50 suppliers offered their solutions in booths and fields and gave more than 20 demonstrations to over 650 visitors. WeLASER consortium used this event to communicate and disseminate the project results, and the prototype was on display in the Netherlands for the first time. A special session for specific stakeholders was held in the afternoon of the 24th.

The event program was based on talks in the conference tent, field demonstrations, and direct assistance to interested people in the booths. CSIC, LZH, and UNIBO gave talks on the WeLASER project in the mornings and the afternoons, followed by demonstrations in a 37×15-m2 field with maize plants provided by VDBP. In addition, from 10 a.m. to 6 p.m., CSIC, LZH, FUT, UNIBO, IETU, and UGENT partners served the visitors in the WeLASER booth.

WeLASER partners received valuable feedback from competitors and stakeholders, revealing a growing interest in adopting laser-based weeding as an alternative to herbicide applications. The event yielded notable conclusions:

- Farmers recognise the potential benefits of robotics; however, the transition is not their top priority now.
- The expected working capacity of the WeLASER system was mainly considered one economic factor discussed among labour costs for manual weeding and investment for the device.
- Competitive factors should be reviewed with a holistic approach to assess process competitiveness, which goes beyond mere cost comparisons and should include factors such as environmental impact, crop health, and regulatory compliance.

3.3.1. Flyer of the 3rd FIELD & DEMONSTRATION DAY



WeLASER consortium will participate in the Precision Farming Days 2023 organized by <u>Van den Borne Projecten</u> (WeLASER partner), giving demos since the pre-demo day (August 24) with the special sessions (i) Robot Developer Day in the morning and (ii) Biofarmers VIP Tour in the afternoon.





3.3.2. Photographs of the event



Overview of the event location



Front view of the WeLASER stand



Back view of the WeLASER stand



WeLASER system integrated (Laser sources WeLASER system integrated (Perception and chillers) systems and scanners)

D6.9 - Exhibition, demonstration and training activities







WeLASER carrying out a mission (a)

M. Wollweber (LZH) giving a talk on WeLASER



WeLASER carrying out a mission (b)



WeLASER carrying out a mission (c)



M. Wollweber being interviewed by the media



Observing the laser shots



A study on "Farmer's attitude towards laserbased weeding" exhibited at the stand (UGENT)



One More mission with the WeLASER system





3.4. Fourth Field & Demonstration Day (Madrid, Spain)

A final demonstration was organised as close as possible to the end of the project to give the opportunity to end-users, professionals and other stakeholders to learn about the final stage of the project and the prototype and exchange views with other colleagues and with the consortium members.

On September 28th 2023, the final event was organised by CSIC and COAG in the Centre for Automation and Robotics (CAR-CSIC) facilities in Arganda del Rey (Madrid, Spain). The main objective of this Field Day was to present the final prototype to end-users, professionals, authorities and students. All the stakeholders and attendees could check the system in action in real farm conditions, and a fruitful interaction was developed. The general press was also invited to this Final Event to enhance the dissemination and communication of the results.

After a short welcome and introduction by COAG, the project coordinator explained the general objective and achievements of WeLASER. Then, WP5 leader (CSIC) explained the components of the prototype.

Afterwards, the attendees went to the field, and the practical demonstration took place on maize, sugar-beet and wheat crops. The participants could see in detail how the system works and interact with the consortium members, who answered the questions on the different elements of the WeLASER prototype—for instance, the reasons for using a fibre laser source and its lifespan in the system.

Participants provided helpful and high-value comments on the prototype. The idea and its practical development were generally recognised and appreciated. Farmers perceived the potential benefits of the WeLASER system and considered it a helpful possibility to tackle weeds within a framework of environmental sustainability. However, more practical developments are needed for a competitive and commercial machine.

The agenda of the event is included in Section 3.2.1.1. The event started at 10:00 a.m. and finished at 14.30 a.m. The list of attendees is included in Section 3.2.1.2. Some photographs of the session are included in Section 3.2.1.3.

