

Augmented Reality for Small-Holder Farmers: Why AR Is the Future of European Agriculture

Across the European rural landscape, a quiet crisis is unfolding. Those who hold the expertise required to tend the land are retiring, and there are too few young people to carry on their legacy. According to Eurostat's Farm Structure Survey, 57.8% of EU farm managers were aged 55 or older in 2020, while only 11.9% were under 40, and the average age of farmers rose from 55 to 57 between 2010 and 2020 (Eurostat, Farmers and the agricultural labour force[1]). At the same time, small farms still dominate the EU's agricultural landscape: 62.8% of the bloc's 8.8 million holdings are under 5 hectares (Eurostat, Farms and farmland in the EU, 2023[2]), meaning that most European farmers simply cannot absorb the cost of losing skilled labour or replacing it with expensive machinery built for large-scale operations.

[1] [Farmers and the agricultural labour force - statistics - Statistics Explained - Eurostat](#)

[2] [73319.pdf](#)





This is precisely the gap that augmented reality (AR) is now positioned to close. By overlaying expert knowledge directly onto a farmer's field of vision, AR can turn decades of accumulated skill into real-time, on-demand guidance (available to anyone, regardless of experience). This article explores why AR is emerging as one of the most promising tools for small-holder farmers, using the EU-funded Horizon Europe project AgRimate as a concrete example of this shift in action.

The Skills Gap and Labour Crisis in Small-Scale Farming

Pruning is one of the most technically demanding tasks in farming (specifically in olives and vineyards as addresses in AgRimate project). Done correctly, it determines a plant's health, yield, and longevity for years to come. Done poorly, it can damage crops and reduce productivity. Yet this expertise has traditionally been passed down through years of apprenticeship (a model that is breaking down as rural populations age and young people leave for other sectors).

Digital technology could help bridge this gap, but adoption remains deeply uneven. The European Commission's Joint Research Centre (JRC) 2025 report *The State of Digitalisation in EU Agriculture: Insights from Farm Surveys* [3] (based on 1,444 farmer interviews across nine Member States) found that:

[3] [New Study Highlights State of play in Digitalisation in EU Agriculture - Agriculture and rural development](#)

- 93% of farmers already use general IT tools, such as accounting software or communication apps.
- But adoption of advanced, crop-specific technologies (like precision-guidance tools) remains marginal, often in the single digits.
- Larger farms adopt significantly more technology than smallholders (between 10% and 84% more, depending on the category) while poor rural connectivity is associated with 4% to 30% fewer technologies adopted.
- The main barriers cited by small-scale farmers are high upfront costs, limited digital skills, and poor internet connectivity, a pattern also confirmed by the European Commission's own Digital Strategy for agriculture, which warns of a growing "digital divide" between farmers with access to cutting-edge tools and those without.

Thus, the farmers who most need help transferring critical are also the least likely to have access to the digital tools that could provide it. This is the core problem that AR-based solutions are now being designed to solve.

How AR Bridges the Gap: The AgRimate Approach

This is where AgRimate (Transforming Pruning for Smallholder Agriculture with Enhanced Productivity and Working Conditions Using AR and Robotics) comes in. Funded under Horizon Europe, AgRimate is a five-year initiative that combines artificial intelligence, augmented reality, and robotics specifically to support small-scale farmers growing high-value crops like olives and grapes. At the heart of the project are two AR tools designed to make expert pruning knowledge accessible to everyone:



- AR Guide: smart glasses that overlay real-time, AI-driven pruning recommendations and safety alerts directly onto the tree or vine in front of the worker, tailored to their experience level.
- AR Trainer: a training platform using 3D digital models, allowing workers to practise pruning techniques in a risk-free simulated environment and receive instant feedback before ever touching a real tree.

Crucially, these AR tools don't work in isolation. AgRimate's underlying AI system is trained by observing expert farmers, learning the subtle judgment calls that go into a good pruning decision, and translating that knowledge into guidance any worker can follow.

The Bigger Picture: A Scalable, Human-Centred Solution

Taken together, AR, AI, and robotics offer something small-holder farming has long lacked: a way to preserve highly specialised knowledge and make it instantly accessible, without requiring years of apprenticeship or expensive specialist labour. Rather than replacing the farmer, AR augments them (putting an expert's judgment directly into the field of view of someone still learning the craft).

This aligns with what the EU's own research shows farmers expect from digitalisation. In the JRC's 2025 survey, farmers were broadly optimistic about the impact of digital technologies: 76% expect economic benefits, 72% expect environmental benefits, and 67% expect positive social outcomes.



AR-based tools like AgRimate's AR Guide and AR Trainer are a direct answer to that optimism (they are inexpensive to scale once developed, they don't require replacing existing tools or land, and they directly target the skills and labour barriers identified as the biggest obstacles for smallholders).

Over its five-year roadmap, AgRimate aims to prove that this model works not just in a lab, but on real farms, with real workers, in two European small-holder landscapes. If successful, the approach could extend well beyond olives and vineyards to other labour-intensive, skill-dependent crops across the continent, offering a scalable blueprint for keeping small-scale, traditional farming both viable and attractive for the next generation.

The future of small-holder farming may not lie in bigger machines or more land, but in smarter, more accessible ways of passing down the knowledge that has sustained these farms for generations. Augmented reality, paired with AI and robotics, is proving to be exactly that: not a replacement for the farmer's expertise, but a way to multiply it.



Leire Bastida

Lead of the Visual and Multimodal Interaction Platform and the Augmented Interaction research line in Tecnia.



Ana Moya

Expert in managing research projects in Tecnia focused on immersive technologies and multimodal interaction.



Tatiana Bartholome

Researcher at Tecnia, specializing in human-centred design, user experience, usability, and stakeholder engagement in innovation projects.

