



RES4LIVE

ENERGY SMART LIVESTOCK FARMING
TOWARDS ZERO FOSSIL FUEL CONSUMPTION

Report on clustering activities

Deliverable D6.1

WP6. Clustering through stakeholders engagement

Project title

RES4LIVE - Energy Smart Livestock Farming towards Zero Fossil Fuel Consumption

Grant agreement: 101000785


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Prepared by: CETRI

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Approvals/ Document history

	Company/Institution
Author/s	CETRI
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ABBREVIATIONS

- CNG** : Compressed natural gas
- PVT** : Photovoltaic thermal
- PV** : Photovoltaic
- RES** : Renewable Energy Sources

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PARTNERS SHORT NAMES

AUA - AGRICULTURAL UNIVERSITY OF ATHENS

UNIBO – UNIVERSITY OF BOLOGNA

ATB - LEIBNIZ INSTITUTE FOR AGRICULTURAL ENGINEERING AND BIOECONOMY

EV ILVO - RESEARCH INSTITUTE FOR AGRICULTURE, FISHERIES AND FOOD

UGENT - GHENT UNIVERSITY

CERTH - CENTRE FOR RESEARCH AND TECHNOLOGY-HELLAS

AU - AARHUS UNIVERSITY

LVAT - LEHR- UND VERSUCHSANSTALT FÜR TIERZUCHT UND TIERHALTUNG GROß KREUTZ E.V.

PSYCTOTHERM - G. LIGEROS & SIA OE

PLEGMA LABS- PLEGMA LABS TECHNOLOGIKES LYSEIS ANONYMOS ETAIRIA

CRMT SAS - CENTRE DE RECHERCHES EN MACHINES THERMIQUES

TERRA - TERRA ENERGY


MG SUSTAINABLE - MG SUSTAINABLE ENGINEERING AB

CETRI - CENTER FOR TECHNOLOGY RESEARCH & INNOVATION LTD

GOLINELLI - GOLINELLI GIULIO

EAAP - FEDERAZIONE EUROPEA PER LA ZOOTECNICA

EUREC - EUREC EESV

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PUBLISHABLE SUMMARY

This report is associated with Deliverable 6.1, “Report on Clustering Activities,” and outlines the efforts undertaken to connect RES4LIVE with other projects from the same call and with similar topics, as well as with farmers' associations and equipment manufacturers' associations. The aim of the clustering activities within RES4LIVE was, on one hand, to interconnect the project with stakeholders in livestock farming and technology development, and, on the other hand, to contribute to policy recommendations, which are detailed in a separate deliverable (D6.2: “Report on policy recommendations”).


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1 INTRODUCTION

Within the framework of Work Package 6-Clustering through stakeholders' engagement lies also Task 6.1: "Clustering formulations and policy recommendations". The task started officially in the 13th month of the project, but clustering activities were initiated almost from the beginning of RES4LIVE until its end. Clustering activities compile the interaction of RES4LIVE with ongoing and past EU projects that are working on subjects related to RES application in livestock farming and agriculture, in general, and also with projects concerning de-fossilization of livestock farming. In particular, the project paid attention to linking the projects with other H2020 projects funded under FNR-06 A and B. Furthermore, RES4LIVE developed clustering activities with farmer's associations and technology developers through the organisation of dedicated national workshops. RES4LIVE was well interconnected with stakeholders from livestock farming throughout its whole duration while the linking to technology developers and innovation brokers was not that extended. Still, at the end of the project, through the technical work conducted in combination with the clustering activities, policy recommendations were developed as part of deliverable D6.2: "Report on policy recommendations".

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2 CLUSTERING WITH EU PROJECTS UNDER FNR-06 A AND B

Networking between EU-funded projects besides being an interesting task due to the exchange of knowledge, results and methods, also provides an opportunity for a common strategy concerning stakeholders' engagement and communication of the results. Towards this direction, RES4LIVE participated in a cluster, named AREA ZERO, during its entire lifetime. AREA ZERO cluster is a joint initiative between projects which promote the application of RES technologies in livestock farming and agriculture and their de-fossilisation.

