A portfolio of dissemination and training material based on demonstration events

Deliverable D3.8

THIS PROJECT HAS RECEIVED FUNDING FROM THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME** UNDER GRANT AGREEMENT N. 101000339

How to quote this document:
Doelman, N., Kaszkowiak-Nowacka, A., Zubac, J. (2025). *Report on A portfolio of dissemination and training material based on demonstration events. Deliverable D3.8 of the Horizon 2020 project IMPWORKS (GA number 101000339)*, published on the project website in April 2025: https://IPMWORKS.net/deliverables-milestones/.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N.101000339

An EU-wide farm network demonstrating and promoting cost-effective IPM strategies

Coordination and Support Action (CSA)

01 October 2020 – 31 March 2025 (54 months)

A portfolio of dissemination and training material based on demonstration events

Due date (as planned in DoA): Month 54 – March 2025

Actual submission date: 11/04/2025

Work package: WP3 – Farm Demonstration activities

Lead partner: 05-DELPHY

Author List: Natasja Doelman (Delphy)
Anna Kaszkowiak-Nowacka (KPODR)
Josip Zubac (KPODR)

Reviewed by the Coordinator: Nicolas Munier-Jolain (INRAE)

Dissemination Level

☒	**PU**	Public
☐	**CO**	Confidential, only for members of the consortium (including the Commission Services)

Abstract

The information summarized in this document is a compilation of self-reported most impactful events from the 22 IPMWORKS Hubs, including summaries of the demonstration events and links to dissemination and training materials produced during the project and used during the events. Training materials were specifically developed by hub coaches and other experts in scope of demonstration events in respective hubs.

Contents

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

1. Introduction

Effective dissemination and training are essential for promoting the adoption of Integrated Pest Management (IPM) strategies among farmers and agricultural advisors. This report, a portfolio of dissemination and training material, presents a collection of resources developed within the IPMWORKS project to support knowledge transfer and capacity building.

The report covers two key components:

- Best demonstration events – Each IPMWORKS hub partner has selected and described their most impactful demonstration event, highlighting key insights, practical outcomes, and farmer engagement. These events showcase successful IPM strategies tested in the field, providing real-world examples of effective pest management with reduced pesticide use. When specific material was developed for the event, either for communication and dissemination (videos), or for training (posters), the links to access this material are provided.

- E-Learning training modules – In addition to field demonstrations, the report briefly outlines the e-learning training modules developed within IPMWORKS. These modules serve as valuable educational tools, offering structured guidance on IPM principles, techniques, and decision-making support for farmers and advisors.

By compiling these dissemination and training materials, this report aims to ensure that the knowledge generated through IPMWORKS demonstration events is widely accessible, further encouraging the adoption of sustainable, low-pesticide farming practices across Europe.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2. Portfolio of most impactful demonstration events by IPMWORKS Hub

This chapter presents a selection of the most impactful demonstration events organized by IPMWORKS hubs, categorized by sector. Each event showcases effective Integrated Pest Management (IPM) strategies implemented in a real commercial farm engaged in the IPMWORKS network, highlighting successful approaches to reducing pesticide use while maintaining crop health and profitability. To provide a structured overview, the demonstrations are grouped into the following sectors:

- Arable farming
- Greenhouse production
- Orchards
- Outdoor vegetables and ornamentals
- Viticulture
- Cross-sector initiatives

By sharing best practices from different agricultural systems, this portfolio serves as a valuable resource for farmers, advisors, and stakeholders looking to implement or improve IPM strategies in their own operations.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1 Arable sector

2.1.1 Netherlands, WUR, Weeding robots for future weed

In 2023 the Dutch arable farming hub in North Brabant gathered for a demonstration on future weed control. Joost Derks, a 29-year-old farmer from Volkel, The Netherlands, introduced the FarmDroid robot used on their 10-hectare field of sugar beets. In search of weed control strategies that require less inputs of herbicides, and with labour becoming more expensive and often not readily available, Joost experiments with autonomous solutions for mechanical weeding. This robot plants seeds and logs the GPS-location for each individual seed. Then it weeds the field using attached hoeing elements, working around the sugar beet plants using their GPS-location. In theory the robot can operate continuously using solar power, but as for mechanical weeding in general it is independent of weather conditions.

During the demonstration, farmers were actively discussing the pros and cons of using such a robot. Joost was able to show the challenges he faced using the FarmDroid. He highlighted the importance of preparing the soil properly and the robot's difficulty with tracks in the field after fertilising or spraying. The weeds still present in the field by the end of June, were the result of trial and error. Using an autonomous weeding robot is not yet feasible for every farmer and takes perseverance, but all participants agreed that these techniques are needed for future-proof agriculture.

Timo Sprangers, crop protection researcher, discussed the robot's performance during the field visit with the farmers. “The robot's precise planting and weeding impressed the farmers”. Overall, robots are seen as a promising tool for modern farming that requires farmers to adapt and learn to use it effectively. Farmers clearly think of such a robot as a part of an integrated approach to weed management, not an all-in-one solution. Building experience is needed to effectively implement these techniques in the future.

During the field visit, recordings were made for a video. This video can be found on Youtube 'NPPL Demonstratie Farmdroid’ or opening the following link: www.youtube.com/watch?v=axvw1Pzz_v8.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.1.2 Poland, KPODR, Probiotechnology in integrated production of oilseed rape, wheat and sugar beet

Demonstration took place on 25th of May 2023 in Tłuchowo on the farm of Mr. Jarosław Tarnicki. The main topics of the demo were: Integrated pest management, certified Integrated production in sugar beet and use of cover crops and endophytic beneficial fungi in winter wheat. Mr. Tarnicki presented 3 of his fields with oilseed rape, winter wheat and sugar beet where he uses mostly pig slurry as source of N fertilization. The host also prepared a freshly dug up soil profile to better understand local pedoclimatic conditions. Farmer stressed out that most of the techniques he is using are nothing new, it is more of a return to good old practices that his father and grandfather used with better equipment and understanding of processes behind them. The importance of soil health care was stressed out as a clear contrast with neighbouring fields where no cover or catch crops were used and no organic fertilization applied regularly. The difference was obvious in the mere colour and structure of the soil where one was darker with favourable structure and other more dry, pale and crumbly. Use of endophytic beneficial fungi with other beneficial microorganisms was presented with farmers' conviction that they work and help plant and soil health if applied in optimal conditions.

Other topics worth mentioning were variety selection, use of cereal mixtures (bony with no bony varieties), cover crops, active substance selection, micro dosing, harrowing, weeding and fertilization strategy and procedures required for Integrated Production certificate. Farmer also mentioned that he is always testing something on his fields to try or verify new approaches, varieties, machinery etc.

In his closing remarks Mr. Tarnicki pointed out that his education in phytopathology and entomology helps him recognize pests and diseases early with systematic daily field visits in peak of season. Then he can reduce or omit some applications of PPP with a good understanding of pests' biological cycles.

After the field walk, a short indoors presentation session was made in collaboration with farmer and his suppliers/partners on topics of variety selection, soil and beneficial microorganisms. The event hosted over 50 participants and concluded with lunch and open discussion.

