



AGROECOLOGY FOR WEEDS

UNA RED DE MANEJO AGROECOLÓGICO DE ESPECIES ARVENSES PARA LA PROMOCIÓN DE LA ADOPCIÓN DE ESTRATEGIAS SOSTENIBLES DE MANEJO DE ESPECIES ARVENSES

Taller nacional en España

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¿QUÉ ES GOOD?



Weed out the problem. Agroecology is GOOD



GOOD es un proyecto de 4 años que ha desarrollado una Red de Gestión Agroecológica de Especies Arvenses (AWMN) con 16 Laboratorios Vivos (LLs) para aumentar la adopción de prácticas de Gestión Agroecológica de las Especies Arvenses y reducir el uso de herbicidas.²



¿QUÉ ES GOOD?

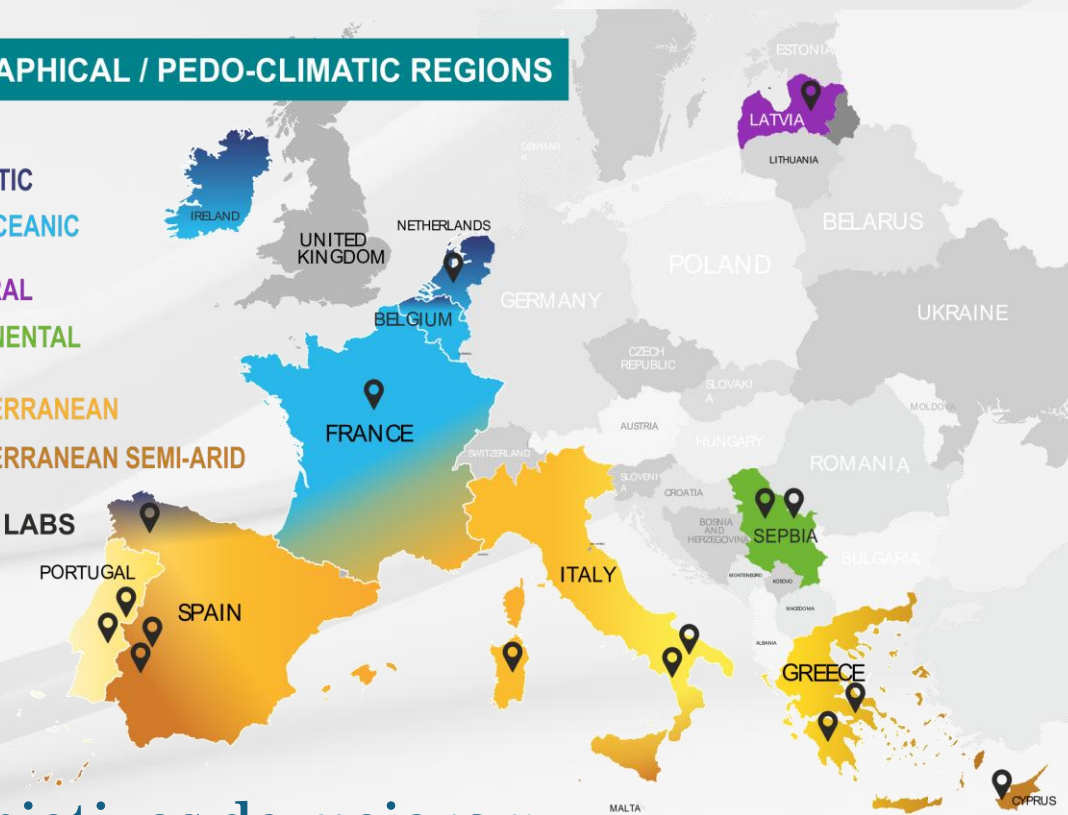
16 Laboratorios Vivos (LLs) en 9 países, con los objetivos de mejorar:

- la co-creación de conocimiento,
- la toma de decisiones de los agricultores,
- la aceptación por parte del usuario final de los enfoques de Gestión Agroecológica de Especies Arvenses

BIOGEOGRAPHICAL / PEDO-CLIMATIC REGIONS

- ATLANTIC
- SUB-OCEANIC
- NEMORAL
- CONTINENTAL
- MEDITERRANEAN
- MEDITERRANEAN SEMI-ARID

LIVING LABS



¿QUIÉNES SOMOS?