2.1 The AREA ZERO Cluster


The AREA ZERO cluster, Alliance for Renewable Energy in Agriculture and Zero Fossil Energy initially consisted of projects funded under topics from the Horizon 2020 Programme: FNR-06 (A and B) and LC- SC3-ES-3-2018/2020. The first meeting was held on the 5th of August 2020. The topic required to projects to link and the project officers put the coordinators in contact to start working. The coordinators of those projects involved the communication project managers in the process. The targets of the cluster, as set during the initial meeting were the following:

- Exchange ideas for better dissemination strategies
- Draw common policy recommendations
- Exchange best practices on technical issues
- Strengthen international presence and members' orientation by utilising the strong international network
- Improve competitiveness business readiness level.

AREA ZERO cluster has its own logo, its website and separate social media accounts. Moreover, common dissemination materials have been developed such as a poster and a brochure and the members were engaged in disseminating the cluster's activities through their social media and circulating forthcoming events amongst the cluster's members.

2.2 Cluster members

The creation of the cluster has been coordinated by the Communication manager of TheGreefa project. In October 2020 the cluster members started drafting the Collaboration Agreement (CA) and working on the activities to develop. The CA was signed in March 2021 by five projects: RES4LIVE, TheGreefa, AgroFossilFree, HyperFarm, and RENAISSANCE. AgroBioHeat signed the agreement in June 2021. Those projects combine the efforts of 83 unique partners across 20 countries, which have received a total of €23.14 million in funding. That was the initial formulation of the AREA ZERO cluster. Currently, after the completion of TheGreefa, AgroFossilFree, RENAISSANCE and AgroBioHeat, the cluster members are RES4LIVE, HyperFarm, REGACE, PV4Plants, Symbiosyst and Value4Farm. The description of cluster members is as follows.

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Project	Description
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TheGreefa



The Greefa project aims to develop a new technology for heating, cooling, air humidity control, and water recovery in greenhouses as well as for drying agricultural goods using thermo-chemical conversion principles based on the use of salt solutions (thermochemical fluids). Topic (FNR-06-2020 B) process from cradle to farm gate, while maintaining yield and quality of the end-product.

AgroFossilFree



AgroFossilFree project aims to create a framework under which critical stakeholders will cooperate to evaluate and promote currently available FEFTS in EU agriculture to diminish in the short term and eliminate in the long run fossil fuels use in any farming process from cradle to farm gate, while maintaining yield and quality of the end-product. Topic (FNR-06-2020 B).

HyperFarm



HyperFarm is an Innovation Action (IA) project which aims to demonstrate combined agrovoltaic systems, with dual land use for crop production and simultaneous power production. HyperFarm joins multiple types of actors intending to optimize viable agrivoltaic business models as well as test the marketability of the products, via the inclusion of new innovative photovoltaic technologies, radically new crop production systems, stakeholder innovation workshops, and citizen-consumer acceptance, public perception analysis, and farmer adoption studies. HyPERFarm also develops and demonstrates new ways of utilizing and distributing the energy produced on-farm. Topic (FNR-06-2020 B).

RENAISSANCE




RENAISSANCE project is an Innovation Action (IA) whose aim is to deliver a community-driven scalable and replicable approach, to implement new business models and technologies supporting clean production and shared distribution of energy in local communities. Topic (LC-SC3-ES-3-2018/2020).

AgroBioHeat



AgroBioHeat project aims at producing a mass deployment of improved and market-ready agrobiomass heating solutions in Europe. Agrobiomass is a large, underexploited, and indigenous resource, that can support the achievement of the European Energy and Climate targets while promoting rural development and circular economy. Actions will be mainly located in 6 European countries (EL, ES, FR, RO, HR, and UA; 5 EU-28+Ukraine) where an extensive national movement is intended to be created by the engagement, alignment of interests, and creation of policy, financial and social conditions favoring the expansion of agrobiomass heating; at the EU level, specific policy recommendations regarding the efficiency and emissions of agrobiomass heating solutions

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will be passed on to relevant bodies for the development of new regulations. Topic (LC-SC3-RES-28-2018-2019-2020).

