

isUP-AgrO

WORK PACKAGE: 2

DELIVERABLE: D2.3 – Workshops vs.1

Date: 30/06/2025



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1. Executive Summary

To date, two workshops have been successfully delivered as part of the following tasks:

- Task 2.2: Training School on Agrosystems and Crop Monitoring, held in Month 5 (November 2024)
- Task 2.3: Training School on Smart Irrigation Technologies, held in Month 7 (January 2025)

These workshops were integrated into the broader training school framework and were designed not only to strengthen the competencies of ISOPlexis Centre staff but also to engage a wider audience, including regional stakeholders, researchers, students, and external participants.

The workshops provided an important platform for knowledge exchange between international trainers from our advanced partners and the local community. They contributed directly to the Twinning objectives by:

- Enhancing the scientific and technical skills of ISOPlexis researchers;
- Promoting institutional capacity-building through exposure to best practices;
- Encouraging regional collaboration and increasing awareness of innovative agricultural practices;
- Fostering interdisciplinary dialogue among academic, public, and private actors.

These outcomes support ISOPlexis's development as a center of excellence in agricultural research and innovation, aligned with the strategic goals of the isUP-AgrO project as well the support to the local community

To ensure visibility and maximize impact, dissemination efforts related to the workshops were carried out through multiple channels, including:

- Online forms and digital platforms (e.g., registration portals, feedback surveys);
- Media outreach and coverage (e.g., news articles, press releases, social media posts);
- Direct and personal communication with relevant stakeholders;
- Internal dissemination within the University, including departmental communications and institutional social media.

2. Outline

The isUP-AgrO project seeks to elevate ISOPlaxis to the status of a center of excellence within the agricultural sector by reinforcing its scientific and institutional capacities. To this end, the project undertakes a structured set of networking activities under a Twinning framework, in close collaboration with two prominent agricultural research institutions from Italy and Spain. These partnerships are further enhanced by the participation of a specialized entity in innovation management, whose role is to support the improvement of research administration processes and to promote sustainable scientific development in the area.

Within this framework, Work Package 2 – Training Schools & International Workshops is dedicated to delivering high-quality theoretical and practical training through a series of structured one-week training schools. These schools incorporate specialized workshops designed not only to build internal capacity within the ISOPlaxis Centre but also to attract and engage participants from outside its immediate scope.

The inclusion of international trainers in these activities represents a significant opportunity for regional stakeholders to benefit from advanced expertise and knowledge transfer. This component of the project is expected to generate a broader impact, extending beyond the ISOPlaxis Centre to reach the academic community, public administration personnel, and relevant stakeholders across the region.

3. Workshop overview

3.1. 1st Workshop - Remote sensing and its application in agriculture, use of plant sensors in precision agriculture, application of plant physiology in precision agriculture

This workshop is associated with the 1st Training School. On November 19, 2025, from 09:15 to 10:30 AM, it was approached the **Topic 4: Plant-Soil Interactions** by Enrique Fernández from IRNAS-CSIC, highlighting the importance of soil-plant dynamics in precision agriculture.

Additionally, on November 22, 2025, from 09:15 to 10:30 AM, António Días from IRNAS-CSIC approached the **Topic 3: Advanced Tools in Agrosystems and Crop Monitoring**, providing insights into cutting-edge technologies used for agricultural monitoring and management.

Objectives of the Workshop

The main objective of this workshop was to provide participants with a focused and accelerated overview of recent developments in remote sensing and plant monitoring technologies within the context of precision agriculture. Emphasis was placed on understanding plant-soil interactions and the use of advanced tools for agrosystem analysis and crop monitoring, with vineyards serving as the model system. This aligns directly with the overarching aim of enhancing agrosystem resilience and adaptability to climate stressors.

Relevance to ISOPlaxis and Twinning Strategy

The workshop is closely aligned with the strategic goals of the ISOPlaxis Centre and its Twinning partnerships, particularly in fostering research excellence in sustainable agriculture. The involvement of international experts from IRNAS-CSIC contributes to capacity-building by facilitating knowledge

transfer and reinforcing collaborative ties. The focus on integrating advanced monitoring tools into the study of plant-soil interactions supports ISOPlaxis' mission to address agricultural challenges through innovation and cross-disciplinary approaches.

Expected Impact on Regional and Institutional Capacity

This workshop contributes to strengthening both institutional knowledge and regional agricultural strategies. Participants acquired actionable insights into cutting-edge tools and methodologies that can enhance vineyard management and inform broader agrosystem practices. In the regional context, the transfer of scientific knowledge to local technicians and stakeholders fosters innovation in Madeira's agricultural sector, promoting resilience and competitiveness in the face of climate change.