Link to communication:

Link to the article on the demo event on KPODR's website with the link to the Booklet in Polish: PIERWSZE WYDARZENIE DEMONSTRACYJNE IPMWORKS W 2023 ROKU - Kujawsko-Pomorski Ośrodek Doradztwa Rolniczego w Minikowie

Link to an IPMWORKS article on J.Tarnicki's activities: Destination: biologization! – IPMworks

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.1.3 Scotland, JHI, Regenerative Techniques and New Cropping Opportunities

The Arable Scotland event held at Balruddery Farm on 2nd July 2024 saw outcomes from the IPMWORKS project. Visitors could walk through field plots showing agroecology in action in a whole systems approach, with cover-, companion-, and inter-crops, represented virtually with a first test of an interactive simulator map aimed at communicating research outcomes through an immersive learning experience. Hub members contributed to panel discussion on improving system resilience. Demonstrations of new tillage equipment, spray technologies and robotic tractors in-field on the day added a practical aspect, providing attendees an opportunity to see reduced tillage, direct sowing and spot spraying in action.

We were delighted to welcome David Webster from LEAF to address the crowd and begin the day's events with an opening speech. Talks and panel discussions held in the marquee complemented the field plots and demo's. Highlights of the program included:

- Short practical workshops on 'Soil quality assessment' with Emma Willis (AHDB), 'Maximising the benefits of integrated management practices' with Professor Fiona Burnett (SRUC) and Dr Neal Evans (Voluntary Initiative), and 'Crop assessment in research trials' with Sebastian Raubach (Hutton).
- A panel discussion on farming practices that create resilience in Scottish arable systems chaired by Elizabeth Massie, a farmer from East Lothian.
- 'Making soils resilient to extreme weather', a seminar with Dr. Kenneth Loades, Research Leader in Ecological Sciences at the Hutton, looking at the long-term management practices required and the balanced and varied approach needed to broach this.
- 'The benefits and constraints of incorporating grazing animals into a soil regenerative approach?' seminar with Frédéric Thomas, one of the founders of BASE-France and a pioneer of conservation agriculture.

Speaking about the event, Dr. Alison Karley, Research Leader in Agroecology at the James Hutton Institute, said: "Our farming future is entering a new era, with a variety of factors changing the outlook of the arable sector. Agriculture is already having to cope with climatic shifts, while at the same time trying to reduce its environmental impact, its contributions to further climate change, and still turning a profit.

"Arable Scotland offers a unique platform in Scotland for knowledge exchange and inspiration, between farmers, agronomists, suppliers, processors and scientists - encouraging the adoption of practices that enhance sustainability and resilience in farming."

A video relating to the event can be viewed here:
https://youtu.be/TRWp3H8zKoo?si=2KPuQHrk8J5xpdx8.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.4 Italy, SSSA, Agroecology Day 2024 7th Edition. The role of functional biodiversity in the agroecosystems

The Italian IPMWORKS Arable Crops Hub organized a Demo Event the 4 June 2024 at the CiRAA (Center for Agro-environmental research "Enrico Avanzi") in Pisa, the research center and experimental farm owned by the University of Pisa, on agroecological practices in arable crops. The event was at its 7th edition. The aim was to build a whole day of field walks with expert talks, gathering together in a single event the display of all the field trials which dealt with agroecology and sustainable practices. This type of demo event was organized by a task force made by the GoA (Group of Agroecology of the Scuola Superiore Sant'Anna SSSA), University of Pisa and Seminare il Futuro Foundation, with different research groups. We organized a launch event on the 27 May with the format of an online round table, included in the national program of the Festival for Sustainable Development. In this spin-off event we asked four professors about their vision of agroecology, and we discussed their thoughts and future perspectives.

On the day of the demo event, the 70 participants were divided into three groups, visiting sequentially three thematic points. Each participant chose where to go and in which order, with two rounds in the morning and one in the afternoon, to let participants visit all. The three thematic points were called "interaction between crops and native biodiversity at genetic level, species level, landscape level". For the genetic level, we visited the trials on organic breeding for soft wheat and chickpea varieties selection. For the species level, we visited the trials on winter cereals and pulses intercropping and wheat and pea intercropping in agroforestry. For the landscape level, we visited the trials on the silvoarable system on wheat with poplar and companion shrubs and the silvopastoral system with poplar for cattle. In every thematic point, two main trials were explained by their principal investigator (from PhDs to full professors) with the help of posters printed on tissue. Furthermore, other extra trials were present in the same thematic point, and each had a poster to satisfy the curiosity of the participants with the opportunity to ask details to their principal investigator. All the participants met in the coffee break and at lunch and had the opportunity to informally interact. We also placed two innovative machines used in the field trial in the yard outside the meeting room, to let participants see them at the welcoming moment and during the two breaks. During the day our communication experts from GoA and from University of Pisa asked for feedback, took photos and organized a round of interviews to some of the organizers of the Agroecology Day. A very intense day under a fierce sun for a lot of enthusiastic people from a very different range of background and role, with some people from outside Tuscany Region and some international participants (helped by participants and researchers with some English translation). For the first time we also had a whole class of students from the agriculture technical high school with their teachers. This Demo Event, year after year, is starting to become a reference point for research in agroecology for Italy and we are "capitalising" the efforts done in these years to showcase IPM practices. Thanks to the "IPMWORKS method" we learnt in setting up successful demo events on holistic IPM management.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Link to communication:

Press release on Terra&Vita magazine about IPMWORKS and the Agroecology Day 6th Edition 2023: https://terraevita.edagricole.it/featured/ricercatori-agronomi-e-agricoltori-uniti-per-ridurre-uso-di-agrofarmaci/

Online round table “Towards the Agroecology Day” launch event, 27 May 2024

Registration available on YouTube: https://www.youtube.com/watch?v=dIubyygdB7U&t=12s

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.1.5 Denmark, DL. Focus on Italian ryegrass

In an area with a lot of resistant Italian Ryegrass, where herbicides are not efficient any more, farmers need support to develop non-chemical method for weed management.

A field experiment was visited in this demo event on 3 May 2022. The basis of the experiment was to see the effect of sowing time in winter wheat. At the demo event, it was clear that the field had a lot of Italian ryegrass. The effect of sowing time on weed density was visible, but with around 3815 (early sown) 1400 (late sown) Italian ryegrass individual plants per m², not much wheat would survive.

The experiment didn't get harvested because of the potential for a bigger next generation of Italian ryegrass. Therefore, it was cut down, once in June and once in July. In the year of the experiment the surrounding field was spring barley. In the following year(s), the experiment plot was visible, hence the Italian ryegrass was not that prominent in that specific spot.

The group discussed the effect seen in the experiment. Different pesticide strategies were also demonstrated in the experiment, and did not have the desired effect on the Italian ryegrass.

An expert of Italian ryegrass was invited for the whole session, to answer questions and do a presentation after the field walk about do's and don'ts. The take home message most of the farmers mentioned, was about the strategy of as little as possible disturbance of the soil, to manage the seed pool in the top of the soil, instead of refreshing the pool with a ploughing every year. Similarly, no harrowing should be done after harvest, because otherwise the seed pool would refresh. If nothing is done, the seeds left on the ground would potentially be eaten by beneficial organisms over the years.

If something must be done, it should be a topmost harrowing, not deeper than 2 cm, and that is a hard thing to accomplish, even by an experienced farmer.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.1.6 Denmark, VELAS. Field day at Funen

At VELAS we have multiple annual events. These include field days in Funen and in Judland. As part of IPMWORKS, we set up two similar field events demonstrating the consequences of early and delayed sowing of winter wheat in combination with different herbicide strategies.