REGACE



The EU-funded **REGACE** project is dedicated to developing an innovative Agrivoltaics technology that uses CO₂ enrichment to sustainably increase greenhouses yields and improve electricity production. Based upon the patented responsive tracking system, developed by REGACE partner TriSolar, the project creates systems that enable the dual use of land and infrastructure leading to reduced construction and maintenance costs, duration of execution, and the reduction of CO₂ emissions caused by conventional Agrivoltaic installations. Topic (HORIZON-CL5-2022-D3-01-06).

PV4Plants



PV4Plants is a European Horizon Project which promotes the synergy of agriculture and energy sectors thanks to an innovative agriPV technology to improve growing conditions and land use efficiency, yield and renewable energy production. Our system is based on light spectrum engineering, multi-indicator real-time monitoring system, improved microclimate beneath agriPV panels to improve health and yield while producing renewable energy. Fundamentally, PV4Plants promotes the creation of AgriPV systems with climate, water and light spectrum control for safe, healthy and improved crop production. Topic (HORIZON-CL5-2022-D3-01-06).

SYMBIOSYST




The EU-funded **SYMBIOSYST** project will deliver standardised cost-effective solutions for agrivoltaics. This will involve developing PV modules, mounting structures, and operation and maintenance practices that meet the specific needs of different crops, climates and landscapes. The project will ensure the solutions developed are aesthetically pleasing and harmoniously integrated with farming practices. Topic (HORIZON-CL5-2022-D3-01-06).

Value4Farm



To reduce the carbon footprint of the agricultural sector, promotion of decentralised renewable energy production and use is seen as a reasonable solution, also encouraging rural development. In the case of farming systems, coupling the place of production and consumption of energy allows synergies between agriculture and renewable energy technologies but usually raises several challenges, such as the high price of technologies especially for small-size farms or the energy crop vs food dilemma. **VALUE4FARM** aims at demonstrating three renewable-based local value chains based on agrivoltaics and biogas, and coupling sustainable food and renewable-energy production. Topic (HORIZON-CL5-2022-D3-02-07).

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2.3 Goals of the Cluster and Tools

The main goal of this cluster is to establish collaboration and promote the developed technology solutions to potential stakeholders/ end-users in a common way. The focus areas for future collaboration established on the collaboration agreement:

- Common organization of the Communication and Dissemination events (incl. common dissemination materials) on relevant Trades and Fairs, Scientific/ Technical Conferences, Workshops, Seminars etc. Each project decided on a case-by-case basis which common dissemination events are interesting for it to attend.
- Common organization of workshops, seminars, etc. among all the projects or during relevant external events in terms of the Exploitation Strategy development; Business Model and Plan creations, as well as in terms of Life Cycle Assessment / Sustainability Impact Assessment.
- Exchange the insights (non-confidential information) on the development of innovative technologies, based on lessons learned during the projects' execution.
- Exchange the non-confidential information on the success stories, between one or all projects, based on the achievements/ outcomes.
- Exchange of knowledge and insights in terms of the Exploitation Strategy development. Business Model and Plan creations, as well as in terms of Life Cycle Assessment / Sustainability Impact Assessment.
- Exchange of the information on the non-technical barriers and the risks, in terms of the delivery of the technology solutions to the market.

As said above, the cluster has its own logo, which is shown in Figure 1, a website which is shown in Figure 2 and a poster and a brochure which are shown in Figure 3. The website content was proposed and discussed by the cluster members and the technical development was done by TheGreefa project, the cluster coordinator. The initial web URL was <https://area-zero.eu/> but, it had to be changed in August 2023 <https://areazerocluster.eu/> because the previous became inaccessible. Finally, the cluster has a YouTube channel where the videos are uploaded.



Figure 1. AREA ZERO cluster logo.



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Figure 2. Previous (left) and current versions (right) of the AREA ZERO website.

Figure 3. AREA ZERO brochure (left) and poster (right).

Within the RES4LIVE homepage, a specific area is dedicated to the AREA ZERO cluster members as shown in Figure 4.