20 socios de 11 países (universidades, centros de investigación y empresas)





¿Qué es la Red de Gestión Agroecológica de Especies Arvenses (AWMN)?

La AWMN del proyecto GOOD es una red temática híbrida que vincula a varias partes interesadas de la cadena de valor agroalimentaria a través de los Laboratorios Vivos y el centro digital de la plataforma GOOD.



¿Qué es un Laboratorio Vivo (LL)?

Los LLs de GOOD son ecosistemas de innovación abierta que cocrearán con las partes interesadas, probarán, evaluarán y demostrarán los resultados combinados de varias soluciones no químicas y digitales para la gestión de las especies arvenses que funcionarán durante tres temporadas de cultivo para crear un impacto sostenible. En este proceso, involucramos a agricultores, asesores, la industria, consumidores, investigadores y responsables políticos.



¿Qué es la gestión agroecológica de especies arvenses?

Diversificación de cultivos

Cultivos de cobertera (cc)

Cultivos intercalados

Rotación de cultivos

Prácticas culturales y novedosas

Control mecánico, corte y mulching

Microorganismos beneficiosos, agentes de biocontrol, pastoreo y herbicidas naturales

Falso semillero y configuración de tasas de siembra en hileras

Nuevas tecnologías

Recubrimiento de semillas para aumentar la competitividad de cultivos

Drones, deshierbe térmico, teledetección, manejo de malezas específico del sitio

Sistemas de apoyo a la toma de decisiones

Datos sobre GOOD

- 16 Laboratorios Vivos
- 6 condiciones pedoclimáticas
- 9 arable y 6 cultivos permanentes
- >14 cultivos de cobertera
- Drones
- Inoculación con AMF
- Combinaciones de AWM



¿CUÁL ES NUESTRA VISIÓN E IMPACTO?

Social

Mejorar la aceptación social y la adopción de nuevas prácticas y tecnologías de AWM

Económico

Aumentar los ingresos de los agricultores y reducir los costes de producción

Medioambiental

Aumentar los indicadores de salud del suelo, la riqueza de la flora y el rendimiento microbiano

Agronómico

Mejorar la eficiencia del manejo de las especies arvenses y reducir el uso de herbicidas en sistemas agrícolas convencionales

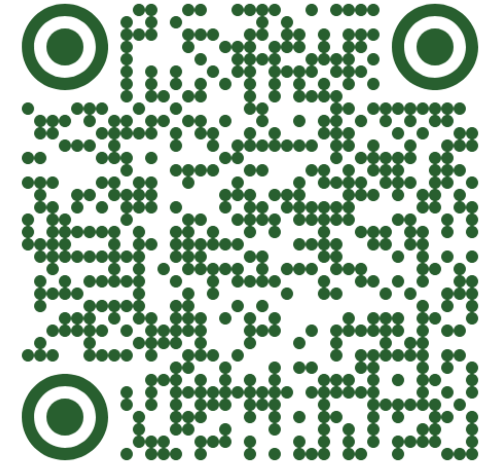
*Fomentar una transición a largo plazo y a gran escala hacia sistemas agroalimentarios sostenibles basados en la biodiversidad mediante el desarrollo de una **Red Europea de Gestión Agroecológica de Especies Arvenses***

El REPOSITORIO de Gestión Agroecológica de especies arvenses YA ESTÁ DISPONIBLE!

<https://www.goodhorizon.eu/platform/description/>

Un repositorio de prácticas actuales de gestión de especies arvenses y uso de herbicidas en agroecosistemas europeos

- Mapas del uso de herbicidas en Europa
- 23 prácticas de gestión agroecológico de especies arvenses (PDF de 2 páginas) → PRONTO SERÁN 40 !