Planning Process

The workshop was developed as part of the structured program of the 1st Training School. Topics were selected to address key aspects of crop monitoring and agrosystem resilience, ensuring coherence with the overall educational and scientific objectives. Sessions were scheduled to balance theoretical content with practical relevance, and speakers were chosen based on their expertise and alignment with ISOPlaxis' thematic priorities.

Structure and Format

This workshop was held in connection with the **1st Training School** and included two expert-led sessions:

On **November 19, 2024**, from **09:15 to 10:30 AM**, Enrique Fernández (IRNAS-CSIC) addressed the **Topic 4: Plant-Soil Interactions**, focusing on the dynamic relationships between soil properties and plant development, particularly in the context of precision agriculture.

On **November 22, 2024**, from **09:15 to 10:30 AM**, António Días (IRNAS-CSIC) delivered a lecture addressing the **Topic 3: Advanced Tools in Agrosystems and Crop Monitoring**, exploring technological innovations for real-time crop assessment and decision support in vineyard systems.

Sessions combined lectures with interactive discussions to maximize participant engagement and knowledge retention.

Selection of International Trainers

The invited trainers, both from IRNAS-CSIC (Spain), were selected based on their internationally recognized expertise in soil-plant interactions and technological applications in agrosystems. Their active participation in EU-funded research and collaboration with ISOPlaxis ensures the quality and relevance of their contributions.

3.1.1. International Trainers' Expertise

José Enrique Fernández Luque is a Research Professor at the Spanish National Research Council (CSIC) and the Director of the Institute of Natural Resources and Agrobiology of Seville (IRNAS) in Spain. He earned his PhD in Agronomy (1989) and degree in Agricultural Engineering (1986) from the University of Córdoba. Since joining CSIC in 1993, he has specialized in plant physiology and irrigation management, particularly in Mediterranean and semi-arid conditions.

Enrique leads the "Plant Ecophysiology and Irrigation" (ECOVER) group at IRNAS, focusing on deficit irrigation strategies, water stress indicators, automated irrigation systems, and sustainable fertigation

practices. His scientific contributions include over 68 journal articles, 21 book chapters, and significant citations exceeding 19,000, with an h-index of 64.

He has managed 12 R&D projects, coordinated 10 industry-academia contracts, and supervised eight PhD theses. As Editor-in-Chief of **Agricultural Water Management**, he is actively involved in advancing irrigation and agricultural engineering and participates in advisory groups on agricultural policy in Spain.

His expertise is crucial for projects on sustainable agriculture, water management, climate adaptation, and technology integration in agricultural systems, making him a valuable asset for innovation in Mediterranean agroecosystems.

Antonio Díaz-Espejo is a Tenured Scientist ("Científico Titular") at the Spanish National Research Council (CSIC) in the Plant–Soil–Water Protection department of the Institute of Natural Resources and Agrobiology of Seville (IRNAS), where he has worked since 2008. He earned a degree in Biology in 1996 and a PhD in 2000 from the University of Seville. His research focuses on plant hydraulics and drought response, including a 2024 paper in **New Phytologist** titled "Plant Hydraulics at the Heart of Plant, Crop, and Ecosystem Functions in the Face of Climate Change."

Antonio leads the Plant Ecophysiology Service at IRNAS and is a member of the ECOVER group, which studies plant responses to water stress and develops ecophysiological models for irrigation. His expertise includes plant water potential, gas exchange, and soil–plant sensing systems. He has secured funding to modernize the eco-physiology lab at IRNAS.

He has published around 76 SCI journal articles, with a Web of Science h-index of 32 and approximately 4,116 citations as of early 2020. On Google Scholar, he has 67 papers with 10,030 citations total, an h-index of 50, and an i10-index of 82. His notable works include studies on mesophyll conductance and modeling photosynthesis in olive leaves.

Antonio has led 17 research projects, including nine as principal investigator, and signed 15 contracts for sensor-based irrigation models for crops like grapevine and tomato. He has supervised three completed PhD theses and currently oversees two more.

He serves on editorial boards for **Plant, Cell & Environment** and **Tree Physiology** and has participated in various scientific committees. Since 2017, he has managed the ISO 9001-certified Plant Ecophysiology Service at IRNAS. His work aims to enhance climate-smart water use and sustainable agroecosystem resilience in Mediterranean cropping systems.