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Clustering with other projects

These activities include clustering with other projects/initiatives for supporting the extraction of policy recommendations and best practices adoption, among others.



AgroBioHeat aims to promote modern, cost-effective and low-emission heating solutions using agricultural biomass for rural Europe. Agrobiomass is an abundant but underexploited resource in Europe that can be mobilized as a renewable energy source for heating applications across a variety of end uses: domestic sector, farms, greenhouses, agro-industries, district heating networks, municipal and commercial buildings, and others. The project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818369.



AgroFossilFree – Strategies and technologies to achieve a European Fossil-energy-free agriculture project aims to create a framework under which critical stakeholders will cooperate to evaluate and promote currently available FEFTS in EU agriculture to diminish in the short term and eliminate in the long run fossil fuels use in any farming process from cradle to farm gate, while maintaining yield and quality of the end-product.



TheGreefa – Thermochemical fluids in greenhouse farming project is aimed at a new technology for heating, cooling, air humidity control and water recovery in greenhouses as well as for drying of agricultural goods using thermo-chemical conversion principles based on the use of salt solutions (thermochemical fluids).




RENAISSANCE – RENewAble Integration and SuStainAbility iN energy CommunitiEs project is an Innovation Action (IA) whose aim is to deliver a community-driven scalable and replicable approach, to implement new business models and technologies supporting clean production and shared distribution of energy in local communities.

Figure 4. RES4LIVE website cluster-dedicated area.

2.4. Cluster activities

Since the launching of the project, several RES4LIVE partners, such as AUA, CETRI, and EUREC, have participated in regular meetings (every 2 or 3 months) to prepare the following common activities:

- A webinar was organized in March 2022 to present the Cluster. Representatives of each project presented their main objectives and results. At the end of the webinar, there was time for questions and comments. The video of the cluster presentation webinar is available on the AREA ZERO YouTube channel and was shared by RES4LIVE and all the project members' social media profiles.
- In the framework of the EUSEW2022 (European Sustainable Week) the Cluster organised a session (in the EUSEW2022 Extended Programme) called "Together towards energy-efficient and de-fossilised agriculture". The RES4LIVE partner EUREC presented online the project. This event was organized in cooperation with TheGreefa and AgroFossilFree projects. The focus was on the current challenges of the European agricultural sector and innovative approaches proposed by the EU-funded projects. The participants, audience, and viewers were introduced to the solutions proposed by the three presenting projects providing answers on how to

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overcome the challenges – innovative ways to increase the use of agricultural biomass for heating, technologies supporting the decoupling of fossil fuels through the integration of renewable energy sources in agriculture and livestock farming, heat and water recovery systems for greenhouses and scalable approaches to the introduction of new efficient technologies for controlled environment agriculture. At the end, a discussion between speakers took place about problems and the future of European agriculture and the necessary steps to reach the EU’s climate goals. The online event has been recorded and it was uploaded on the AREA ZERO Cluster YouTube account with 74 views, so far.

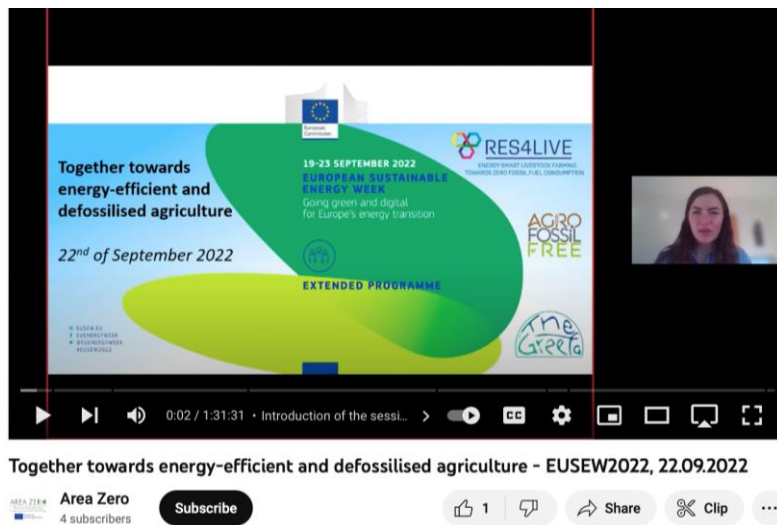



Figure 5. The joint event was organized by three of the AREA ZERO cluster members as part of the extended EUSEW 2022.