Crop Diversification



Crop Rotation



Intercropping



Cover Crops



AGROECOLOGY FOR WEEDS

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AGROECOLOGICAL WEED MANAGEMENT REPOSITORY

The Agroecological Weed Management (AWM) Repository
(<https://www.goodhorizon.eu/platform/awm-practices/>)

is a virtual space where you can freely and openly find information and educational material on current and agroecological weed management practices in the European Union. You can browse and learn about several weed management practices and crops.

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BIOHERBICIDES

DESCRIPTION & BENEFITS

Bioherbicides (or natural herbicides) are naturally occurring substances (e.g., plant extracts) or microorganisms (e.g., fungi, bacteria) that are used to:

- **offer an environmentally friendly alternative to synthetic herbicides** for weed management, as these are often biodegradable, do not pollute and pose minimal risk to non-target organisms and ecosystems
- **suppress weed growth and reproduction** (often causing a quick knockdown effect to the plant tissues), thereby reducing weed competition with crops
- **terminate naturally the cover crops** and leave them decompose

STRENGTHS

- Environmentally friendly alternative to synthetic herbicides, reducing the ecological impact on soil, water, and non-target organisms
- Novel solution to deal with herbicide resistant weed populations
- Suitability for organic farming systems, meeting consumers demand for chemical-free crop production

OPPORTUNITIES

- Potential selective weed control, targeting specific weed species
- Biotechnological advancements and research in identifying new bioherbicides
- Synergies between research centers, agrochemical companies, and farmers to bring bioherbicides to market

WEAKNESSES

- Limited efficacy compared to synthetic herbicides, requiring repeated applications or combinations with other weed management practices
- Potential for non-target effects on beneficial organisms or crop phytotoxicity if not applied correctly or under certain environmental conditions
- Varying shelf life and stability, requiring careful storage and handling to maintain efficacy

THREATS

- Regulations and approval processes for bioherbicides, leading to delays in availability and market access
- Perception of farmers regarding the efficacy and reliability of bioherbicides compared to conventional herbicides, impacting adoption rates
- High costs for the development of bioherbicides and their purchase by farmers



TIPS

- **select the appropriate method of application** to avoid unintentional damage to crops
- **decide which is the main aim of bioherbicides application** (e.g., inhibition of weed seed germination, prevention of seed set, suppression of weed growth to allow the implementation of other agricultural practices)
- **be aware that maximum efficacy is not guaranteed** as bioherbicides may require time to show results, are not always efficient against perennial weeds due to regrowth, and depend on environmental conditions and weed growth stage
- **do your own experiments** with various bioherbicide formulations and application rates to achieve optimal weed management targets (always following the regulations and the product labels)
- **integrate bioherbicides into a holistic plan** for agroecological weed management to reduce reliance on synthetic herbicides
- **be aware that the price of bioherbicides is still high** on markets, thus, applicate them only when it is needed

LIABILITY DISCLAIMER

This is the first version of AWM repository released in April 2024. While every effort has been made to ensure the accuracy and reliability of the information provided in this factsheet, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability of the information contained herein for any purpose. Any reliance you place on such information is therefore strictly at your own risk. In no event will we be liable for any loss or damage, including without limitation, indirect or consequential loss or damage, or any loss or damage whatsoever arising from loss of data or profits arising out of, or in connection with, the use of this factsheet.

WEBINARS



**Weed
Management
in Legumes**



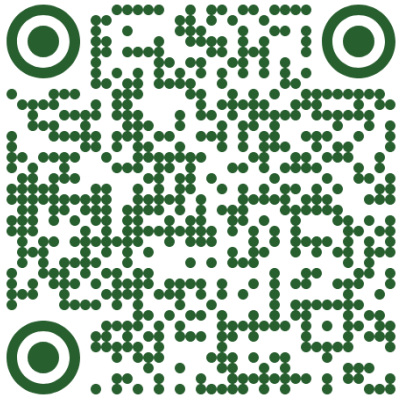
**Leveraging
Ecosystem Services
for legume
production**