3.4.1. Agenda of the 4th FIELD & DEMONSTRATION DAY

September 28th, 2023

Address: CENTER FOR AUTOMATION AND ROBOTICS (UPM-CSIC), Carretera de Campo Real, KM 0,200 28500 Arganda del Rey. Madrid (Spain) <u>https://www.car.upm-csic.es/contact/</u>

FINAL DEMONSTRATION						
10:00 – 10:30	REGISTRATION					Building A, Auditorium
10:30 – 11:00	WeLASER Project Introduction	Overview	and	Field	Day	Building A, Auditorium
	Pablo Gonzalez-de-Santos (Project coordinator) (CSIC)					





1

11:00 – 11:30	Introducing the WeLASER weeding system FUT, LZH, AGC, CSIC, UNIBO	Building C, High-bay Lab
11:30 – 11:45	Training on the WeLASER System Luis Emmi (CSIC)	Building C, High-bay Lab
11:45 – 13:15	WeLASER System Demonstration Luis Emmi (CSIC)	Experimental Field
13:15 – 13:30	Discussion/Questionnaires Alvaro Areta (COAG)	Building A, Auditorium
13:30 - 14:30	Lunch	

3.4.2. List of attendees

External participants

Name	Institution
Apolinar Castellanos Pellitero	COAG León
Diego Castellanos	COAG León
Jose Manuel Garcia Ruiz	COAG Burgos
Rodrigo Sadornil Pérez	COAG Burgos
Ruben Abejón Arauzo	COAG Burgos
Josu Revuelta Garcia	COAG Burgos
Ricardo Rodríguez Miranda	UAGA Aragón
Ivanna Martínez	AGIM COAG
Pablo Anido	AGIM COAG
Adrián Jiménez Navas	ACOR
Guillermo Berruguete Raposo	ACOR
Pedro Ortega Guerrero	Plantas Continental
Jesús Antonio Moreno Ortega	Plantas Continental

Stakeholder attendance by professional competence





WeLASER Consortium participants

NAME	Consortium member
Pablo González	CSIC
Roemi Fernández	CSIC
Luis Emmi	CSIC
Pedro M. Martín	CSIC
Paola Córdova	CSIC
Eloisa Cortiñas	CSIC
Álvaro Areta	COAG
Cristina Sanz	COAG
Juan Yuri	COAG
Merve Wollweber	LZH
Hendrik Sandmann	LZH
Giuliano Vitali	UNIBO
Matteo Francia	UNIBO
Janusz Krupanek	IETU
Christian Andreasen	UCPH
Duc Tran	UGENT
Joachim Schouteten	UGENT

3.4.3. Photographs of the event



P. Gonzalez-de-Santos (CSIC introducing the event



L. Emmi (CSIC) introducing the WeLASER system.



L. Emmi (CSIC) introducing the demonstration WeLASER starting a mission.



D6.9 - Exhibition, demonstration and training activities





WeLASER carrying out a mission.



H. Sandmann (LZH) checking the implement



Analysing the mission results (a)



Analysing the mission results (b)



Analysing the mission results (c)



Commenting the results



D6.9 - Exhibition, demonstration and training activities



Attendees at the event

4. TRAINING ACTIVITIES

WeLASER training activities were devoted to promoting the use of the final system among the potential users and were held during different project events: The WeLASER Summer School and the Field Days.

4.1.Summer School

On July 10 to 12, 2023, the consortium held the "WeLASER Summer School: AI-Autonomous Robots for Agriculture – Weeding with Laser", focused on disseminating the WeLASER project results.

It was an opportunity to introduce intelligent autonomous robotics for agriculture focused on the specific example of weeding with laser. The course was intended for undergraduate, master's, and doctoral students, PhD researchers, industry practitioners, and academics interested in the robotics trends for agriculture, including technical, scientific, economic, and ecological aspects.

The school was led by CSIC, which was assisted by the developers (FUT, LZH, AGC, UNIBO) in demonstration activities and by both developers and agronomists (UCPH, IETU, UGENT and COAG) in training activities.

Fifty-nine students were registered in the course and up to 43 students from different countries (Bangladesh, Belgium, France, Germany, Hungary, India, Italy Morocco, Servia, Spain, Turkiye, etc) were connected online. On the last day, a demo was conducted at the Centre for Automation and Robotics (CSIC) and attended by 14 students. This event was also followed online.

The course consisted of online lectures for the first and second days. The third day was focused on a training course and demonstrations. Registered students were invited to attend the on-site training and demonstration carried out at the Centre for Automation and Robotics, Madrid, Spain. The course was free of charge with a pre-registration. A diploma was provided to the attendees.