The early parcels were sown on the 05/09 (top in the photo) while the late sown was established on the 04/10. Although weather conditions made it hard to do follow up herbicide sprayings in the parcels established in October, these parcels were the ones with the lowest weed pressure from grass weeds, but with some variation across herbicide treatments. We set up the same demo in Judland, with roughly the same result. All in all, about 400 farmers visited the two locations, with IPMWORKS consultants making talks about the treatments, and interpreting the visual result. The farmers were very positive as to the demonstrations and asked many questions, especially about the reasons for the yield loss. The explanation provided was a larger attack of lice and thus stronger occurrence of oat rot, again resulting in lower plant growth and stronger competition from the sown grass weeds. Furthermore, the farmers were concerned with the fewer effective herbicide strategies, when the sowing was delayed – especially focusing on the loss of herbicide products. In addition, another threat is the development of resistance, due to less effective treatments. Farmers really raise awareness of their strategies for sowing time and effective establishment of the crops.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Two different plots, with the same herbicide treatments but different sowing dates. The plot to the left was sown in September, while the one to the right was sown in October.

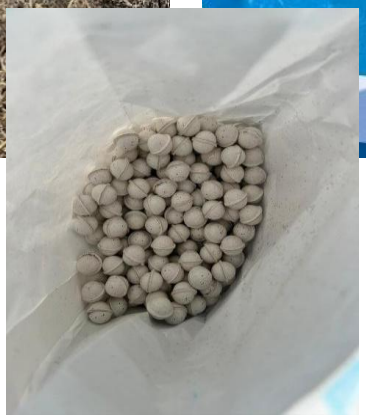
THIS PROJECT HAS RECEIVED FUNDING FROM THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME** UNDER GRANT AGREEMENT N. 101000339

2.1.7 Serbia, BIOSENSE. Trichogramma drone application

For the first time in Serbia, capsules containing Trichogramma parasitic wasps, natural enemies of the European corn borer, were applied using drones on organic and integrated maize fields.

A total of 16 hectares were treated in this groundbreaking effort, covering areas near Kikinda, as well as fields in the Novi Sad and Zemun Polje regions. This initiative was carried out as part of the European projects “CREDIT Vibes,” coordinated by the Maize Research Institute Zemun Polje, and “IPMWORKS,” led by the BioSense Institute in Novi Sad. The demonstration event was specifically designed for farmers, agricultural advisors, and the scientific community, aiming to promote innovative and sustainable pest control practices. The activity was widely covered by the media and actively shared on social media platforms, ensuring broad outreach and engagement. The demonstration of Trichogramma capsule application marks a significant step forward, setting a best-practice example for organic and integrated farming across the Western Balkans region.

Pictures:



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.8 Spain, INTIA. Basic principles of direct sowing

In 2023, the IPMWORKS Spanish arable farming hub in Navarra gathered for a demonstration on basic principles of direct sowing that took place in the Ororbia cooperative. The objective was to train the attendees to change in the management of extensive farming with adaptations to the new CAP while maintaining profitability and reducing the environmental impact.

38 participants took part in the event, the highest number of all the workshops carried out in the project.

Direct sowing is an agricultural technique that is increasingly used in different parts of the world. This technique consists of sowing seeds directly into the soil without the need for soil disturbance, resulting in a significant reduction in the use of machinery and savings in natural resources.

In addition to reducing costs and the amount of time needed to prepare the soil, no-tillage also helps to conserve soil quality and prevent erosion. Furthermore, by reducing the amount of machinery used, it reduces greenhouse gas emissions, which contributes to combating climate change. However, no-tillage also has some challenges. One of them is the need to control weeds and other pests that can affect the crop.

The success of this day was due to the participation of a farmer who has experience with direct sowing. The conclusions of this farmer are “Direct sowing changes the way you produce and changes your life. It is an investment with slow results, but the balance is positive. You have to be prepared to do no-tillage, and this system is best suited to drier areas with extensive cultivation”.

The agenda of the event demonstration

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

News in INTIA website: https://www.intiasa.es/web/es/noticias/la-tecnica-de-la-siembra-directa-es-una-inversion-economica-largo-plazo-con-beneficios

Social media: https://x.com/IntiaSa/status/1633005856965918720

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.9 Germany, JKI. Mechanical weed control in arable crops

On June 2nd, 2023, the Julius Kuehn Institute organised a demonstration on mechanical weeding at a farm in Thuringia, Germany, as part of the IPMWORKS project. The event featured talks from two farmers and an expert, followed by live demonstrations of various weeding machines in different crops (oats, maize, peas) and soil types. The farm (Pahren agricultural cooperation), run by René Kolbe, is managed partially conventional and organic and uses the approach of regenerative farming. In his introductory talk, Kolbe emphasized the importance of timing, weather, and soil conditions for effective weed control, though he noted the higher costs in fuel and labor.

Josef Rauwolf, an organic farmer, followed by presenting an efficient method combining hoeing and harrowing in one operation in crops that he sows with a wider row space, using a camera-guided system for better weed control in less time. This approach led to a 5 to 10 percent increase in yields and increased aeration of the soil, which reduces the risk of emerging foot diseases. Participants showed particular interest in the camera system. An expert from the Julius Kuehn Institute then shared long-term insights on different mechanical weeding machines in various conditions.

After a break, Kolbe introduced several weeding machines used on his farm, with dealers from Einböck, Horsch, and GST Denmark explaining the features of each. The event concluded with on-field demonstrations of roller-hoes and harrows in three different crops.

By combining practical reports, scientific insights, recommendations from the advisory and trade sectors and practical demonstrations in the field, the event provided participants with a comprehensive understanding of mechanical weeding and its potential benefits for their own farm management.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

A “Biostar” roller hoe from GST Denmark (Photo by Silke Dachbrodt-Saaydeh, JKI)

On-field demonstration of machinery for mechanical weed control (Photo by Silke Dachbrodt-Saaydeh, JKI)

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.10 Germany, GLZ. Innovative techniques for automated detection, machine learning and AI

In the future, the use of automated detection, machine learning and AI will increase, potentially contributing to Integrated Pest Management. In 2024, the IPMWORKS German arable farming hub in Wesermarsch demonstrated these new technologies.

The RumboJet is a trailed implement for the automated detection and control of blunt-leaved docks in permanent grassland. The dock plants are detected and sprayed with pesticide in a single operation. The plants are detected using a multispectral camera and then sprayed with individually switchable nozzles. Machine learning and AI algorithms are used to identify and localize plant species from the composite drone images and sensor data. Specific individuals or groups of individual plant species can be identified and localized, creating maps of the scanned field with the distribution of plant species.

This detection is of practical relevance for agriculturally relevant species, such as the distribution of nutritious forage plants, which are indicators of high-quality grassland, and, in contrast, the quantity and distribution of harmful and even poisonous plants, which can reduce the quality of the forage or even be dangerous to the health of the animals.

And what does the practice say?