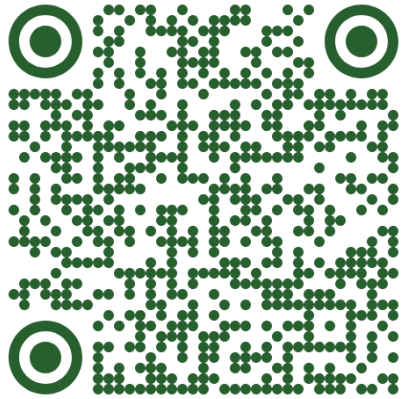
**Cultural control
solutions for weed
and soil management**



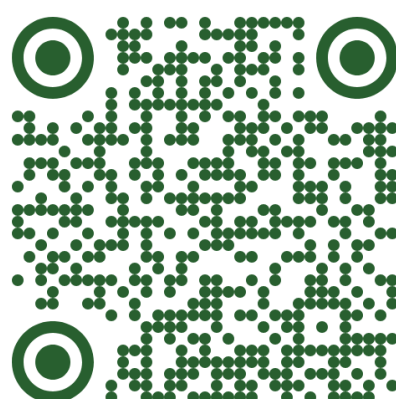
**“Adoption of sustainable agriculture:
from the producer to the consumer”**



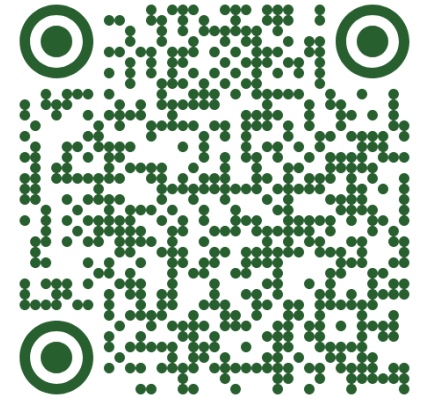
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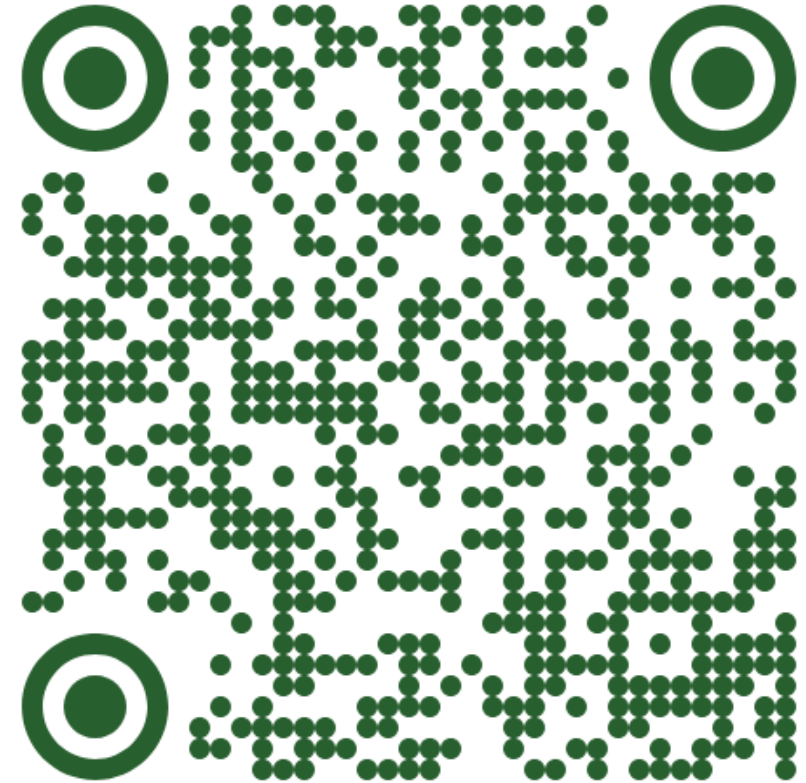


RESÚMENES PRÁCTICOS

PERCEPTION OF STAKEHOLDERS

LIVING LAB EXPERIMENTATION

AGROECOLOGICAL TRANSITIONS



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English .