Students were asked to fill out an online questionnaire. The questionnaire answers/statistics are reported in Annex B.



4.1.1. Summer school schedule

— Day 1, July 10, 2023



	Monday, July 10, 2023 (Online sessions)	
09:30-10:15	Introducing the summer school Precision agriculture and robotics Pablo Gonzalez-de-Santos (CSIC, Spain)	
10:15-11:00	AI controllers for autonomous robots Luis Emmi (CSIC, Spain)	
11:00-11:15	Break	
11:15-12:00	Cloud computing for agriculture Matteo Francia (University of Bologna, Italy)	
12:00 - 12:45	Precision agriculture: farm economics and B2B management Joachim Schouteten (Ghent University, Belgium)	

Day 2, July 11, 2023 (online)



	Tuesday, July 11, 2023 (Online sessions)
09:30-10:15	AI algorithms for weeding with laser Merve Wollweber (Laser Zentrum Hannover, Germany)
10:15-11:00	Laser effect on crops and animals Christian Andreasen (University of Copenhagen, Denmark)
11:00-11:15	Break
11:15-12:00	IoT for agriculture Giuliano Vitali (University of Bologna, Italy)
12:00-12:45	Real robots for real agriculture Sihem Boubaker (AGREENCULTURE, France)
12:45-13:30	Ecological aspects of using autonomous robots for agriculture Janusz Krupanek (Institute for the Ecology of Industrial Areas, Poland)

Day 3 - July 12, 2023 - (On-site)



W	ednesday, July 12, 2023	On-site	Online
(01	n-site / Online sessions)	On site	oninc
09:30-10:00	09:30-10:00 Moving from Madrid to CAR (UPM-CSIC)		
10:00-10:30	Introducing CAR Pablo Gonzalez-de-Santos (CSIC, Spain) Introducing the demo Luis Emmi (CSIC, Spain)	CAR Auditorium	Online
10:30-10:45	Coffee break		
10:45-12:15	Demo Luis Emmi (CSIC, Spain)	Experimental Field	Online
12:15-13:00	WeLASER subsystems and training Luis Emmi (CSIC, Spain)	High-bay Lab	Online
13:00-13:15	Questionnaire to attendees Pablo Gonzalez-de-Santos (CSIC, Spain)		Online
13:15-14:30	Lunch at CAR-CSIC		
14:30	Returning to Madrid	CAR Shuttle	



4.1.2. Lectures at the WeLASER Summer School

- 1. Precision agriculture and robotics Pablo Gonzalez-de-Santos (CSIC, Spain)
- 2. Al controllers for autonomous robots Luis Emmi (CSIC, Spain)
- **3. Cloud computing for agriculture** Matteo Francia (University of Bologna, Italy)
- 4. Precision agriculture: farm economics and B2B management Joachim Schouteten (Ghent University, Belgium)
- 5. Al algorithms for weeding with laser Merve Wollweber (Laser Zentrum Hannover, Germany)
- 6. Laser effect on crops and animals Christian Andreasen (University of Copenhagen, Denmark)
- 7. IoT for agriculture Giuliano Vitali (University of Bologna, Italy)
- 8. Real robots for real agriculture Sihem Boubaker (AGREENCULTURE, France)
- **9. Ecological aspects of using autonomous robots for agriculture** Janusz Krupanek (Institute for the Ecology of Industrial Areas, Poland)
- **10. Demo, WeLASER subsystems and training** Luis Emmi (CSIC, Spain)



4.1.3. Photographs of the event (Day 3)



P. Gonzalez-de-Santos and L. Emmi (CSIC) introducing the event



L. Emmi (CSIC) introducing the WeLASER equipment.



Getting ready for training



A student being trained by P. Martin (CSIC) on WeLASER manual control.



Understanding the Human-machine Interface (a)



Supervising a mission execution



D6.9 - Exhibition, demonstration and training activities



Executing a mission



A student returning the robot to the shed.



Group photo of the attendees to the WeLASER Summer School demo and training day



4.2. Field Days

As part of the Field Day events, attendees interested in operating the WeLASER system received training. It consisted of (i) executing the system switch-on procedure, (ii) moving the robot with the portable remote controller, (iii) selecting a working field, (iv) defining a mission (v) running the mission and (iv) supervising the mission execution.