Farmer's testimony: "*We have been doing spot spraying for two years as part of the Lower Saxony´s pesticide reduction programme. By doing this, we achieve comparable efficiencies compared to area spraying with a reduced use of pesticides of around 90%. The advantage is that only the dock is treated and clover and other desired species are protected. Only as much product is used as is actually needed, consistently with the motto: as much as necessary, as little as possible.*

The technique now works so well and reliably that we will continue to use it on our farm in the future.

Rumex detection with the drone is useful because I have the map afterwards, which I can also upload to the tractor. And then I can use it to control my sprayer. On the one hand, I can of course save pesticides on a large scale. On the other hand, the effect on other plant species is reduced. With this Spot Spraying technique, I can protect the grassland and secure the yield.

Species recognition by drone is a very interesting technology, especially for Rumex. It can already be used to some extent or can be used within the next few years. It is a great development."

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Link to communication:

- https://youtu.be/0RCmJmiwILU?si=rSp1EfMrhj7cabhv
- https://youtu.be/04D5boMR4nQ?si=uYYluFwfBa1AAhBP
- https://www.instagram.com/p/C87E37tiTnT/
- https://www.instagram.com/p/C87E37tiTnT/
- https://www.linkedin.com/feed/update/urn:li:activity:7214195793426083841
- https://www.linkedin.com/feed/update/urn:li:activity:7211712080469442561
- https://www.facebook.com/share/v/1H9G3KqF47/
- https://www.facebook.com/Gruenlandzentrum/posts/pfbid023z2Z4hFoKiS7M6RPuhxEHkhj6BYn7NNXG7isxUgiBSxqMSF2eta1c2sqfEuiC1fpl
- https://www.gruenlandzentrum.org/wissen-kompakt/

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.11 Germany, GLZ. Visit of the Vocational School for Agriculture at the Grünlandzentrum

The vocational school for agricultural economics from Fritzlar, located in the heart of northern Hesse, was on a study trip to our Grünlandzentrum in Summer 2024. The excursion offered the prospective farmers an excellent opportunity to gain practical insights into the agricultural practices of a region that is very different from their usual environment of low mountain ranges and arable farming.

The Wesermarsch - insights into a unique production system: One of the highlights of the visit was the introduction to the Wesermarsch, a region that is predestined for grassland farming due to its specific geographical and climatic conditions. In contrast to the regions of northern Hesse, which are better known for arable farming, the Wesermarsch offers ideal conditions for livestock farming and forage production. The concepts and methods presented, such as sustainable management strategies, IPM and water management, illustrated the complexity and necessity of adapted agricultural practices in different environments.

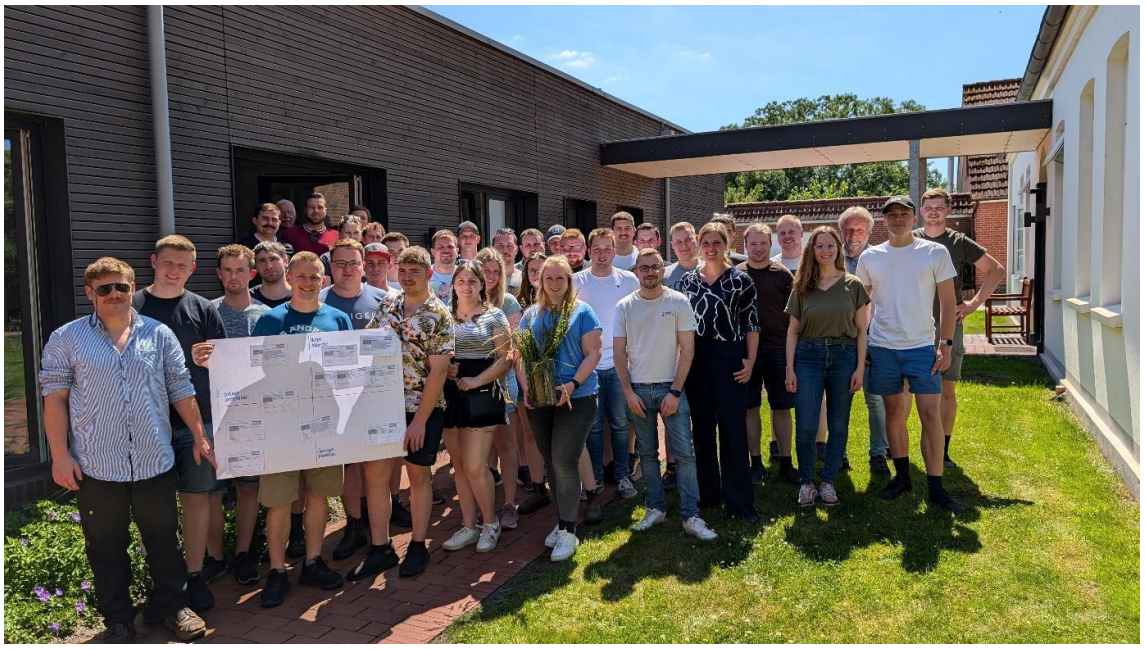
The value of exchanging ideas with young farmers: The exchange with young farmers offers great added value for both sides: The young farmers gain insights into current research and practical applications, while the researchers receive valuable impulses and fresh ideas from the next generation. This exchange not only promotes understanding and enthusiasm for agricultural science, but also contributes to the continuous development and improvement of agricultural practices.

Link to communication:

- https://www.instagram.com/p/C8rdaSsIhsH/?img_index=1
- https://www.linkedin.com/feed/update/urn:li:activity:7211712080469442561
- https://www.facebook.com/Gruenlandzentrum/posts/pfbid02xnPUHhn7jfnbbwYeDb4xRFe6JC2NgxkHJ5KsA1XiyNirHCrDwvAC6Baoi7RkRBJGl

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.1.12 Ireland, TEAGASC._IPMWORKS farm walk Darren Allen

In June 2022, Teagasc organized a series of summer farm walks on three of the IPMWORKS farms, looking at all aspects of each farm and how they attempted to reduce their dependence on pesticides.

Hub Coach testimony: "*The event in Darren Allen's farm in Ballymaloe in Cork stands out as probably one of the best farm walks that I organized during the project. The farm is mixed cropping with winter wheat, winter barley, spring barley, spring beans as the main crops as well as areas for diversity including cover crops which also bring other benefits to the farm.*

The event was organized with the help of a local co-operative who provided refreshments and also assisted with the promotion of the event among their customers. This cooperation with the local merchant proved to be vital in the success of the walk as they helped to broaden the appeal of the event to their customers, many of whom traditionally would not attend Teagasc events.

On the evening, we had approximately 120 farmers and interested parties, so we decided to split the crowd into groups of 30 people who then went to the different talks which covered a wide range of topics including cover crops, soil protection & nutrition, BYDV monitoring, grass weed control, grain trading, protecting water quality and crop establishment systems. Each talk lasted for approximately 10 -15 minutes, which meant that, including the introduction, the whole event lasted almost two hours. At the end of the event there was tea and coffee available for the attendees which was another key element to the success, as it facilitated discussion about the different topics that they had witnessed during the event."