1. Tillage, chain mower and roller crimper impact on weed suppression | Download PDF
2. Use of pelargonic acid to control weeds in triticale crop | Download PDF
3. Arbuscular Mycorrhizal Fungi (AMF) inoculation of cover crop seeds | Download PDF
4. Unmanned Aerial Systems (UAS) for weed mapping | Download PDF
5. How to inoculate seeds with arbuscular mycorrhizal fungi | Download PDF
6. How to select the best performing cover crops to inoculate with mycorrhizae | Download PDF



Practice Abstract N° 17

Needs, barriers, gaps and opportunities for weed management in Europe

INTRODUCTION

To better understand the challenges and opportunities in agroecological weed management (AWM), we conducted interviews and questionnaires across multiple Living Labs with stakeholders, including farmers, researchers, advisors, policymakers, consumers and industry representatives. This analysis aimed to identify key needs, existing barriers, knowledge gaps, and opportunities for advancing sustainable weed management practices based on agroecological principles.

MAIN RESULTS – OUTCOMES

The results are aggregated across the Living Labs to show the key needs, barriers, gaps and opportunities for agroecological weed management in Europe.

Key findings

★ NEEDS	⊕ OPPORTUNITIES	⊘ BARRIERS	! GAPS
<ul style="list-style-type: none"> Training & education Technical solutions New policies Extension services Funding & labor 	<ul style="list-style-type: none"> New business models Implementation of IPM Ecosystem services Peer-to-peer knowledge Reduction of reliance on herbicides 	<ul style="list-style-type: none"> Regulatory challenges Climate change Changes in weed flora & invasive species Lack of funding & low consumer awareness Complexity & time consuming 	<ul style="list-style-type: none"> Lack of knowledge & practical experience Lack of labor Lack of incentives-subsidies Cost of applications-machinery Changes in farmers' habits

PRACTICAL RECOMMENDATIONS

- Enhance farmer training & knowledge sharing through (1) peer-to-peer exchange of knowledge, (2) demonstration events showcasing successful AWM strategies, (3) hands-on programs
- Foster innovation & research on AWM through the (1) active involvement of farmers into the research part, (2) monitoring of sustainability dimensions, (3) exploration of combinations of practices, (4) new business models
- Advocate for economic incentives & policy support to boost market acceptance and make resilient systems
- Participate in Living Labs and other collaboration networks to co-create solutions that are tailor-made to your region and farming system



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Do you want to learn more about agroecological weed management?



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Practice Abstract N° 2

Use of pelargonic acid to control weeds in triticale crop

INTRODUCTION

Weed control in triticale is challenging as a narrow row crop. **Pelargonic acid** (bioherbicide) is increasingly used as an alternative weed control method, both in organic systems as well as in conventional systems aiming to reduce reliance on herbicides. This study assessed the impact of pelargonic acid on weed suppression and triticale yield in trials in Sardinia, Italy.



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MAIN RESULTS – OUTCOMES

- Pelargonic acid effectively reduced weed biomass
- While **effective in weed control**, the application of pelargonic acid was associated with **lower triticale grain yield** compared to untreated and cover crop treatments
- Lower straw yield compared to cover crop treatments. The impact of pelargonic acid on overall biomass production suggests potential stress on the crop

PRACTICAL RECOMMENDATIONS

- Optimize application timing and rate to minimize negative impacts on triticale yield while maximizing weed suppression
- Combine pelargonic acid with other weed management strategies such as cover cropping or mechanical control to enhance effectiveness.

What is pelargonic acid?

Pelargonic acid (PA) ($\text{CH}_3(\text{CH}_2)_7\text{CO}_2\text{H}$, n-nonanoic acid) is a saturated, nine-carbon fatty acid ($\text{C}_9:0$) naturally occurring as esters in the essential oil of *Pelargonium spp.* and can be derived from the tissues of various plant species. Pelargonic acid along with its salts and formulated with emulsifiers is used in terms of weed management as a **nonselective herbicide** suitable either for garden or professional uses worldwide.