Following pictures illustrate some of the training activities.



A participant moving the WeLASER system with the portable remote controller (Field Day 1)



An agronomist getting ready to manage the system (Field Day 2)



Training Pablo Anido (The farmer in charge of the CSIC experimental fields)



D6.9 - Exhibition, demonstration and training activities



L. Emmi (CSIC) training the attendees on field and mission definitions (Field Day 4)



* * *

5. ANNEX A – FIELD DAY QUESTIONNAIRE FORMS



Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools

5th Stakeholder Event Questionnaire July 26, 2023

GENERAL QUESTIONS ON HIGH-TECH AGRICULTURE MACHINERY

1. How frequently do you interact with high-tech systems? (Click one)

Daily	Weekly	Monthly	Yearly	Never	

2. How important are the following characteristics of a high-tech system for you?

Please tick 🧭 a level for every input.

	Trivial	Low	Medium	High	Critical
Cost					
Access to information and education					
Connectivity and Internet access					
Data management and privacy					
Compatibility and integration					
Adaptability and scalability					
Maintenance and support					
Legal Regulation					

3. What features or functionalities do you consider essential for an agricultural tool to be useful to you? (Please tick 🔗 a level for every input)

	No	Slightly	Moderately	Very	Absolutely
	essential	essential	essential	essential	essential
Durability and reliability					
Ease of use					
Accuracy and precision					
Adaptability to work with different crops					
Real-time monitoring and alerts					
Cost-effectiveness					
Connectivity and data sharing					
Compatibility with farming practices					
Energy efficiency					
Support and training					

4. What kind of user interface do you prefer?

Keys	Buttons	Touch path (smartphone, tablet)	Mouse

5. Do you have any preferences regarding the power source for the tool?

Manual	
Fossil fuel	
Battery-powered (Fully electric),	
Hybrid (Fuel and battery)	
Solar	

6. Are there any specific safety considerations you would like the tool to address?

Design for safety and ergonomics	
Guarding and shields (safety shields, protective covers, and physical barriers to minimize the risk)	
Visibility and signalling (such as reflective surfaces or warning signs)	
Safety interlocks and controls (a two-step start mechanism or use of both hands to operate)	
Operator training and instructions (against electrical hazards, fire, protective equipment, etc.)	
Regular maintenance and inspections	
Low noise and vibration	
Power sources and fuel handling	
Transportation and storage	

7. What kind of support would you need to effectively use a hi-tech tool?

	Trivial	Low	Medium	High	Critical
Instructional materials					
Training sessions					
Safety guidelines					
Technical support					
Ongoing updates and maintenance					



Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools



WeLASER SPECIFIC QUESTIONNAIRE

Yes

No

1. Have you used the WeLASER user interface during the demo?

If yes:

How would you rate the overall user interface of the WeLASER system in terms of usability and intuitiveness? (Click one)

Very Poor	Poor	Fair	Good	Excellent

2. Are there any WeLASER-specific features or functionalities that are difficult to understand or use?

	Very easy	Easy	Normal	Difficult	Very difficult
Autonomous robot (mobile platform)					
Laser implement					
Map builder					
Mission planner					
Mission launch					
Mission supervisor					

3. Does the WeLASER system provide an efficient workflow for its main task? (Click one)

Highly Inefficient	Inefficient	Moderately Inefficient	Efficient	Highly Efficient

4. How responsive is the system in terms of speed and performance? (Click one)

Very Slow	Slow	Moderately Responsive	Responsive	Highly Responsive

5. Does WeLASER system support the following aspects required for your work? (Click in supported aspects)

	ר⊘ו
File formats	
Protocols	
Hardware	
Software	
Standards	

- 6. On a scale of 1 to 10, how would you assess the overall WeLASER System?
- 7. On a scale from 1 to 10, how would you rate the friendliness of the WeLASER human-machine interface?
- 8. How would you assess the following WeLASER characteristics?