- On the 14th of March 2024, and as part of the extended program of the EU Sustainable Energy Week 2024 (EUSEW 2024), the AREA ZERO Cluster organized a webinar entitled “The Farming Future: Opportunities and Challenges in the Agricultural Energy Transition”. The online event was organised in collaboration with the projects HyPErFarm, RES4LIVE, TheGreefa, PV4PLANTS, REGACE and Symbiosyst. The event focused on practical solutions and their social implications, ensuring that new technologies are adopted and well-received by the farming community. The participants, audience, and viewers were introduced to the solutions proposed by the three ongoing projects HyPErFarm, RES4LIVE and TheGreefa, which presented their results in terms of improvement of energy and resource efficiency in the agricultural sector whereas the three new projects PV4PLANTS, REGACE and Symbiosyst introduced and presented as new members of the AREA ZERO Cluster. A panel of experts discussed the social aspects and acceptance of the newly developed technologies. The online event has been recorded and it was uploaded on the AREA ZERO Cluster YouTube account with 170 views, so far.

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AGENDA

WEBINAR

The Farming Future: Opportunities and Challenges in the Agricultural Energy Transition

AREA ZERO 

Alliance for Renewable Energy in Agriculture and Zero Fossil Energy

SUSTAINABLE ENERGY WEEK

14/03/2024, 2PM – 4PM CET

Time	Title	Speakers
2:00 PM - 2:05 PM	Opening of the event	Jasper van den Berg – PNO Consultants
Innovative Technological Applications		
2:05 PM - 2:50 PM	TheGreefa: thermochemical fluids in greenhouse farming	Serena Danesi – ZHAW
	HyPErFarm: key highlights and results of the HyPErFarm Agrivoltaics pilot sites	Wouter Merckx – TRANSFARM
	RES4LIVE: PVT installation in livestock farms	Alexander Loris – MG Sustainable Engineering
2:50 PM - 3:10 PM	Adaptations to Farms <i>Panel discussion on social aspects and acceptance of the developed technologies</i>	Marleen Gysen – Boerenbond (<i>Moderator</i>) Raphaël Herculain – Strane Innovation Tom Schaecken – Boerenbond Petros Tegenaw – ILVO
	New EU-funded projects	
	3:10 PM - 3:55 PM	PV4PLANTS: AgriPV system with climate, water and light spectrum control
3:55 PM - 4:00 PM	REGACE: Greenhouse Agrivoltaics	Esther Magadley – Trisolar
	Symbiosyst: Creating new synergies between solar energy and agriculture	David Moser – Eurac Research
3:55 PM - 4:00 PM	Closing remarks	Jasper van den Berg – PNO Consultants

These projects have received funding from the European Union's Horizon 2020 Research and Innovation programme. HyPErFarm: GA101000785, RES4LIVE: GA101000785, TheGreefa: GA101000785





#AreaZero areazerocluster.eu
#EUSEW2024

Figure 6. The online event was organized by the AREA ZERO cluster members as part of the extended EUSEW 2024.

Cluster members have taken the opportunity to be invited to participate as experts and present their projects in the events organized by them:

- RES4LIVE was presented by its Coordinator in the 2nd Greek regional workshop organized by the AgroFossilFree project focused on Greenhouses (Athens, Greece).
- RES4LIVE was presented by its Coordinator in the 3rd Greek regional workshop organized by the AgroFossilFree project focusing on Livestock Farming (Arta, Greece).
- The Greefa and RES4LIVE coordinators presented their projects to the audience of the 1st AgroFossilFree Transnational Workshop. Strong enhancement of the collaboration of these 3 projects. Both had 15 minutes to present their projects to the audience.
- AgroFossilFree had the chance to participate in the 1st National Workshop of the RES4LIVE project in September 2022 (Athens, Greece).
- AgroFossilFree Brokerage Event: all projects were represented at the AgroFossilFree Brokerage Event in Brussels held on 22nd June 2023. There was an AREA ZERO corner for the cluster and members' presentations, with different communication materials, such as flyers, roll-ups and

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videos. The representatives of the Cluster members contributed also to the presentation of the policy recommendations and the following discussion.