3.1.2. Attendees

A total of 23 individuals registered for the 1st Training School, among them, a total of 20 participants attended the session led by Prof. José Enrique Fernández Luque (IRNAS-CSIC), dedicated to Topic 4: Plant–Soil Interactions, and 17 participants took part in the session delivered by Dr. António Díaz-Espejo (IRNAS-CSIC), focusing on Topic 3: Advanced Tools in Agrosystems and Crop Monitoring. Some of the participants were affiliated with the ISOPlexis Centre, underscoring the Centre's strong institutional commitment to advancing precision agriculture practices. The remaining participants included graduate student, professor from the University of Madeira (UMa), government technicians, and stakeholder representing the viticulture sector.

This multidisciplinary group contributed to a dynamic and interactive learning environment, enriching the discussions around **remote sensing**, **plant sensors**, and **plant physiology** in agricultural systems. The diversity of backgrounds encouraged meaningful exchanges between researchers, students, technicians, and industry representatives, which enhanced the practical relevance of the methodologies presented and promoted broader knowledge dissemination and potential applications in regional agricultural practices.

3.1.3. Dissemination and Visibility

To enhance visibility and broaden the reach of the workshops, a diverse range of dissemination strategies was employed. These included the use of digital tools such as online registration forms and post-event feedback surveys, coordinated media efforts through press releases, news features, and social media engagement, as well as direct outreach to key stakeholders through personalized communication. Additionally, internal promotion within the University was facilitated via departmental updates and official institutional social media channels.



Figure 1. Internal dissemination within the University, including departmental communications and institutional social media.

This workshop was successfully publicized on different media channels as can be seen in the following links:

- ✓ Media social sites

- Radio

<https://madeira.rtp.pt/ciencia/isoplexis-vai-avancar-com-um-projeto-piloto-sobre-a-vinha-da-madeira-audio/>

- ✓ University of Madeira sites

- University of Madeira newsletter:

<https://www.uma.pt/noticias/projeto-europeu-isup-agro-unlocking-the-potential-for-agricultural-research-on-an-eu-outmost-region-boosting-isoplexis-centre/?contentid=195249>

- University of Madeira Facebook:

<https://www.facebook.com/photo/?fbid=1065384275473365&set=a.177422284269573>

- ✓ ISOPlexis social media:

- Facebook:

<https://www.facebook.com/share/p/16YYU8cuEG/>

o **Instagram:**

https://www.instagram.com/p/DC6dW6oxeta/?img_index=1

✓ isUP-AgrO Social Media

<https://www.linkedin.com/feed/update/urn:li:activity:7267847338893713411/?actorCompanyId=103926861>

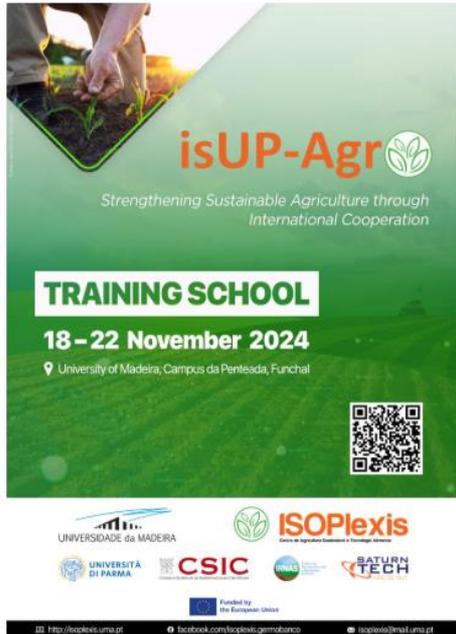
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7 m · Editado ·

From November 18th to 22nd, the University of Madeira will host the 1st training school as part of the European Project isUP-AgrO.

This training will be conducted by researchers from the Institute of Natural Resources and Agrobiology of Seville (IRNAS), part of the Spanish National Research Council (CSIC), a project partner. The main target audience includes researchers from the ISOplexis Centre – Centre for Sustainable Agriculture and Food Technology at the University of Madeira. Additionally, a limited number of spots will be available on the Centre's website for other participants interested in fields related to agroecosystems and genetic resources.

#AgriculturalResearch #SustainableAgriculture #Innovation #ISOplexis #HorizonEurope #Collaboration #UMa #CSIC #UNIPR #Saturntech #Eufunded #Research #Widening #Twinning #Training #HorizonEu #widera #NCPs

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<http://isoplexis.umag.pt> facebook.com/isoplexis.gimofarco isoplexis@ma.uma.pt

Figure 2. A screenshot of the publication in the isUP-AgrO LinkedIn page.