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.2 Greenhouse sector

2.2.1 Belgium, INAGRO. The use of banker plants to stimulate beneficials

Belgian strawberry farmers typically use glasshouses, tunnels, or covered gutters for strawberry plants. On the ground there is a mulch of mainly plastic in the glasshouse and tunnels or short mown grass under the covered gutters. This practice aims to eliminate weeds and other plants that can host pests like Thrips. However, increasing biodiversity within the crop can positively impact beneficial insects already naturally present, or those being commercially released. Jolien, the hub coach of the IPMWORKS soft fruit hub in Belgium, experimented with the banker plant, Lobularia maritima, to stimulate beneficial insects such as lacewings, hoverflies, and Orius laevigatus at the applied research station Inagro.

During a visit to Wageningen University with the hub, farmers were further inspired by the use of banker plants. These plants flower for extended periods, providing food, shelter, and a place for beneficial insects to multiply. Lobularia maritima, in particular, is seen as an attractive plant that provides food for beneficial insects. Jolien introduced this technique to her hub, and the farmers of the hub began planting L. maritima alongside strawberries. Monitoring revealed frequent observations of Orius laevigatus and hoverflies in the L. maritima at some farms. Farms with higher biodiversity, including flower borders, often had more beneficial insects.

Although Thrips were present in the banker plant, they did not harm the strawberry crop. Predatory mites against Thrips, such as *Neoseiulus cucumeris*, could easily settle in the banker plant and manage the Thrips population. Some hub members who experimented with this technique are willing to continue using it. Jolien: "*I'm most proud of the change in mindset of my farmers and this technique is now also tested in leek fields to control trips*."

Overall, the introduction of banker plants like Lobularia maritima has shown promise in enhancing biodiversity and supporting beneficial insects in strawberry farming, leading to a more sustainable and integrated pest management approach.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.2.2 Spain, COEXPHAL. Biological control in watermelon

The demonstration was organized to share and discuss the advantages and benefits of biological control in watermelon crop, and in which the Coprohnijar cooperative, the company Bioline Iberia, and the Phytosanitary Alert and Information Network of the Junta de Andalucía (regional government) have collaborated.

60 participants attended the demo on 22 April 2021. Out of them, fifty were farmers from the Coprohnijar cooperative. Participants were split into several groups and shifts to keep the safety measures required by COVID-19, before starting the visit to the greenhouse of Esther Molina, a member of Coprohníjar. In her greenhouse, participants had the chance to see (and touch!) in situ how this farmer has implemented several biological control strategies via conservation biodiversity and biological control in the cultivation of watermelons in her greenhouse.

During the visits, Juan José Guzmán, Isabel María Caparrós, and Carmen Méndez, advisors from the cooperative, Bioline and RAIF respectively, as well as Esther Molina have explained in a very graphic way to the farmers how their steps have been in which Starskii, the Amblyseius swirskii provided by Bioline Iberia, has been the base for biological control in the three hectares distributed over four farms.

To deal with aphids and red spider mites, the main pests that could attack watermelon crops, one of the keys has been anticipation. The reservoir plants, very important to provide shelter and food for the auxiliary fauna, were planted two months before the transplantation of the watermelon, so when the cultivation began there were already numerous parasitoids and predators of the aphid. Also decisive was the adequate release of A. swirskii to attack the red spider mite in the foci where it appeared.

According to the hosting farmer (Esther), it is also important to control the humidity in the watermelon crop, either with water in the corridor or with a nebulizer "*because if not, we cannot release them because the bugs will not survive. When the temperature reaches 50 degrees, only one survives, the aphid!*"

One of the most important aspects discussed by the participants was the plant species used to boost biocontrol, both inside and outside the greenhouse. In the first case, the *Lobularia maritima* and the sunflower have been key to the feeding of parasitoids, as well as bees in their pollinating task. Equally important have been the cereal, corn and fennel reservoir plants.

Also, most of the participant farmers have been interested about the minimum greenhouse area that all these types of plants have to be planted. According to Esther's experience it is minimal, approximately a minimum of 1% of the surface, but its benefit is enormous.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.3 Orchard sector

2.3.1 Italy, SSSA, Olive tree pruning-chopping and use of crop residues

The demonstration was part of an IPM strategy filled with actions to maintain biodiversity and ecosystem services and to increase soil and plant health to fight olive fly and other pests of the olive grove ecosystem.

The demonstration meeting was held on 24 May at 'L' Aspro', farm of Dimitri Zinetti, one of the more active farmers of our IPMWORKS hub. We dedicated the demo to innovative methods as an alternative to the practice of burning olive tree pruning, offering new possibilities for the use of pruning residues on the farm.

Olive farms produce large quantities of wood from pruning that are usually disposed of by burning. This is a very old practice adopted both to physically eliminate the wood and to prevent the spread of any harmful plant diseases or insects, or to obtain ash that can be reused as fertilizer.

Pruning residues are to be burned in the field; in an amount equal to or less than 3 cubic metres per hectare per day, taking care not to harm things or persons and in compliance with regional, provincial and municipal provisions. In addition, Ecoscheme 3 provides for a direct payment of 220 euro per hectare, imposing certain obligations, including a ban on burning pruning residues.

These considerations lead to defining alternative solutions for managing pruning residues in olive groves and orchards in general.

Hub coach testimony: "*I believe that the secret of the success of this demo was in the personal involvement of a farmer as a trainer in this field lesson. An olive grower who was directly interested in finding an alternative solution to burning. During these years, Dimitri had experienced the different possibilities of shredding machines, and this makes his narration reliable to other farmers. In addition, the demonstration of the different techniques, the advantages and disadvantages of a number of shredding machines in comparison, together with the possibility for participants to try out the usefulness and observe them while working, clearly rendered the idea of what we aimed to show. Above all, it was important for the involvement of those present in the discussion: farmers experts and researchers.*

We saw several machines, namely:

- *a bio-shredder producing more or less homogenous wood chip as residues;*
- *a shredder which works by grinding the pruning residues on the ground;*
- *a motor cultivator, a versatile machine to which a shredder can be attached, which also grinds the residues on the ground;*
- *finally, a bio-shredder, which is more expensive but working the pruning residues better and can be moved with wheelbarrows along the difficult terrain of our olive groves.*

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Thanks to these technical means, the olive pruning residues are kept on the ground, that benefit from their soil-conditioning and fertilising power. This is a sustainable cultivation practice and strongly recommended, especially in organic farming, where fertilisation is severely limited due to the few products available and the cost of this operation. On Dimitri's farm, the material resulting from shredding is also used as bedding for the sheep barn and as mulch in the vegetable garden. It is also suggested for use in protecting the inter-row of young olive groves for which it is essential to ensure the availability of water and nutrients.

We thereafter stimulated a looking forward reflection, about the need to increase studies on transformation by thermochemical processes more complex than classical combustion, such as pyrolysis and gasification, in order to produce gaseous (syngas) and liquid (pyrolysis oil) fuels to generate electricity. The by-product of these processes is charcoal, which could be used as a soil conditioner. The material, that until now was considered a waste to be disposed of, can also be looked at in a new perspective, as an asset to be exploited for heat production by burning it in biomass boilers, or in pellet boilers after densification into pellets to improve energy efficiency. This vibrant discussion also contributed to the success of the demo event."

This interesting demonstration day was attended by the mayor of the municipality. She announced in advance that one of the local associations that brings together the olive growers of Monte Pisano has obtained funding for the purchase of a bio-shredder to be rented free of charge to any olive grower in the area who requests it.