	Very negatively	Negatively	Normal	Positively	Very positively
It is an autonomous robot					
It is a tracked vehicle					
It exhibits Internet connectivity					
The graphical user interface is web-based					
It has a friendly graphic user interface					
It allows the user to observe the mission					
development in real-time					



5º Evento de Partes Interesadas

Cuestionario julio 26, 2023

Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools

PREGUNTAS GENERALES SOBRE MAQUINARIA AGRÍCOLA DE ALTA TECNOLOGÍA

1. ¿Con qué frecuencia interactúa con sistemas de alta tecnología? (Haga clic en uno)

Diario	Semanal	Mensual	Anual	Nunca

 ¿Qué importancia tienen para usted las siguientes características de un sistema de alta tecnología? Marque y un nivel para cada entrada.

	Trivial	Bajo	Medio	Alto	Crítico
Coste					
Acceso a la información					
Conectividad y acceso a Internet					
Gestión de datos y privacidad					
Compatibilidad e integración					
Adaptabilidad y escalabilidad					
Mantenimiento y soporte					
Regulación legal					

3. ¿Qué características o funcionalidades consideras esenciales para que una herramienta agrícola te sea útil? (Marque 🥙 un nivel para cada entrada)

	No es	Ligeramente	Moderadamente	Muy	Absolutamente
	esencial	esencial	esencial	esencial	esencial
Durabilidad y fiabilidad					
Facilidad de uso					
Exactitud y precisión					
Adaptabilidad para trabajar con diferentes cultivos					
Monitoreo y alertas en tiempo real					
Rentabilidad					
Conectividad e intercambio de datos					
Compatibilidad con las prácticas agrícolas					
Rendimiento energético					
Soporte y formación					

4. ¿Qué tipo de interfaz de usuario prefieres?

Teclas	Botones	Táctil (smartphone, tablet)	Ratón de ordenador

5. ¿Tiene alguna preferencia con respecto a la fuente de alimentación de la herramienta?

Manual	
Combustible fósil	
Alimentado por batería	
(totalmente eléctrico),	
Híbrido (combustible y batería)	
Solar	

6. ¿Hay alguna consideración de seguridad específica que le gustaría que abordara la herramienta?

Diseño para la seguridad y la ergonomía	
Protecciones (escudos de seguridad, cubiertas protectoras y barreras físicas para minimizar el riesgo)	
Visibilidad y señalización (superficies reflectantes o señales de advertencia)	
Controles de seguridad (un mecanismo de arranque de dos pasos, uso de ambas manos para operar, etc.)	
Capacitación e instrucciones del operador (contra riesgos eléctricos, incendios, equipos de protección, etc.)	
Mantenimiento e inspecciones regulares	
Bajo nivel de ruido y vibración	
Fuentes de energía y manejo de combustible	
Transporte y almacenamiento	

7. ¿Qué tipo de soporte necesitaría para utilizar eficazmente una herramienta de alta tecnología?

	Trivial	Bajo	Medio	Alto	Crítico
Materiales didácticos					
Sesiones de entrenamiento					
Directrices de seguridad					
Soporte técnico					
Actualizaciones y mantenimiento continuos					



5º Evento de Partes Interesadas





Sustainable Weed Management in Agriculture with Laser-Based Autonomous Tools

CUESTIONARIO ESPECÍFICO SOBRE WELASER

Sí

No

1. ¿Ha utilizado la interfaz de usuario de WeLASER durante la demostración?

En caso afirmativo: ¿Cómo calificaría la interfaz de usuario general del sistema WeLASER en términos de usabilidad e intuición? (Haga clic en uno)

Pobretón	Pobre	Justo	Bien	Excelente

2. ¿Hay alguna característica o funcionalidad específica de WeLASER que sea difícil de entender o usar?

	Muy fácil	Fácil	Normal	Difícil	Muy difícil
Robot autónomo (plataforma móvil)					
Implemento láser					
Constructor de mapas					
Planificador de misiones					
Lanzamiento de la misión					
Supervisor de misión					

3. ¿El sistema WeLASER proporciona un flujo de trabajo eficiente para su tarea principal? (Haga clic en uno)

Altamente ineficiente	Ineficiente	Moderadamente ineficiente	Eficaz	Altamente eficiente

4. ¿Cómo es de sensible el sistema en términos de velocidad y rendimiento? (Haga clic en uno)

Lentísimo	Lento	Moderadamente sensible	Sensible	Altamente receptivo

5. ¿El sistema WeLASER es compatible con los siguientes aspectos necesarios para su trabajo? (Haga clic en aspectos compatibles)



6. En una escala del 1 al 10, ¿cómo evaluaría el sistema WeLASER en general?

	_	_	

- 7. En una escala del 1 al 10, ¿cómo calificaría la facilidad de uso de la interfaz hombre-máquina WeLASER?
- 8. ¿Cómo evaluaría las siguientes características de WeLASER?

