



Active Ingredient Detector (AcID)



Farmer's name

N/A



Contact

Stergios Dimou-Sakellariou, Director of IoT
Neuropublic SA
sds@neuropublic.g



Name of the farm

Applications in two greenhouses, in
Lasithi, Crete and in Thessaloniki



Country

Greece



Description of the farm context

The AcID system has been deployed in two greenhouse facilities located in Northern and Southern Greece. The northern installation is in Thessaloniki, within a temperate climatic zone, covers an area of 500 m², and is dedicated to the cultivation of peppers and leafy greens. The second greenhouse, located in Lasithi on the island of Crete, lies within a Mediterranean climate, spans 2,000 m², and is being cultivated tomato and cucumber crops.

Partner Organization



AdvisoryNetPEST

The **AdvisoryNetPEST** project aims to create a **network** and **upgrade advisory services** across the EU to increase the sharing of knowledge and the **adoption of innovative solutions to reduce the use and risks of pesticides** (RURP) in all **EU Member States**, enabling the agricultural sector to achieve the targets proposed by the Farm to Fork Strategy.



[AdvisoryNetPEST](#)



www.advisorynetpest.eu

The practices identified in this project are called 'Novel Approaches' and abbreviated as 'NA'

THE TECHNIQUE

Short Description:

The AcID framework, integrates both a process and a product designed for precision farming. It enables real-time detection of active pesticide ingredients during greenhouse spraying and incorporates advanced sensing technologies into a smart farming system.

Crop Sector:

Vegetable (greenhouse)

Targeted pest and diseases:

Powdery and downy mildew

Objective of the NA:

The system monitors pesticide application by detecting active ingredients, tracking environmental conditions (e.g., temperature and humidity), and recording phenological stages of crops. Through the smart farming platform, it automates compliance checks, ensures legal pesticide use, and supports integrated pest management by providing actionable insights. It targets crops affected by powdery mildew and downy mildew.

Level of practice adoption across the country:

1 2 3 4



Funded by
the European Union



UK Research
and Innovation

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the European Commission can be held responsible for them."



Expectations regarding RUPP

By leveraging real-time detection of active ingredients, it ensures that pesticides are applied only as necessary, avoiding over-application and unnecessary chemical exposure and use. This targeted approach not only minimizes residues on crops but also reduces environmental pollution. Additionally, its integration with smart farming systems enhances decision-making, helping farmers adopt safer and more sustainable pest control practices.



Methods/strategy of application in the farm

The AcID system is installed along the planting line. The 'CLEAN AIR' intake, which passes through the 'FILTER BOX', was positioned high above the crop in order to access the cleanest possible air sample. The AcID system uses nanosensors coated with selective polymers to detect pesticide vapors in greenhouses. When these compounds are present, the polymer expands, altering the electrical resistance between the particles. These resistance changes are analysed through PCA classification to create unique digital signatures, allowing accurate identification of the detected chemicals in near real time.



Figure 1: AcID Smart sensor system, the FILTER BOX can be spotted above the crops. Source: Project deliverables of AcID.



Key success factors

The key factors for successful adoption include the proper installation of the AcID system, its ongoing maintenance and periodic recalibration, as well as the farmer's familiarisation with its functionalities and the evaluation of the resulting outcomes. Additionally, it is essential to ensure an adequate power source (such as a solar panel, battery, or mains connection), the availability of the gaiaTRON telemetry station, access to the cloud platform, and reliable Internet connectivity to enable uninterrupted data transmission.



Improvements of the NA

There are no need for any major improvements of the NA. One of the modifications that is anticipated is to simplify the interface of the AcID system.



Figure 2: Application of Pesticide Spraying. Source: Project deliverables of AcID.



Figure 3: Application of Pesticide Spraying. Source: Project deliverables of AcID.



Resources and skills needed to adopt the NA

On the technical side, the AcID sensor system must be installed, together with a suitable power source (solar, battery or mains), the gaiaTRON telemetry station, access to the cloud platform, and stable Internet connectivity for continuous data transfer. In terms of personnel, an agronomist is needed to carry out the spraying activities, while a technician is required for the installation, setup and basic maintenance of the system. And lastly, the initial cost of investment, which is around 5000€.



Figure 4: Assessing the results. Source: Project deliverables of AcID.