Link to the video: https://alumnisssup-my.sharepoint.com/personal/stefano_carlesi_santannapisa_it/_layouts/15/stream.aspx?id=%2Fpersonal%2Fstefano%5Fcarlesi%5Fsantannapisa%5Fit%2FDocuments%2FAttachments%2FVIDEO%20LOC%20%20ASPRO%201%2Emp4&referrer=StreamWebApp%2EWeb&referrerScenario=AddressBarCopied%2Eview%2E14c50305%2D50da%2D4194%2Da91b%2De0a018f03fd1&ga=1

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.4 Outdoor vegetables and ornamentals sector

2.4.1 Netherlands, Delphy. Field-demonstration spot sprayer EcoRobotix ARA

As part of the IPMWORKS project, DELPHY organized a highly successful field demonstration showcasing the innovative EcoRobotix ARA spot sprayer. This event focused on its application in two crops: onions and sugar beets, addressing a wide range of weeds, including potato volunteers. The EcoRobotix ARA employs advanced camera technology to recognize weeds selectively and applies herbicides with pinpoint precision, reducing pesticide use by an impressive 85-95%. Unlike many conventional spraying robots, this machine stands out for its high speed and capacity, making it a practical and efficient solution for modern farming.

The event aimed to demonstrate the functionality and effectiveness of the EcoRobotix ARA while educating farmers on how it could be integrated into their integrated pest management (IPM) strategies. The day began with a presentation by 'Doorgrond,' a reputable sales and advisory organization. The speaker provided a detailed explanation of the machine's operation, highlighting advanced features, and engaged in a lively Q&A session with the 52 attending farmers. The presentation covered key topics, such as how the technology works, the types of targeted weeds, and the practical benefits for reducing pesticide without compromising crop health.

After the presentation, attendees were invited to the field for a live demonstration of the EcoRobotix ARA in an onion crop. During this demonstration, the machine sprayed clear water instead of herbicides, allowing participants to clearly observe its precision—fluid was applied solely to the weeds, leaving the onion plants untouched. This hands-on experience gave farmers an opportunity to evaluate the machine's capabilities and understand its practical applications. Advisors were on hand to answer specific questions about herbicide doses, potential risks of crop damage, machine algorithms, and, naturally, the overall cost and return on investment.

The demonstration successfully illustrated how this advanced technology can improve weed management in a sustainable and efficient way, offering farmers a viable method to significantly reduce chemical inputs while maintaining productivity.

Link to communication:

During the presentation the following video's of Doorgrond are shown:

- Ecorobotix ARA spotsprayer Demonstratie omgeving Onstwedde doorgrond.nl https://www.youtube.com/watch?v=g5oUzBHWttE
- Ecorobotix ARA spotsprayer, plaats specifieke toepassingen in de uien (slow motion) https://www.youtube.com/watch?v=mjc2wK4krZo

Besides these two videos shown at the event, these two videos below are also very interesting about this machine:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

- https://www.youtube.com/watch?v=2m_NSiLw2zA
  The video titled "Middelenbesparing en bestrijding aardappelopslag met EcoRobotix" discusses how spraying with the EcoRobotix ARA spot sprayer leads to significant savings in resources due to its high precision.
- https://www.youtube.com/watch?v=OrObv3tPAJo
  The YouTube video titled "EcoRobotix ARA at NPPL group Flevoland" showcases a demonstration of the EcoRobotix ARA, a precision spraying robot that uses camera technology to detect weeds and spray them selectively. This technology allows farmers to significantly reduce the use of herbicides by targeting only the weeds and not the crop. The demonstration took place with the NPPL group in Flevoland.

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME** UNDER GRANT AGREEMENT N. 101000339

2.4.2 Belgium, INAGRO. Biological aphid control and substrate cropping

This demo was done at the farm of a vegetable IPMWORKS hub member in Belgium. The family grows mostly organic vegetables, but is also specialising in early season yellow zucchini (non-organic) in polytunnels. As the farmers are convinced of the organic practices, their strategy for aphid management is based on biological control. This was demonstrated and explained at the event by the local contact of Biobest.

The farmer is also growing the zucchini on substrate with a classic A/B system. This is not a common practice in the region, and is therefore a novelty for the other farmers. During this demo, the farmer could explain to the attending farmers his view and experiences with the system. A driver is that soil-born pathogens are mostly evaded when cultivating in pots on substrate. Early zucchini growing is only possible in greenhouses and plastic tunnels in the region. When crop rotation is not a viable option, substrate cultivation could prove to be a solution.

Link to communication:

https://www.ipmworks.net/toolbox/fr/#/resource/648700feabdd4f6c5c74761f

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.4.3 Portugal, CONSULAI, Conservation bio-protection

In October 2022, the open-air horticulture hub of Portugal, managed by CONSULAI, got together to discuss the topic of conservation bio-protection.

The demo event took place in Mafra, at the demo farm Carlos Neves, managed by Bruno Neves. The farm produces mainly lettuce but also cabbage and cucumber.

The demo event was attended by several farmers from the hub, others farmers of the region, advisors from farmers associations and private companies, as well as researchers and policy makers.

Supported by Koppert, the event started with a presentation of the topic and of the demo-farm. Then, the group moved to the field to learn about the agronomic aspects of keeping flower strips in lettuce fields, and how that biodiversity can increase and maintain auxiliary insects that will have a positive impact in pest management.

This practice, along with others, has helped the farmer to drastically reduce the use of pesticides.

Then the group discussed and evaluated the strategies presented, leading to the conclusion that conservation bio-protection, combined with other measures, is an essential tool to a holistic approach of pest management in the sector of outdoor vegetables (as in other sectors).

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.4.4 Finland, ProAgria. Open field day at Peltosirkku Farm

In October 2023, The IPMWORKS hub organised an open field day in polytunnel for soft fruit growers and stakeholders. The event was focused on soft fruits management and protection, more specifically on thrips management in strawberry and on biological control of raspberry root diseases.

A new IPM method was presented at the event, based on oxygen nanobubbles, a promising approach for improving plant health and stress resilience. Ozone is added to irrigation water, expecting to enhance strawberry protection against pests and improve both the yield and quality of the crop. The oxygen content of water reaching plant roots has a significant impact on plant well-being, such as improved immunity, nutrient uptake, growth rate and yield. By introducing oxygen into the water in the form of nanobubbles, plant growth and productivity can be significantly enhanced, potentially by tens of percent. Consequently, the impact on the yield from the cultivated area is substantial.

During the open field day, there was also a presentation of different substrate types. Peat has been the most used substrate in Finland. Nowadays, new materials can replace peat, such as moss and other components. A representative researcher from Natural Resources Institute Finland presented various options for innovative substrates.

The open field day gave the opportunity to review IPM (Integrated Pest Management) options, focusing particularly on the biological control of root diseases in raspberries and methods to reduce thrips damage in strawberry crops. In everbearing strawberries, the greatest losses occur because of thrips severe damage on the second harvest. The first harvest is typically good.

The field day received a strong interest from the attending farmers and stakeholders.

Link to communication:

- https://www.proagria.fi/hankkeet/ipmworks-protecting-crops-without-pesticides
- https://mailchi.mp/2f96a7613c9e/ipmworks-hub-newsletter-17646283?e=e1f948e260

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.5 Viticulture sector

2.5.1 Portugal, CONSULAI. Vegetation cover management in the vineyard

On the 6th of December 2023, as part of the European IPMWORKS project, a demonstration event of the IPMWORKS viticulture hub was held at Herdade dos Grous, in Abegoaria, in the Baixo Alentejo.