3.1.4. Photos

The 1st workshop photographic record was consisted of many photos and short videos showing the presence of the participants. In Figure 2 is a compile of some of the photos.



Figure 3. Photographic record of the 1st workshop ministered by Enrique Fernández and Antonio Díaz (IRNAS-CSIC).

3.2. 2nd Workshop - Introduction to vascular plant anatomy for understanding water relations and hydraulic function and Introduction to vascular plant physiology for understanding water relations and hydraulic

On **January 27, 2025**, from **11:00 AM to 1:00 PM**, two open lectures were delivered by researchers from the **Institute of Natural Resources and Agrobiology of Seville (IRNAS-CSIC)**.

This workshop was held in connection with the **2nd training School**, addressing **Topic 2: The new irrigated agriculture** and **Topic 4. Adaptation actions and strategies**, with a specific focus on **leaf turgor pressure-related sensing systems**. The session provided foundational scientific content necessary for understanding the biophysical and anatomical basis of water transport and regulation in vascular plants.

Sessions were designed to be accessible and interactive, encouraging participant questions and discussion to foster deeper understanding.

Objectives of the Workshop

The main objective of this workshop was to introduce participants to the anatomical and physiological foundations of plant water relations, with emphasis on hydraulic function and its relevance to sensing technologies in agriculture. This foundational knowledge supports the development and application of tools for monitoring plant water status, a core element in precision irrigation and agrosystem resilience. By linking plant structure and function to sensor development (e.g. leaf turgor sensors), the session laid the groundwork for more advanced applications in crop water management, aligning with the overall goals of the Training School.

Relevance to ISOPlaxis and Twinning Strategy

The workshop is strategically aligned with the capacity-building goals of the **ISOplexis Centre** and the broader Twinning project framework. The content directly supports ISOplexis' research lines on **plant stress physiology, water use efficiency, and sensor development** for smart agriculture.

The participation of **IRNAS-CSIC** researchers, who are internationally recognized in the field of plant hydraulics and eco-physiology, reinforces institutional collaboration and knowledge transfer, advancing the Twinning objective of strengthening scientific excellence and interdisciplinary cooperation.

Expected Impact on Regional and Institutional Capacity

This training contributed to institutional strengthening by equipping **researchers, students, and technicians** with critical baseline knowledge on plant water transport systems—an essential element for the adoption of advanced crop monitoring technologies.

Regionally, this capacity is expected to support:

- Improved interpretation of sensor data in agricultural applications.
- Better design and implementation of irrigation strategies adapted to plant hydraulic behaviour.
- Integration of physiological concepts into agrosystem management practices, especially in viticulture and water-limited environments.

Planning Process

This workshop was developed as an integral component of the 2nd Training School. The topics were carefully selected to complement the technical content on sensing technologies with core biological knowledge, ensuring coherence with both the scientific and practical aims of the program. The session was organized as an **open lecture format**, allowing broad participation and outreach without registration barriers.

Selection of International Trainers

The invited lecturers from **IRNAS-CSIC** were selected based on their proven expertise in plant eco-physiology and hydraulics, as well as their ongoing participation in EU-funded projects related to crop monitoring and climate adaptation. Their involvement ensures scientific rigor and supports the Twinning project's objective of institutional learning through international collaboration.

3.2.1. International Trainers' Expertise

Virginia Hernández Santana is a Tenured Scientist ("Científica Titular") at the Spanish National Research Council (CSIC), based at the Institute of Natural Resources and Agrobiology of Seville (IRNAS) within the Department of Plant–Soil–Water Protection. She earned her PhD in 2008 from the University of Salamanca and previously held postdoctoral positions at Iowa State University and the University of New Hampshire, where she led independent research on plant transpiration and water use.

Virginia's research links plant water uses and hydraulic traits with growth processes at the plant and fruit level. Her work addresses fundamental, unresolved questions about the mechanistic regulation of plant growth under drought, aiming to improve predictions of drought impact and develop effective deficit irrigation strategies. Since joining IRNAS in 2012, she has been an active member of the "Irrigation and Ecophysiology" (REC) research group, now part of ECOVER, contributing to the advancement of plant–water relations in Mediterranean systems.

Her scientific output includes 49 peer-reviewed publications - 41 of them in leading SCI journals across Plant Sciences, Agronomy, Forestry, and Water Resources - along with three book chapters and 42 conference contributions (23 oral presentations). Her work has been cited over 950 times, with an h-index of 17.