Travlos, I., Rapti, E., Gazoulis, I., Kanatas, P., Tataridas, A., Kakabouki, I., & Papastylianou, P. (2020). The Herbicidal Potential of Different Pelargonic Acid Products and Essential Oils against Several Important Weed Species. *Agronomy*, 10(11), 1687. <https://doi.org/10.3390/agronomy10111687>

Learn more about bioherbicides on our GOOD website!

https://www.goodhorizon.eu/wp-content/uploads/2024/05/GOOD_11-bioherbicides-v2.pdf



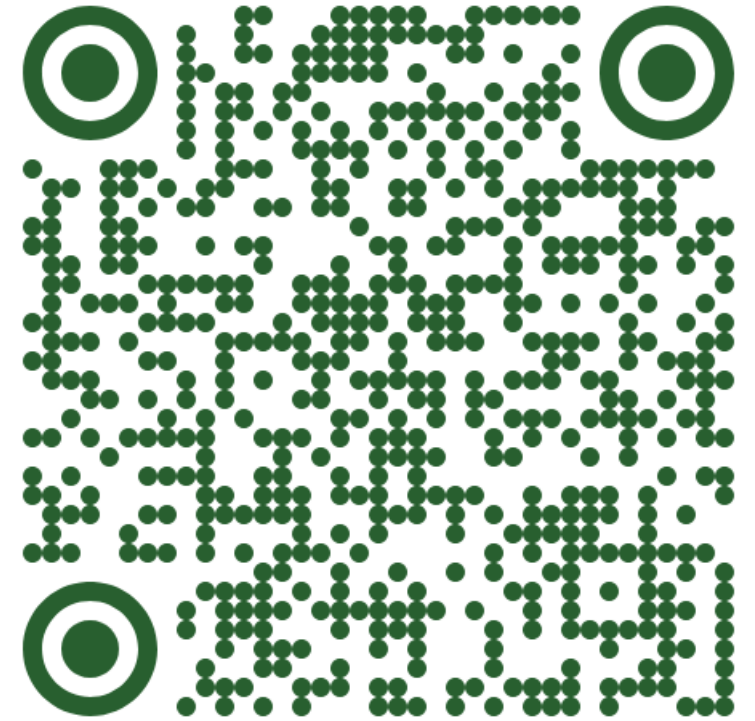
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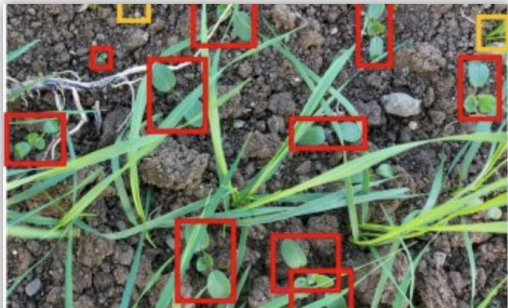


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ARTÍCULOS GOOD



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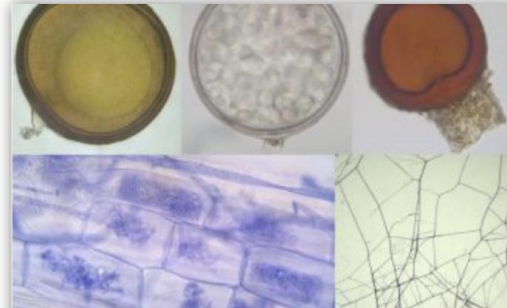
📅 July 24, 2024

**IMAGE ANNOTATION
TECHNIQUES FOR
DIGITALIZATION OF
AGROECOLOGICAL WEED
MANAGEMENT**



📅 July 24, 2024

**EXPLORING THE FUTURE
POTENTIAL OF
BIOPESTICIDES IN
EUROPE**



📅 July 24, 2024

**BENEFICIAL
MICROORGANISMS TO
BOOST AGROECOLOGICAL
TRANSITION**

BENEFICIAL MICROORGANISMS TO BOOST
AGROECOLOGICAL TRANSITION

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Georgia Cantini^{1,2}, Eleonora Granata¹, Arianna Grassi¹, Irene Pagliarani¹, Matteo Bellanca¹,
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In the next decades, a major challenge for European agriculture will be the sustainable production of food crops that can be achieved through the implementation of agroecological practices, the reduction of chemical fertilizers and pesticides, and the protection of biological soil fertility.