*RUPP : Reduction of Use and Risks of Pesticides



Advice from the Advisor

Advisors welcomed the idea of the AcID system and confirmed that it could be implemented in their countries. Farmers are generally open to such agritech solutions, however, the initial high investment cost may act as a deterrent factor. For this reason, the system may be more suitably deployed in larger greenhouse units.



Farmers Testimony

The farmers expressed a high level of satisfaction with the implementation of the AcID system. They reported tangible improvements, reduction in pesticide use, enhanced product quality, greater yield stability, and noticeably lower operational costs. Overall, the system was viewed as a valuable tool that contributed meaningfully to both environmental performance and farm profitability.



Social and Cultural Acceptance

It does not directly align with traditional local practices, as it is a cutting-edge technological system. However, it integrates well with the growing shift toward precision agriculture methods, which are increasingly being adopted in recent years.



BENEFITS

The adoption of this NA has demonstrated clear advantages for both cultivation practices and farm performance. At the operational level, it supports more efficient crop protection through optimised spraying intervals and the use of predictive spraying models, hence precision pesticide management. For farmers, these improvements translate into a 20–30% reduction in pesticide use, enhanced product quality, greater yield stability, and lower overall operational costs.



BOUNDARIES

The system requires ongoing maintenance, including periodic recalibration and consideration of the sensor lifespan. A reliable external power supply is also necessary, which may not always be readily available. In addition, the technology can be complex for small-scale users, while the high initial investment cost may further limit uptake. Finally, there is a need for a more simplified and user-friendly interface to facilitate broader adoption.



Policies and Regulatory Support

The adoption of this NA is supported by the existing policy and regulatory framework. Key instruments such as the EU Farm to Fork Strategy, the Sustainable Use of Pesticides Directive, and the Common Agricultural Policy (CAP) Strategic Plans provide a favourable environment for its uptake. More broadly, policies that encourage precision agriculture and the integration of digital tools further reinforce its alignment with European sustainability objectives.

To go further on NA replication:

To go further on NA replication, certain conditions need to be in place. Successful adoption of the AcID system benefits from a gradual, step-by-step approach, beginning with the proper installation by a qualified technician and continuing with a supported learning phase to help farmers become familiar with the system's interface and outputs. Wider replication would also be strengthened by awareness-raising activities, demonstration events, and ongoing farm-level trials that showcase tangible results.

Systemic Feasibility Analysis: Expert insights from Literature and Field Data

CRITERIUM	INDICATOR	INDICATOR SCORE	EVALUATION
Pesticide use reduction level	Reduction of the applied volume of pesticides	high reduction (>25%) moderate reduction (10-25%) low reduction (<10%) no reduction	
Effectiveness of controlling the target pest/diseases/weed	Percentage reduction of the target pest/weed infestation or of the damage caused by the target disease	high reduction (>60%) moderate reduction (30-60%) low reduction (<30%) no reduction	
Biodiversity	Impact on bees	--/-/0/+/ ++	
	Impact on arthropods other than bees	--/-/0/+/ ++	
	Impact on non-target soil micro-organisms	--/-/0/+/ ++	
Air quality	Impact on pesticide emissions	--/-/0/+/ ++	
	Impact on air pollutants emissions	--/-/0/+/ ++	
Working conditions	Knowledge requirements	high training level moderate training level low training level no training	
	Impact on human health	high risk moderate risk low risk no risk	
	Risk mitigation on operator/employee exposure	high mitigation moderate mitigation low mitigation no mitigation	
Costs	Required level of investment	> EUR 100.000 EUR 50.000 - 100.000 EUR 10.000 - 50.000 < EUR 10.000	
Outputs	Impact on crop quality	--/-/0/ +/++	

Impact Highlights

The AcID framework offers a modern approach to greenhouse spraying by using sensors to monitor active pesticide ingredients in real time. On the plus side, it's an affordable system that doesn't require extensive training. Its main advantage is its consistent and positive impact on the environment, as it cuts down harmful emissions and is safer for beneficial insects like bees.

While its current impact on pesticide reduction and disease control is moderate, the AcID framework shows significant promise. Its combination of low cost and proven environmental benefits makes it a valuable and accessible starting point for growers aiming to enhance their sustainability, paving the way for future refinements that will undoubtedly boost its agronomic performance.

Evaluation:


Not Satisfying


Not Satisfying


Moderately Satisfying


Satisfying


Very Satisfying

Find out more details:

<https://activeingredientdetector.gr/>