	Muy negativamente	Negativamente	Normal	Positivamente	Muy positivamente
Es un robot autónomo					
Es un vehículo de orugas					
Exhibe conectividad a Internet					
La interfaz gráfica de usuario está basada en					
web					
Tiene una interfaz gráfica de usuario amigable					
Permite al usuario observar el desarrollo de la					
misión en tiempo real					



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6. ANNEX B – SUMMER SCHOOL QUESTIONNAIRES

6.1. Google questionnaires form

WeLASER Summer School Questionnaire

* Indicates required question



Program Evaluation

1. a. How satisfied are you with the overall WeLASER summer school program? *

Mark only one oval.

- Very dissatisfied
- Dissatisfied
- Neutral
- Satisfied
- Very satisfied
- 2. b. What aspects of the program did you enjoy the most?

3. c. Are there any areas of improvement you would suggest for future summer school programs?

Learning Experience:

4. a. How would you rate the quality of instruction in this course?

Mark only one oval.

1 (Lower)
2
3
4
5 (Higher)

5. b. Did the WeLASER summer school meet your expectations in terms of educational content?

Mark only one oval.

Very poor
Poor
Satisfactory
High

🕖 Very high

Activities and Events:

6. a. Did you participate in the online demo organized by the WeLASER summer school?

Mark only one oval.

\square	\supset	Yes
	_	

____ No

7. b. Which activities (lectures/demo) did you find the most enjoyable or valuable?

8. c. Is there anything specific you would like to see included in future courses?

Facilities and Resources:

9. a. How would you rate the resources provided during the summer school (e.g., online platforms, demo facilities, lecture material, etc.)?

Mark only one oval.

\bigcirc	Very poor
\bigcirc	Poor
\bigcirc	Satisfactory
\bigcirc	Good
\bigcirc	Very Good

10. b. Were there any challenges or limitations you faced in accessing necessary resources?

Organization and Logistics:

11. a. How would you rate the overall organization and logistics of the summer school (e.g., registration process, scheduling, communication)?

Mark only one oval.

Very poor

- Satisfactory
- 🔵 Good
- Very good
- 12. b. Were there any areas where you encountered difficulties or experienced confusion? (If so, please indicate)

Future Recommendations:

13. a. Would you recommend this summer school program to others?

Mark only one oval.



___) No

14. b. What suggestions or recommendations do you have to enhance future summer school programs?

Additional Comments:

15. Please provide any additional comments, suggestions, or feedback you would like to share.

This content is neither created nor endorsed by Google.





1 1 1

6.2. Questionnaire responses

WeLASER Summer School Questionnaire

23 responses

Program Evaluation





b. What aspects of the program did you enjoy the most?

23 responses

Demo

The demo

The explanation on how the robot works and it's built looking directly to their mechanisms

Al

Experts from different fields were exicting

practical applications

The field demo was great

I enjoyed the whole program. The information on available robotics and laser techs being used in weed control.

I like that presentations were broad enough to explain enough even to someone without in depth computer knowledge.

The organization, punctuality and the field demo which was available to attend online

Demo of the Robots

The topics and presentations were quite interesting and informative.

When they explain to us how everything works

The demo, I enjoined knowing the people who manage the project and their experiences

Specific show case of Laser-weeding, however with making the context of robotics very clear.

The section about weeding with laser and the agriculture robots presented.

The presenter in charge of the demonstration

The demonstrations

Watch the demo working in the field and the explanations of the slides. They were very easy to follow them.

Presentations

Expert presentations from different areas

The LZH pdf and clarification

c. Are there any areas of improvement you would suggest for future summer school programs?

19 responses

Better meal.

Maybe have a large screen or a way to visualize live data from the robot.