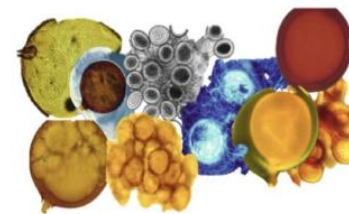
In this perspective, soil microorganisms play a fundamental role, as they are the basis of the completion of biogeochemical cycles, modulating soil biochemical, biological, and nutritional processes. Among such beneficial microorganisms, a key group is represented by the complex microbial communities living in the rhizosphere and establishing symbiotic relationships with plant roots, the arbuscular mycorrhizal fungi (AMF). AMF (phylum Glomeromycota) live in the roots of about 80% of land plants, including the major food crops, from cereals to legumes, fruit trees, vegetables and industrial plants. They are obligate biotrophs, obtaining carbon from the host plant in exchange for soil plant nutrients (such as P, N, S, K, Ca, Cu, and Zn), that are absorbed and transferred to the host plant by large extraradical hyphal networks spreading from colonised roots into the soil, where many nutrient transporter genes are expressed. The importance of such hyphal networks for plant nutrition is shown by some data of their structure: their length ranges from 2.7 to 20.5 m/g of soil, with a mean growth rate of 0.74–1.1 m per day. AMF are closely associated with large and diverse bacterial communities that complement and enhance their properties, showing important plant growth-promoting traits, such as phosphate solubilisation, phytate mineralisation, nitrogen fixation, and the production of siderophores, plant hormones and antibiotics.

The numerous plant-beneficial properties of AMF and their associated bacteria may be exploited to improve the efficient use of natural resources and enhance the performance of cover crops. Actually, cover crops represent an increasingly used management practice in sustainable agriculture and agroecology, as the most promising tool to enhance biodiversity, reduce soil erosion and boost biological soil fertility, while reducing fertilizer input by suppressing the development of aggressive agricultural weeds. The competitive ability of cover crops against weeds may be enhanced by AMF inoculation through two mechanisms. The first one entails mycotrophic cover crop species, such as *Avena*, *Hordeum*, *Lolium*, *Trifolium*, *Medicago*, *Secale*, *Sorghum*, *Vicia*, *Vigna*, which are rapidly and highly colonized by AMF, thereby benefiting from the increased availability of soil nutrients absorbed and transferred by the extraradical mycorrhizal network. The second one entails non-mycotrophic (non-host) weeds, such as most species belonging to the families Brassicaceae and Chenopodiaceae, which are unable to establish the mycorrhizal symbiosis and whose growth is negatively affected by AMF inoculation, mainly due to their reduced access to nutrients and also to parasitic interactions involving plant defence responses and root cell death. Actually, two of the most aggressive weeds, *Chenopodium album* and *Echinochloa crus-galli*, when inoculated with AMF, showed

shoot dry weight decreases of 59% and 46% compared with control plants, while the main crop, sunflower, had P levels increases of 48%.

A further advantage of mycorrhizal inoculation of cover crops consists in the long-term survival of the extraradical mycelium, whose lifespan and functionality are uncoupled from host plant lifespan, being able to establish mycorrhizal symbioses with the successive crops for more than five months since the harvest of the preceding crop. In addition, mycorrhizal cover crops represents a strategic tool for AMF-inoculation of adjacent fruit trees, as the extensive networks of extraradical hyphae spreading into the surrounding soil can establish belowground connections among the root systems of plants belonging to different species, genera and families, thereby establishing the symbiosis with the roots of adjacent perennial plants, which can, in this way, benefit from the soil resources flowing in the network.

Our Horizon Europe research project GOOD (AGROecOlogy for weedDs), will assess the efficacy of the combination of cover crops with the use of beneficial AMF as agroecological tools for weed management. Autochthonous AMF from seven EU countries will be reproduced in pot cultures together with highly mycotrophic host plants, given their status of obligate biotrophic symbionts. Then the reproduced AMF will be sent back to the relevant Living Labs, for inoculating the seeds of cover crops, in order to increase their performance and promote their competitive ability against weeds. The main crops to be tested with the experimental seed inoculation of cover crops are represented by herbaceous species, like wheat, rice, maize, soybean, and by perennial fruit plants like apple, citrus, grapevine and olive. At the end of the experimental studies, the GOOD project will devise innovative, systemic and sustainable solutions for weed management in Europe, in order to promote long-term and large-scale agroecological transition towards innovative low-input, safe and resilient agroecosystems.