Virginia has participated in 16 national and international research projects and has co-supervised two PhD theses and four master's theses across institutions in Spain, the USA, and China. She has also served as a consultant for international academic and development projects with institutions such as Universidad Rafael Landívar (Guatemala), the University of Lisbon (Portugal), and Beijing Forestry University (China). Her invited lectures include talks at the University of Riga (Latvia), Beijing Forestry University, and the University of Seville.

Virginia's research supports the development of climate-resilient agricultural practices through a deep understanding of plant hydraulics and drought physiology, with practical applications in irrigation optimization and sustainable crop production.

Celia M. Rodríguez Domínguez is a Postdoctoral Researcher at the Institute of Natural Resources and Agrobiology of Seville (IRNAS), part of the Spanish National Research Council (CSIC). She earned her PhD in Biology from the University of Seville (2014), after beginning her doctoral training at CEBAS-CSIC, where she worked on dendrometry-based irrigation tools in fruit trees. Her PhD focused on the physiological mechanisms regulating transpiration in olive and almond under drought, and included research stays with global leaders in stomatal modeling and leaf hydraulics in the USA.

Celia has held research positions at the University of Seville, IRNAS-CSIC, and the University of Tasmania, where she worked as an Adjunct Researcher. She was awarded a prestigious Marie Skłodowska-Curie Global Fellowship (2017–2020), during which she led an international project on plant hydraulics. She currently holds a Juan de la Cierva-Incorporación Fellowship and has recently secured both the Spanish I3 Certification and a national Consolidation Project (2023–2025). In 2022, she was also awarded an Alexander von Humboldt Junior Fellowship (Germany).

Her research combines plant physiology and precision agriculture, focusing on stomatal responses, leaf hydraulics, and drought adaptation mechanisms. She has authored 31 scientific publications (25 SCI), with over 1,300 citations (Google Scholar) and an h-index of 17 (WoS). Celia has supervised four undergraduate and master's theses and currently mentors one PhD and one master's student. She is on the editorial board of *Plants*, serves as a reviewer for top journals, and will co-organize the 6th Xylem International Meeting (Seville, 2025). Her work supports the development of sensor-based, climate-resilient irrigation strategies for Mediterranean crops.

3.2.2. Attendees

Although no formal registration was required, the workshop drew the participation of 21 individuals, including researchers from the ISOPlaxis Centre, university students, government technicians, and academic staff. This diverse audience contributed to a multidisciplinary environment, which enriched discussions and facilitated the exchange of knowledge across different institutional and technical backgrounds.

The **interactive format** of both lectures encouraged active participation and open dialogue, which supported a deeper understanding of the subject matter and enabled broader dissemination of the concepts and methodologies presented.

By bringing together participants from various academic and professional fields, the workshop effectively contributed to **institutional learning** and the **regional reinforcement of scientific capacity** in the areas of **plant hydraulics, sensor-based monitoring, and climate-smart agricultural practices**.

3.2.3. Dissemination and Visibility

To enhance visibility and broaden the reach of the workshops, a diverse range of dissemination strategies was employed. These included the use of digital tools such as online registration forms and post-event feedback surveys, coordinated media efforts through press releases, news features, and social media engagement, as well as direct outreach to key stakeholders through personalized communication. Additionally, internal promotion within the University was facilitated via departmental updates and official institutional social media channels.



Figure 4. Internal dissemination within the University, including departmental communications and institutional social media.

These workshops were successfully publicized on different media channels as can be seen in the following links:

- ✓ Media sites

- *Diário de Notícias* - Jornal

<https://www.dnoticias.pt/2025/1/24/435542-universidade-da-madeira-acolhe-formacao-internacional/>

- ✓ University of Madeira sites

- University of Madeira LinkedIn:

https://www.linkedin.com/posts/universidade-da-madeira_smart-irrigation-technologies-segunda-a%C3%A7%C3%A3o-activity-7288533105819197440-hzbn?utm_source=share&utm_medium=member_desktop&rcm=ACoAAArcOssB-MMee_qBRfRzq9jCD2mENHMXzSQ

- University of Madeira Facebook:

<https://www.facebook.com/UMaGIRP/posts/pfbid0BRWuhH3yRkHBr5bk5hBTJkW8sjX-PEukLHVbn6w6bSG8ixUmka3dLbq8FUfTRwHqI>

- ✓ ISOPlexis social media:

- Facebook:

<https://www.facebook.com/isoplexis.centro/posts/pfbid02KEQiiX3BwqoAWDv6rHwm29rTPwRvUss-WsX9iWQRoH9MCKG8xNjfeRnmQ46oDndppl>

○ Instagram:

https://www.instagram.com/p/DFNsf7dRQez/?utm_source=ig_web_copy_link&igsh=NjVrbTBld-GFnbXA0

✓ isUP-AgrO Social Media

<https://www.linkedin.com/feed/update/urn:li:activity:7288528855840018432>

https://www.linkedin.com/posts/isup-agro_agriculturalresearch-sustainableagriculture-activity-7288528855840018432-6izx

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From January 27th to 31st, the University of Madeira will host the 2nd Training School as part of the European Project isUP-AgrO.