RES4LIVE @RES4LIVE · Jul 10
 RES4LIVE representation at @agrofossilfree brokerage event in June

As partners in the #AreaZero cluster, RES4LIVE project was spotlighted during the AgroFossilFree H2020 project brokerage event last month which took place in Brussels 🇪🇺
 agrofossilfree.eu



Figure 7. AREA ZERO and RES4LIVE participation in the AgroFossilFree project's brokerage event.


The AREA ZERO cluster members have also decided to proceed to a common publication in the European Energy Innovation magazine in June 2023. In this publication, the AREA ZERO Cluster is presented along with its members, RES4LIVE amongst them, to get the potential reader to know what the targets of the cluster and each project are separately. The publication is entitled “The Green Deal: Paving the Way to Defossilise Agriculture”.




Figure 8. The AREA ZERO cluster publication in the European Energy Innovation magazine, summer edition.

2.5 Clustering with EU projects - Conclusions

Clustering provides the opportunity to disseminate the activities and the results to a wider audience through projects, initiatives, and entities connected. It also provides the opportunity to increase the impact of the projects and information to produce common outcomes as publications to increase the impact of the projects and contribute to achieving the goals of the topics and calls under which they are funded. The

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results of the clustering activities within the AREA ZERO Cluster were interesting and rather important, since fruitful outcomes, such as joint publications and common webinars were produced.

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3 CLUSTERING WITH FARMER'S ASSOCIATIONS AND TECHNOLOGY DEVELOPERS – NATIONAL WORKSHOPS

3.1 Introduction

For the clustering opportunities with farmers' associations and technology innovators, national workshops were organised during RES4LIVE by the farms participating in the project. In total, 12 national workshops were conducted, three per farm and the corresponding country, namely three by AUA in Greece, three by LVAT in Germany, three by ILVO in Belgium and three by GOLINELLI in Italy. The workshops focused on the application of RES technologies in livestock farming and livestock buildings. The RES4LIVE partners have presented the developed RES solutions to relevant stakeholders and the results from the corresponding phase at which the project was at the time of the workshop. The participants were representatives from the corresponding farmers' associations (e.g. the Greek poultry and egg industry) and of technological/RES development (e.g. Centre for Renewable Energy Sources and Saving). All the workshops are published on the RES4LIVE website and communicated through the project's social media and newsletters, and their outcomes are part of a separate deliverable (D6.3).

In total, the 12 national workshops involved more than 300 participants, covering the northern (Belgium, Germany), central (Germany), southern (Italy, Greece) and east (Greece) regions of Europe. Most of the attendants were farmers and people from the scientific community, while to a smaller extent people from the technology sector and policymakers.

3.2 National Workshops in Greece

The Greek workshops were organised between the period 28.09.2022 and 12.09.2024 at the premises of AUA. The participants were stakeholders from the poultry and egg industry of Greece, policymakers from the corresponding Greek department and technology developers from the centre from renewable energy sources and saving. The solutions proposed by RES4LIVE were presented by the project team, and the participants identified advantages, problems, challenges, and prospects of the installation of RES technologies in poultry housing facilities. They contributed with comments, observations, and suggestions that will be included in the process of further developing the RES4LIVE solutions. Through the interaction with the stakeholders during the Greek national workshop, key points were identified to make RES4LIVE solutions more comprehensive, cost-effective, and tailored to specific cases.


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Figure 9. The 1st Greek workshop was realized at AUA premises with a focus on the application of RES technologies in the poultry and egg industry.