The meeting began with a discussion on "Vegetation cover management in the vineyard". The production manager at Herdade dos Grous, Luís Constantino, gave a presentation on the

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

vegetation cover management practices applied at Herdade dos Grous, which fueled the discussion among the hub members.

Some of the practices discussed were the use of cover crops, mechanical management of the vegetation cover, and cooperation with shepherds in the region to manage the vegetation cover through sheep flocks in the vineyard.

Afterward, the attendees went for a field walk, providing the opportunity to see in the field all the practices mentioned in previous discussions.

At the end of the meeting, there was a networking lunch where the discussion on various topics related to the meeting continued.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.5.2 Spain, FEUGA. Exploring Sustainable Vineyard Pest Control: Pheromone Diffusers and Bat Shelters as Alternatives to Pesticides

On April 22, 2022, FEUGA organised a demonstration on sustainable pest control strategies in the Rías Baixas wine region, where two innovative methods to combat the grapevine moth (Lobesia botrana) were showcased: the use of pheromone diffusers and the introduction of bat shelters. During the event, practical information on how to build bat shelters was provided, giving farmers the knowledge needed to implement this biological control solution on their own vineyards.

One member of the IPMWORKS hub presented the use of pheromone diffusers, a highly effective biotechnological control strategy. These diffusers work by emitting a specific sex pheromone that confuses the male moths, preventing them from finding females to mate with. As a result, the moths are unable to reproduce, significantly reducing the pest population. This method is not only effective but also minimizes the environmental impact compared to traditional chemical insecticides. During the event, experts discussed the practical application of these pheromone diffusers, including the need to cover large vineyard areas—at least four hectares—to create a "protected zone." It was highlighted that careful management is essential to avoid unprotected areas where pests might still reproduce.

Additionally, Bodegas Enguera shared their experience with using bats as a biological control agent. According to their studies, bats consume 80 to 100% of their body weight in insects every night, making them highly effective predators of pests like the grapevine moth. Bats can capture over 1,000 insects in just one hour. To encourage the presence of these natural predators, refuge boxes were installed in the vineyards. These boxes provide a safe environment for bats, promoting their role in pest control and reducing the need for chemical treatments.

The event emphasized the integration of these two methods as part of an IPM approach. Participants discussed the technicalities of each method, including installation procedures, monitoring, and the challenges of ensuring the effective coverage of large areas. The event highlighted the importance of collaboration among farmers and the potential for these methods to be integrated into sustainable vineyard management practices.

A video documenting the event can be found on Youtube: https://www.youtube.com/watch?v=pg28RFoDGdw.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

THIS PROJECT HAS RECEIVED FUNDING FROM
THE EUROPEAN UNION' HORIZON 2020 RESEARCH
AND INNOVATION PROGRAMME
UNDER GRANT AGREEMENT N. 101000339

2.5.3 Greece, AUA. Spraying technologies demo

The Spraying Technologies Demo was successfully held on October 31, 2024, at the AUA OFC Experimental Farm in Spata, Greece, in collaboration with the Agricultural University of Athens (AUA) and the Hellenic Crop Protection Association (HCPA). The event, designed to showcase cutting-edge spraying technologies in agriculture, gathered 50 attendees, including farmers, researchers, and industry professionals.

The demo focused on drone-based spraying applications, a rapidly growing innovation in the field of precision agriculture. It offered attendees the opportunity to explore the latest advancements in drone technology and their role in enhancing the efficiency and sustainability of pest management practices.

Key Highlights:

- Drone-Based Spraying Applications: A central feature of the event was a hands-on, live demonstration of drone preparation and operational functionalities. Attendees observed drones in action, showcasing their capabilities in delivering precise, targeted treatments for pest control.
- Workshops and Informative Sessions: The event included interactive workshops and presentations, providing valuable insights into the benefits of drone technology in agriculture. Topics covered included the legislative framework surrounding drone spraying, as well as smart farming practices and their integration with drone technologies for sustainable agricultural solutions.
- Legislative Framework for Drone Spraying: Experts discussed the regulatory guidelines and policies governing drone usage in agricultural spraying. This session ensured participants understood the legal requirements, safety measures, and best practices for implementing drone-based technologies in their operations.

Takeaways:

- Attendees gained a comprehensive understanding of drone spraying technology, from the basic setup to advanced operational techniques.
- The event facilitated discussion on how drone applications can optimize pesticide usage, reduce environmental impact, and increase overall farm productivity.
- Participants left with valuable practical skills that can be directly applied to enhance their own farming practices, leveraging the power of drones for more efficient and sustainable pest management.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

2.6 Cross sector HUB

2.6.1 Slovenia, Vineyards in Svetinje by Puklavec

Demonstration was held on the vineyard in Svetinje, Slovenia which belongs to Puklavec and a friend company. The company produces the vine on over 500 hectares, managed according to IPM priciples.

Grapevine flavescence dorée is an important quarantine disease that has spread significantly in vineyards in northeastern Slovenia in recent years. Infected grapevines can be found in all varieties, with chardonnay, riesling, šipon, white and gray pinot, and blue frankovka being the most affected. The disease is spread among grapevines and vineyards by the vector, the American grapevine leafhopper, which first appeared in northeastern Slovenia in 2004 and then spread to all vineyards within a few years. Controlling the American grapevine leafhopper (Scaphoideus titanus) by removing symptomatic grapevines is a mandatory measure. In the infected area, three sprayings were necessary. Due to the limited number of permitted insecticides, a different mode of action insecticide should be used for each spraying to prevent resistance. Monitoring the population of the American grapevine leafhopper in several vineyards using yellow sticky traps was presented, considering the size of the vineyard and the number of sprayings. It was found that three sprayings were most effective, especially on larger areas or in areas where all grape growers implement control and removal measures.

Links:

Citation (DOI)

https://cris.cobiss.net/ecris/si/sl/researcher/12573

https://cris.cobiss.net/ecris/si/sl/researcher/44387

Link to communication:

- https://www.youtube.com/watch?v=JCTFauqpVUc
- https://www.youtube.com/watch?v=oVgSoXSQDjM

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

Pictures:

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

3 E-learning training modules

As part of the IPMWORKS project, a series of e-learning training has been developed to support farmers, advisors, and other stakeholders in implementing Integrated Pest Management (IPM) practices (reported in ***Deliverable 6.4 Training modules***). These modules have been prepared based on successful experiences within the IPMWORKS network, covering a wide range of topics such as technical IPM strategies, farm performance, co-innovation, and farm hub coaching. They are designed to target both farmers and advisers, providing practical insights and guidance.

The training materials focus on IPM efficiency to enhance sustainability and promote cost-effective IPM strategies. They combine both existing IPM resources and new holistic management examples developed within the IPMWORKS network.

Each module consists of presentations that outline theoretical concepts and recorded video lectures for a more interactive learning experience.

To ensure adaptability, these modules are structured in short chapters, allowing users to access specific content based on their national needs and local contexts. This flexibility makes them a valuable tool for customized training, enabling targeted learning for diverse agricultural settings.