On January 27th, from 11:00 AM to 1:00 PM, researchers from the Institute of Natural Resources and Agrobiology of Seville (IRNAS - CSIC), a project partner, will deliver an open lecture (no registration required) covering the following topics:

- Introduction to vascular plant anatomy for understanding water relations and hydraulic function - Virginia Hernández Santana.
- Introduction to vascular plant physiology for understanding water relations and hydraulic function - Celia M. Rodríguez Domínguez.

The primary audience includes researchers from the ISOPlexis Centre - Centre for Sustainable Agriculture and Food Technology at the University of Madeira, as well as technicians and students.

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CONFERENCES

"Introduction to vascular plant anatomy for understanding water relations and hydraulic function"
Virginia Hernández-Santana, PhD
IRNAS-CSIC, Sevilla, Spain

"Introduction to vascular plant physiology for understanding water relations and hydraulic function"
Celia M. Rodríguez-Domínguez, PhD
IRNAS-CSIC, Sevilla, Spain

27 Jan. 2025 - 11h00-13h00
Instituto de Ciências Agrárias, Universidade da Madeira - Madeira - Portugal

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Figure 5. A screenshot of the publication in the isUP-AgrO LinkedIn page.

3.2.4. Photos

The 2nd workshop photographic record was consisted of many photos and short videos showing the presence of the participants. In Figure 6 is a compile of some of the photos.



Figure 6. Photographic record of the 2nd workshop ministered by Virginia Hernández Santana and Celia M. Rodríguez Domínguez (IRNAS-CSIC).

4. Impact and Lessons learned

Skills and Knowledge Transferred

The workshops **enabled the effective transfer of advanced scientific knowledge** and applied technical skills in the domains of precision agriculture, plant ecophysiology, and crop-soil interaction monitoring.

The sessions were aligned with the goals of the isUP-AgrO project, particularly in reinforcing institutional capacity and fostering the adoption of climate-smart agricultural practices. Here is explained how: **José Enrique Fernández Luque** led a comprehensive session on ***Plant-Soil Interactions (Topic 4)***, where participants gained practical knowledge of sustainable fertigation, deficit irrigation, and physiological indicators to monitor water stress under Mediterranean and semi-arid conditions—crucial for enhancing crop productivity and agroecosystem resilience. **António Díaz-Espejo**, through ***Advanced Tools in Agrosystems and Crop Monitoring (Topic 3)***, provided training on eco-physiological modeling and the use of sensor-based irrigation systems, helping participants master gas exchange measurements and remote sensing technologies for real-time crop management. **Virginia Hernández Santana**'s contribution to ***The New Irrigated Agriculture (Topic 2)*** offered key insights into plant water transport mechanisms by exploring vascular plant anatomy, equipping participants with foundational knowledge on xylem structure and drought response. Building on this, **Celia M. Rodríguez Domínguez** presented in **Topic 4 (*Adaptation Actions and Strategies*)**, where she deepened participants' understanding of water relations through plant physiology, covering essential processes like transpiration and stomatal regulation. Collectively, these expert-led sessions empowered attendees with interdisciplinary tools and strategies to support sustainable, water-efficient, and resilient agricultural systems.

The workshops successfully transferred:

- Knowledge of **plant physiological responses** to abiotic stress (drought, temperature).

- Use of **remote sensing and in-situ sensors** for crop and soil monitoring.
- Application of **data-driven models** for irrigation and yield optimization.
- Insight into **ecophysiological tools and techniques** for precision agriculture.
- Practical guidance on adapting agriculture to **climate change** in Mediterranean regions.
- Strategic approaches to climate-smart agriculture

Institutional and Regional Benefits

Institutional Benefits:

- Strengthening of the ISOPlexis Centre's scientific competencies in plant-soil interactions and sensor-based monitoring.
- Enhanced collaboration between ISOPlexis and IRNAS-CSIC, reinforcing the Twinning strategy and opening pathways for future joint research, staff exchanges, and scientific co-publications.
- Improved research-based training capabilities for postgraduate students and young researchers at the University of Madeira.