3.3 National Workshops in Germany

The German workshops were organised between the period 23.04.2024 and 06.06.2024 at the premises of LVAT in cooperation with ATB. The events drew significant attention since more than 100 stakeholders participated in the three workshops. The participants came from diverse sectors including researchers, consultants, industry representatives, policymakers, and business figures focused on alternative fuels. The focus was, at first, on the tube ventilation and cooling system to reduce or mitigate heat stress in dairy cows by injecting pre-cooled air into the barn via a tube ventilation system, aiming at barn temperature reductions of up to 5 K. Then, the discussions focused on the technical and economic facets of the BioCNG refuelling station and explored the potential of compressed natural gas (CNG) to achieve self-sufficiency and fossil-free agriculture. Discussions also covered the market availability of CNG and biogas tractors, costs associated with refitting diesel engines, and the existing barriers hindering market development.

The main outcome of the first workshop was that the participants agreed on the need for ways to measure and assess the benefit of the system compared to alternative cooling systems, like spray cooling and conventional fan ventilation systems. A positive effect with regard to the energy consumption of the tube ventilation and cooling system is the seasonality of the application. Heat stress mitigation is directly linked to warm or hot climate conditions during the summer half-year, where non-fossil energy from e.g. photovoltaic arrays usually is available in abundance. The main emission-related question about the tube ventilation and cooling system was if this actually could also

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contribute to emission mitigation in peak times due to cooling down the air in the barn. Specifically, ammonia emissions are known to depend on temperature, and this could be another topic to investigate. The synergy of improving barn climate while using solar energy at relevant peak times was also noted. Concerning the second and third workshops, participants were provided with an overview of relevant economic and technical key figures, drawn from the practical operation of the BioCNG filling station and a tractor converted to run on CNG. Additionally, experiences from official approval practices were shared, providing valuable insights into the regulatory landscape. The participating stakeholders pointed out that Investment in the BioCNG upgrade plan should come with a business plan that also includes potential users external to the farm. Future emission-related studies should also include the composition change of the biogas due to the off-gas that is reverted to the biogas plant.



Figure 10. The 1st (left), 2nd (centre) and 3rd (right) German workshops were realized at LVAT premises with a focus on the application of RES technologies in dairy farms.

3.4. National Workshops in Belgium

The Belgian workshops were organised between the period 25.01.2023 and 18.06.2024 by ILVO in close collaboration with UGent. The first workshop focused on the introduction of RES4LIVE to the stakeholders who participated, to the simulation of financial and environmental impacts at the ILVO farm and to hurdles, needs, and opportunities for renewable energy in livestock farming. The participants were asked to (1) their current energy sources, (2) which renewable energy sources they have, (3) which options they are still considering and (4) what measures they already take to reduce their energy use. The outcomes are shown in Figure 11 from left to right.

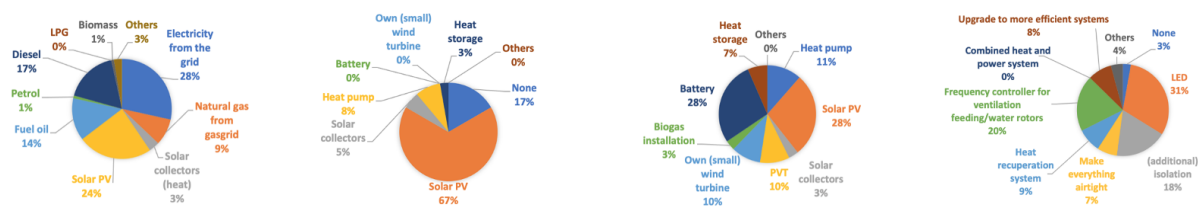



Figure 11. Main outcomes of the 1st Belgian workshop.

The second workshop was organised as part of the European Energy Sustainable Week and participation was limited. However, in the third workshop more than 130 participants registered including researchers, policy makers, financiers, contractors, and farmers. At first, the results from the market study about available energy-efficient and renewable energy source technologies were presented and participants were informed on how to heat and cool livestock farms in a sustainable and/or renewable way. Then, the simulation work and the RES4LIVE case studies were explained. Participants pointed out some positives and negatives, with the main disadvantages being high

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investment costs, difficulties in obtaining permits, and insufficient knowledge of the technologies. The ability to connect to the electricity grid was also mentioned, as some farms lie in remote areas where the grid isn't maintained well and are unable to handle new PV or wind turbine installations. The main advantage was found to be cost-beneficial after overcoming the initial investment cost.