The modules are available through the IPMWORKS Toolbox, a platform dedicated to sharing IPM knowledge and best practices. By attending these training courses, users can enhance their understanding of IPM principles, reduce reliance on chemical pesticides, and implement more sustainable and resilient farming practices.

The e-learning training modules consist of eight different modules. In the sections below, more detailed information is provided for each module.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

3.1 Module 1: Agrosystem/Agroecosystem: Concepts and theory. Holistic approach to IPM

Module 1 focuses on the concepts and theory of agro-ecosystems, including the holistic approach of IPM. It begins by outlining what an agro-ecosystem is and what the objectives are for the progress of agriculture in the world. It also introduces the three groups of organisms that cause crop losses along with the impact of arthropod pests, diseases and weeds on crop yields. In addition, it introduces landscape ecology and epidemiology and agro-ecosystem management and the holistic concept of IPM. The module contains a case study: protected crops, which exposes the evolution of pest control in EU greenhouses, and the introduction of biological control. In terms of the Agroecosystem and the limitations for IPM implementation, the case study presents tools for managing the landscape around the greenhouses in order to facilitate the colonization by beneficial insects.

1.0. Introduction
1.1. What an agroecosystem is
1.2. Objectives for the progress of agriculture in the World: simultaneous increase of the productivity and sustainability
1.3. The three groups of organisms that cause crop losses
1.4. Impact of arthropods pests, diseases, and weeds on crop yield
1.5. Landscape ecology & epidemiology and agroecosystem management
1.6. A general survey of agroecosystem management for IPM. Holistic IPM concept
1.7. Two case studies: protected and arable crops
1.8. Open questions for reflection and discussion

3.2 Module 2: Plant health risk challenges and Policy context in the EU

Module 2 presents the Plant health risk challenges and Policy context in the EU. It starts presenting the risks and challenges for Plant Health in the present decade, including pest resurgence and emerging risks and also addressing the current EU legislation. Examples of resurgent pests are included for arthropod pests (*Frankliniella occidentalis*), plant pathogens (*Xylella fastidiosa*) and weeds (*Amaranthus palmeri*), including the risk factors for each of them. Furthermore, Module 2 presents a case study based on how the SUD has been implemented in Denmark and exposes new and future EU legislation on pesticides and a closer look on the IPM principles.

2.1. Risks and Challenges for Plant Health in the present decade. Pest resurgence and emerging risks
2.2. Current EU legislation
2.3. Case study: How the SUD has been implemented in Denmark
2.4. New and future EU legislation on pesticides and a closer look on the IPM principles

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

3.3 Module 3: Integrated Weed Management (IWM)

Module 3 starts presenting the principles of IWM and the biology of weeds. For the technical aspects of IWM, this module strongly relies on material previously released by the H2020 IWMPRAISE project. This material is presenting a comprehensive number of IWM tactics, accessible for the IPMWORKS e-learning modules users. These resources include available IWM tools for Perennial crops / Narrow row crops / Broad row crops and perennial weeds / annual weeds. The IWMPRAISE booklets of experimental trials in Europe are also presented, including results, tools and strategies identified in Denmark, Spain, France, Switzerland, Italy, Netherlands, Slovenia, and the United Kingdom. Furthermore, IWMPRAISE sheets, made as one-pagers which give a short and concise description of each IWM tool or tactic are also introduced. The IPM strategy of cultivar choice is also exposed, in the case study of winter wheat. As a complement to IWMPRAISE material, this module includes two case studies, namely the case study based on an 18-year IWM experiment in arable field crops in France, and the case study of an IWM experiment on arable vegetables in The Netherlands. Case studies outline a number of IPM tools for preventing establishment and competition and reducing multiplication of weeds, along with results on cost-efficiency.

3.1. Introduction to integrated weed management
3.2. Principles of IWM, triangles and hexagons
3.3. The biology of weeds
3.4. Individual IWM tactics
3.5. Case study #1 French case, arable crops
3.6. Case study #2 Dutch case, arable vegetables

3.4 Module 4: Integrated Disease Management (IDM)

Module 4 focuses on disease management and on the challenges we are facing in agriculture, considering three main aspects, which are climate change, the need and request to reduce the use of plant protection products, and last but not least, the resistance management. The module gets into the context of Sustainable Agriculture and applied epidemiology for disease control. In addition, it presents 3 case studies: Arable crops (wheat), Horticultural crops (processing tomato) and Perennial crops (grapevine). This module introduces the multiple modelling approach Decision Support Systems (DSSs). The content present different IPM tools for the following crops / diseases with 3 cases studies: i) Wheat / Fusarium head blight, ii) Tomato / Downy mildew, Alternaria leaf blight and Bacteriosis and iii) Grapevine / Downy mildew.

4.1. Current challenges in disease control
4.2. Disease management in the context of Sustainable Agriculture
4.3. Applied epidemiology for disease control
4.4. Case study. Arable crops: wheat
4.5. Case study. Horticultural crops: processing tomato
4.6. Case study. Perennial crops: grapevine

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

3.5 Module 5: Integrated Invertebrate Pest Management (IIPM)

Module 5 focuses on invertebrate pest management. This module introduces the concept of the art of doing nothing as a core philosophy for pest management. And finally, the wide range of IPM tactics available for invertebrate pest management are introduced. Specific examples on IPM tactics are provided in the rest of the module.

5.1. Introduction to Invertebrate Pest Management
5.2. Injury and damage caused by invertebrate pests
5.3. Agronomic, mechanical, and physical management options
5.4. Decision Support Systems and monitoring as part of Invertebrate IPM
5.5. Biocontrol of invertebrate pests
5.6. Synthetic Chemical Pesticides Resistance Management

3.6 Module 6: Holistic IPM examples

Module 6: Holistic IPM examples presents one chapter per each of the 5 agricultural sectors represented in IPMWORKS: arable crops, vineyard, orchards, vegetables, and horticulture, including different holistic IPM strategies in each of these sectors.

6.1. Orchards. Carlos Lozano, Aragon Government (external collaborator, IAMZ-CIHEAM)
6.2. Arable crops. Geert Kessel (WUR)
6.3. Vineyards. David Lafond (ACTA/IFV)
6.4. Outdoor vegetables. Dieter Depraetere (INAGRO)
6.5. Greenhouse – horticulture. Eduardo Crisol (COEXPHAL)

3.7 Module 7: Assessment of an IPM system

Module 7 covers the Assessment of an IPM system. It presents how, when redesigning cropping and farming systems to adopt more IPM so as to reduce pesticides use, we need to be aware of the diversity of assessment topics. This is important, both to convince farmers to adopt IPM and to inform policymakers about the consequences of promoting the adoption of IPM.

7.1. Introduction
7.2. Measuring pesticide use and impact
7.3. Assessment of cost-efficiency of low-pesticide IPM-based cropping system

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339

3.8 Module 8: Soft skills for facilitating interactive learning and demonstration on IPM

Module 8 is dedicated to technical methods of implementation of IPM, social skills and group coaching for advisors and collective coaching of farmers through peer-to-peer learning and in-farm co-innovation processes. Given the changes in practices, it is important to ensure how they can be facilitated with farmers. The (new) approach for advisors engaged in coaching farmers towards more holistic IPM requires a balance between being an expert and being a facilitator. The module relies on experiences in the IPMWORKS project farmer groups that we call hubs, coordinated by so-called hub coaches.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339