At the **regional level**, benefits included:

- Capacity-building among **local stakeholders**, particularly government technicians and vineyard sector representatives, promoting **evidence-based decision-making** in agricultural practices.
- Introduction of innovative and **climate-resilient agricultural practices** tailored to Madeira's unique agroecological context.
- Potential for integrating **sensor-based monitoring** and **precision irrigation techniques** in local vineyards, leading to **water use efficiency** and improved crop quality.

Feedback from the participants

This is the summary of participant feedback from 2nd Workshop:

1. Overall Experience: 77% rated the experience as *Excellent*, and 23% as *Good*.
2. Content Expectations: 38% said content *exceeded expectations*, 54% said it *completely met them*, and 8% felt it was only *partially met*.
3. Trainer's Clarity: 85% rated trainer clarity and expertise as *Excellent*, and 15% as *Good*.
4. Pace and Duration: Most found the duration and rhythm *adequate* (85%), while a few noted sessions were *too short* or *too long*.
5. Recommendation: 100% of respondents said they would *definitely recommend* the conference to others.

These results highlight strong overall satisfaction and perceived value, with minor suggestions for enhancing practical components and timing.

Feedback Summary from Conference Participants

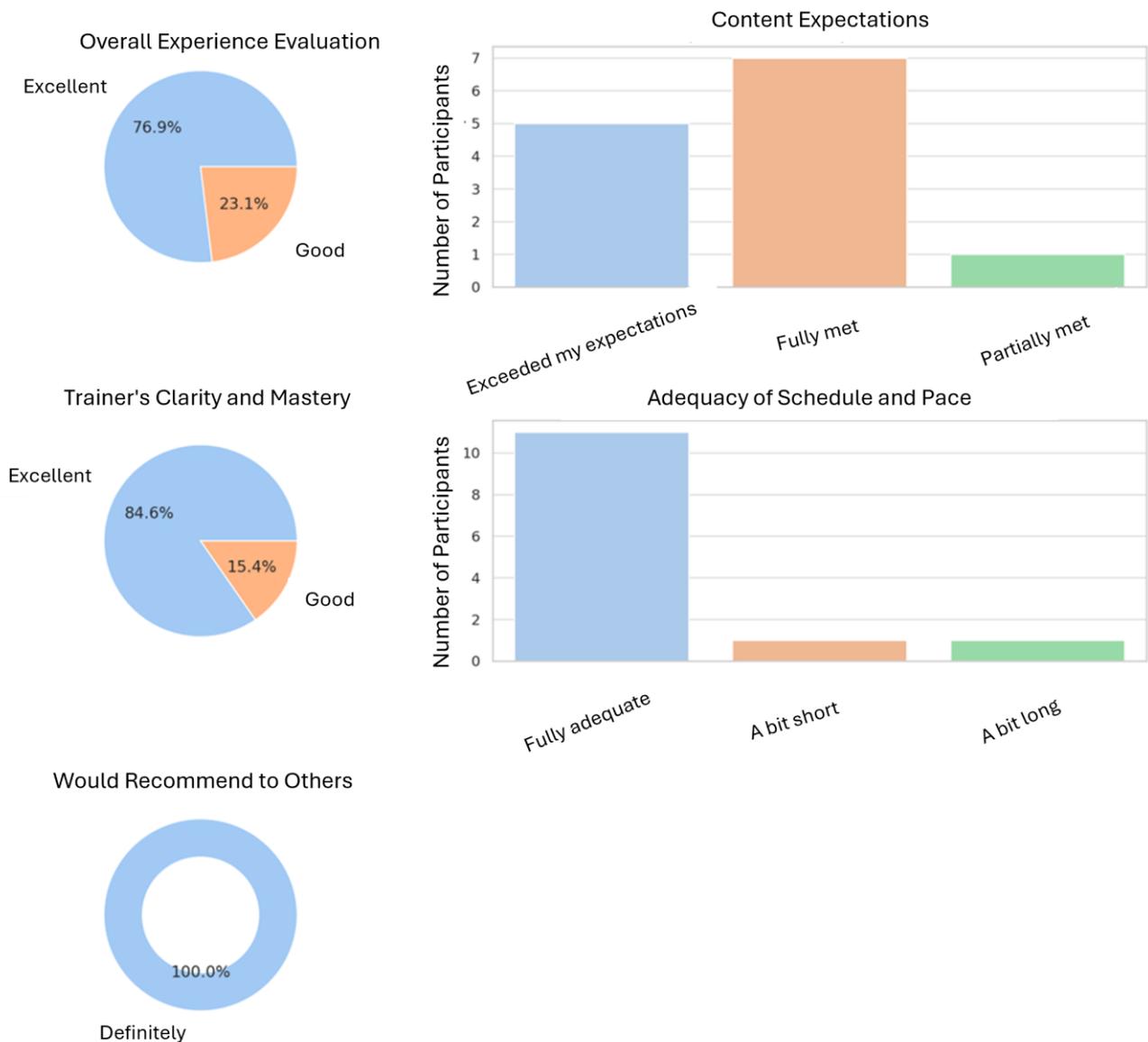


Figure 7. Participant feedback for the 2nd Workshop.

Best Practices and Lessons Learned

Best Practices:

- Alignment of workshop content with both institutional goals and regional agricultural challenges ensures relevance and impact.
- Inclusion of a diverse group of participants (researchers, students, technicians, and industry stakeholders) promotes peer learning and applied knowledge dissemination.
- Use of model systems (e.g., vineyards) contextualizes complex topics, making advanced research more accessible and applicable.
- Continuous collaboration with isUP-AgrO partners contributes to long-term capacity-building and sustainable knowledge integration within the host institution.

Integration of **remote sensing and physiological measurements** with climate adaptation strategies is a critical pathway for sustainable agriculture, especially in regions facing water scarcity.

Lessons Learned:

There is a strong demand among researchers and stakeholders for practical training in advanced monitoring tools and plant physiological modeling, particularly in the context of climate adaptation in agriculture. Workshops that provide direct exposure to field-applicable technologies and real-world case studies—such as vineyards under water stress—greatly enhance participant engagement and learning outcomes. By combining high-level scientific research with strong regional relevance, these workshops foster long-lasting impact and support the adoption of integrated approaches that merge physiological, agronomic, and technological insights. Their hands-on, research-driven format is especially effective in engaging multidisciplinary audiences and facilitating meaningful knowledge transfer.