Figure 12. The 3rd Belgian workshop gained significant attention since more than 130 stakeholders participated.

3.5 National Workshops in Italy

The Italian workshops were organised between the period 22.10.2022 – 09.09.2024 by GOLINELLI in close collaboration with the University of Bologna. The first workshop took place within the framework of the National Agricultural and Livestock Exhibition. The participants included representatives of the main national farmers' associations, members of the Agricultural Commission of the Italian Parliament, technicians involved in the design of livestock buildings, and managers of livestock farms. The workshop focused on the RES4LIVE technologies developed for pig barns, that were under installation in GOLINELLI farm. In particular, the innovative solution of an integrated system with PVT panels, geothermal storage boreholes and a modular heat pump was analysed. The participants identified the main obstacle that can limit the widespread adoption of these technologies, i.e. the economic impact of the initial investment. Therefore, various proposals were formulated in terms of possible policies to support farmers in reducing the economic uncertainties of investments in Renewable Energies, as well as enhancing livestock productions carried out with sustainable low-carbon approaches.

During the discussions and the round table of the second workshop participants began with a presentation on climate-changing emissions linked to various human activities, including agriculture. They engaged in dialogue, emphasizing the significance of proposed ideas and interventions. Specifically, they stressed the need for guidelines, policies, and regulations to boost agri-food production while facilitating the integration of renewable energy sources compatible with agricultural practices. Additionally, incentives for enhancing energy efficiency in agricultural and livestock buildings were highlighted. Professor Daniele Torreggiani emphasized the importance of integrating these topics into the education and training of young agronomists at all academic levels.

Finally, the third workshop entitled "The Contribution of Livestock Farms to Energy Independency and De-fossilization" was a co-design meeting among stakeholders. During the discussion, participants addressed difficulties in obtaining permits for building new pig farms, the need for national criteria to

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validate technological innovations, and the challenges farmers face in preparing applications for funding. Additionally, they discussed the lack of coordination between agricultural, energy, and urban planning policies.



Figure 13. The 3rd Italian workshop focused on the contribution of livestock farms to energy independence and de-fossilisation.

3.6 Clustering with Farmer's Associations and Technology Developers - Conclusions

The RES4LIVE networking and clustering with various stakeholders' categories such as farmers' associations and technology developers were conducted through dedicated national workshops. During RES4LIVE 12 national workshops were conducted. The outcomes of those clustering activities were very interesting and fruitful for the RES4LIVE partners since they pointed out hurdles, requirements and future challenges both technical as well as financial and environmental for the extended application of RES technologies in livestock farming.

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4 CONCLUSIONS

Networking and clustering activities have provided RES4LIVE the chance to disseminate the activities and the results to a wider audience through projects and various stakeholders' categories. Clustering with other projects under the same or similar funding schemes and topics offers the opportunity to join efforts, research, and information to produce common outcomes as publications increasing the impact of the project and contributing to the achievement of the topic goals. The results of the networking with partners from the AREA ZERO Cluster have been important, a joint publication and common webinars were produced as well as policy recommendations based on the exchange of information and knowledge between the cluster's members.

In a different direction, the clustering activities with stakeholders such as farmers and technology developers offer a different perspective, that of hearing the opinion of the market on the developed products and technologies to adapt and tailor the solutions to specific cases. This networking was conducted during RES4LIVE through the organisation of national workshops where participants from the farmers' society, the renewable energy sector, manufacturers, policymakers and scientists attended the progress of the project and participated in discussions concerning the difficulties and challenges of RES applications in livestock farming. The outcomes from those workshops were important for the RES4LIVE consortium pointing out crucial issues during the development and installation of RES technologies in livestock farming.

All in all, the clustering activities of RES4LIVE was an interesting task which provided important information to the project's partners and opportunities concerning the communication and dissemination strategy of the project. However, clustering and networking require plenty of time and dedicated personnel to increase efficiency since project partners are always busy with the technical requirements of the project in most cases.