A prototype of all the components used in the laser weeding machine would help to deliver way more efficiently. Therefore people with less technical knowledge can also benefit something from the course

no

-

Not particularly

General terms could be made simpler for people with little knowledge on robotics

the only I have to mention is regarding the field demo. I would suggest to make the screen on site for the attendees present on site, so the ones attending online could connect normally (there were certain delays and problems to connect and the transmission was cutting - it was not flowing normally), or for example some stronger modem for the future field demos

The lecturers should be informed in advance how to access the school system for their presentations so that they do not waste their time on those things and have enough time to explain their work and presentation.

This topic is fairly new to me and so I don't have any suggestions.

No

I'm experienced in the field already. So if day 1 would have been (and mentioned) as 'general introduction to agri-robotics' and day 2 and 3 more deep-dive, I would have skipped day 1 I think...

I would have liked to ave a simulated version of an agriculture robot in an outside environment.

Was perfect

Some of the lectures starting a little late

Try to make more lectures face-to-face instead of online.

Field demo

Earlier confirmation that participation has been accepted

I would Love if it could be recorded for people who are busy on one of the days





Activities and Events:





b. Which activities (lectures/demo) did you find the most enjoyable or valuable?

21 responses

Demo

Lectures about technical aspects rather than economic.

Business model AI and ecologic

all

WeLASER subsystems and training

demo

I enjoyed all the days

I enjoyed them all very much. The demo was definitely particularly awesome.

Object detection and use of AI for that

Indoor introduction of subsystem

Christian Andreasen's presentation was very interesting to me

I enjoyed watching the robot work the most.

AI controllers for autonomous robots

It's exactly the combination of the theorie AND seeing it in 'real' in the demo

Weeding with laser

The lecture title AI for autonomous robots

IoT for agriculture

To be able to see the robot working in the field and get in touch with the interface of the system.

Laser Effects on Living organisms (C. Andreasen)

Al algorithms for weeding with laser & Laser effects on crops and Animals

0





Facilities and Resources:



b. Were there any challenges or limitations you faced in accessing necessary resources?
20 responses
Νο
no
Nothing
-
I had internet connectivity issues on last day and could not access the course
the only suggestion I have regarding the presentations: when you make e.g. pictures to pop up over the text when you roll the slides, when you save and share presentation as the pdf and/or print it you cannot see the text because the object above it covers it and that cannot be changed in the pdf version. so maybe it can be suggested to the speakers not to use that kind of effects.
Nope
Language
No. And especially with an outdoor-field demo live, exceptionally GOOD arranged!
None
No, all was ok
Organization and Logistics:



Future Recommendations:





b. What suggestions or recommendations do you have to enhance future summer school programs?

14 responses

I would like to see the robot actually leave the warehouse in its own and reach the fields autonomously

Give awareness to the future canditates that some techical knowledge contents are there in the course

implementation in other university institutions

I don't have any at the moment

I would be grateful for recording of the demo(day3)

I think I mentioned all I wanted to note as the answers to some previous questions. Keep up with the great work. It was an honor attending your summer school.

This course is very good. Maybe an additional presentation on programming would be more useful, nothing else.

I enjoined the summer school, no suggestions

You can send the announcement to me (ducksize.com) and perhaps I can promote it via my socials also!?

More demos

Be the summer camp more face-to-face

I suggest to include more field demonstration in diversified crops, vegetables and fruit trees for robot laser weed control for researchers but also for farmers and farmer organizations.

Do promotion/advertisement of the event in relevant areas of interest. Participation could be much more if the people would have known the existence of the research project

recorded sessions

Additional Comments:

Please provide any additional comments, suggestions, or feedback you would like to share.

10 responses

The facilities are great, and the people working there are lovely.

We are actually a startup based up in india and very much interested in developing tech related products to the world robotics in agriculture is what we looking for. we are in search of some mentors to kickoff our dream. Give us a mail if you guys could help us regarding this. Thank you.

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I don't have any at the moment

Very informative. Thank you

Nothing else at the moment. I hope I will have the opportunity to attend the other summer schools you organize. Also, it would be great if there was some kind of internship for the PhD students and postdocs. Thank you again for this amazing summer school. Kindest regards and greetings from Serbia.

Great set-up of a three-day morning program online!

Congratulations to the organizers

Thank you for providing me an opportunity to attend this course.

thank you for your time and effort

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