Moreover, the participation of internationally recognized experts significantly enhanced the credibility of the training, motivated attendees, and increased institutional visibility. However, a key lesson from the 1st Workshop was the need to clearly distinguish workshops from training schools—both in terms of structure and communication strategy—in order to improve outreach and encourage broader participation from third parties and external institutions. It was also important to develop a separate feedback questionnaire specifically for the workshop, distinct from the one used for the training school. These issues were successfully addressed in the 2nd Workshop: by separating the workshop from the training school, we achieved greater visibility, higher attendance, and more effective engagement of the international trainers. In addition, a dedicated questionnaire focusing solely on the workshop was distributed to participants to gather more targeted feedback.

Looking ahead to the next Training School—**Task 2.4: Training School on Soil Microbial Interactions – Challenges and Advanced Techniques**, scheduled for **October 20–24, 2025**—we plan to start dissemination efforts earlier. Additionally, we are considering hosting part of the event at the university's **rectoral building in the city center**, aiming to attract a wider audience beyond the academic community and increase public engagement

5. Conclusions

In summary, the workshops significantly advanced knowledge and capacity in precision agriculture by focusing on plant-soil interactions, advanced monitoring tools, and plant water relations. Featuring international trainers from IRNAS-CSIC with recognized expertise, they offered valuable experience and excellent networking opportunities. The sessions provided a unique platform for young researchers to engage with senior experts, fostering mentorship, collaborative learning, and the strengthening of a vibrant research community. The practical and theoretical insights gained are expected to enhance regional agricultural practices—particularly in viticulture—supporting innovative approaches to climate adaptation and resource-efficient management. These efforts highlight the importance of continuous capacity-building and international cooperation in addressing the evolving challenges of modern agriculture.

5.1. Follow-Up Actions

Looking ahead to the next Training School—**Task 2.4: Training School on Soil Microbial Interactions – Challenges and Advanced Techniques**, scheduled for **October 20–24, 2025**—we plan to start dissemination efforts earlier. Additionally, we are considering hosting part of the event at the university's **rectoral building in the city center**, aiming to attract a wider audience beyond the academic community and increase public engagement.

This type of action is also foreseen for the last two Training Schools planned for **next year**: **Task 2.5** Training School, *Add Value to Agriculture and Food Chain By-products*, in **April 2026**, and **Task 2.6** Training School, *Bioinformatics and Data Analysis*, in **June 2026**.