GOOD
AGROECOLOGY FOR WEEDS

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GOOD ARTÍCULOS CIENTÍFICOS



📅 November 14, 2025

Informational nudges with adverse effects

Vasileiou, E., Agnoli, L., Georgantzis, N., Ramos-García, M., Osuna, M. D., Ferreiro-Domínguez, N., ... & Freitas, H. (2025). Informational nudges with adverse effects. Open Research Europe, 5, 338. <https://doi.org/10.12688/openreseurope.21531.1>

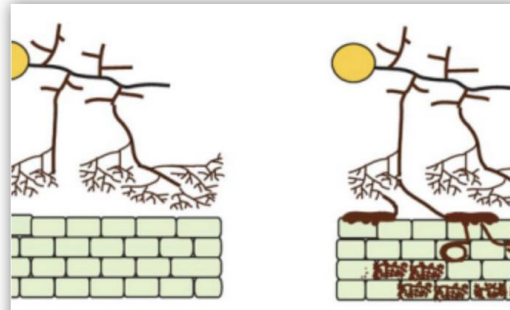
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📅 November 14, 2025

EU-funded research to advance agroecological weed management in Europe, Part I: vision

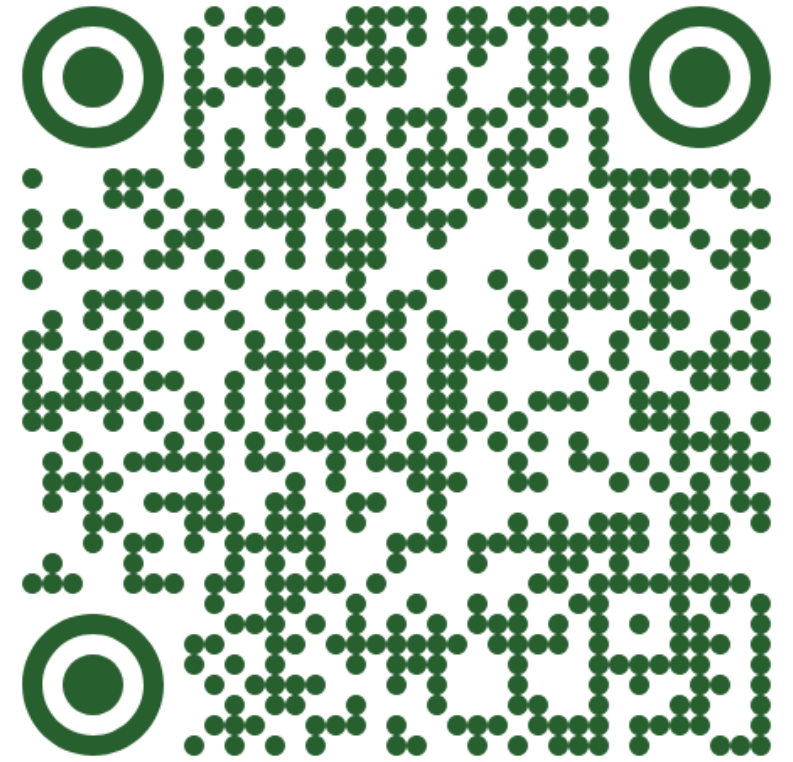
Tataridas, A., Anastasi, M., Vieites-Álvarez, Y., López-González, D., Campillo-Cora, C., Giusti, A., Sánchez-Moreiras, A.M., & Freitas, H. (2025). EU-funded research to advance agroecological weed management in Europe, Part I: vision. Open Research Europe, 5, 211.



📅 November 14, 2025

The nonhost mycorrhizal status of weeds and its relevance to weed management in agroecology

Pagliarani, I., Grassi, A., Agnolucci, M., Turrini, A., Avio, L., & Giovannetti, M. (2025). The nonhost mycorrhizal status of weeds and its relevance to weed management in agroecology. Frontiers in Agronomy, 7,



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