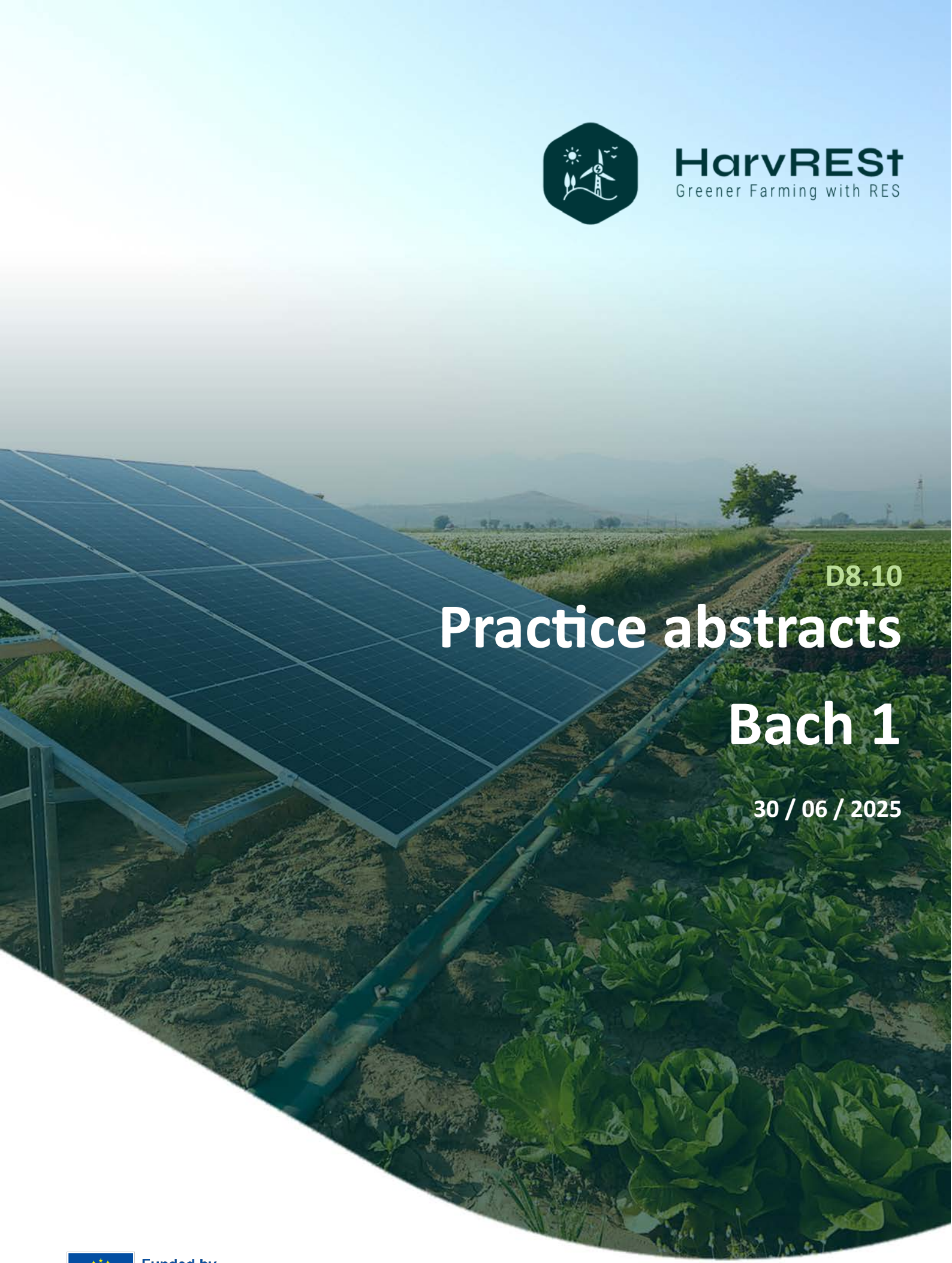
HarvRESt
Greener Farming with RES



D8.10

Practice abstracts

Bach 1

30 / 06 / 2025

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the European Union

www.harvrest.eu

PROJECT INFORMATION

ACRONYM	HarvRESt
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0.1	15/04/2025	Definition of ToC	CKIC
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0.3	20/06/2025	Consolidated version	CKIC
0.4	27/06/2025	Review and comments	CIRCE, CKIC
1.0	30/06/2025	Final submission version	CIRCE

TABLE OF CONTENTS

ABBREVIATIONS

AI	Artificial Intelligence
ANN	Artificial Neural Networks
AVPP	Agro Virtual Power Plant
DER	Distributed Energy Resource
DSS	Decision Support System
EIP-AGRI	European Innovation Partnership for Agriculture
EU	European Union
GHG	Greenhouse gas
KPI	Key Project Indicator
LSTM	Long Short-Term Memory
MCDA	Multi-Criteria Decision Analysis
MLP	MultiLayer Perceptron
NWP	Numerical Weather Predictions
N/A	Not Applicable
PA	Practice Abstract
RES	Renewable Energy Source
TBD	To Be Defined

1. EXECUTIVE SUMMARY

The HarvRESt project aims to accelerate the integration of renewable energy solutions at the farm level to support Europe's transition towards climate-neutral and sustainable agriculture. By developing innovative tools, methodologies, and business models, HarvRESt empowers farmers, cooperatives, and rural stakeholders to adopt renewable energy technologies effectively and economically.

To disseminate the project's innovative knowledge at the European level, HarvRESt produces practitioner-friendly summaries in the common EIP-AGRI format known as Practice Abstracts (PAs). These PAs distil complex technical and socio-economic outputs into accessible, actionable insights designed to support knowledge exchange, capacity building, and replication of best practices across diverse agro-environments.

This deliverable presents the first batch of 14 Practice Abstracts, covering topics such as business models for renewable energy, decision support tools, forecasting algorithms, virtual power plant, and soil health metrics. These abstracts will be further refined and expanded in a second batch to be delivered by the end of the project.

To ensure alignment with EIP-AGRI dissemination standards, HarvRESt developed a dedicated PA template to collect and harmonize contributions from project partners. Project has already been registered in EU CAP network platform (link) and a dedicated section for HarvRESt Practice Abstracts will be created, including links to audiovisual materials and the project website, thereby facilitating broad access and engagement within the agricultural innovation community.

Theses PAs can also be checked in HarvRESt website, in the section "Results & publications"

2. INTRODUCTION

This deliverable presents the first batch of practice abstracts developed under the Horizon Europe project HarvRESt. These abstracts aim to translate the project's early innovative outcomes into actionable knowledge for practitioners, in line with the EIP-AGRI common format.

The 14 abstracts included here cover a wide range of topics essential to integrating renewable energy solutions on farms. They span technical tools (such as forecasting algorithms, hybrid energy models, and smart energy system design), planning and decision support (e.g. biogas planning tools and DSS), as well as enabling frameworks including soil quality methodologies, KPIs, and business models. Furthermore, the batch includes resources targeting engagement and adoption, such as strategies for multi-actor involvement and capacity-building materials.

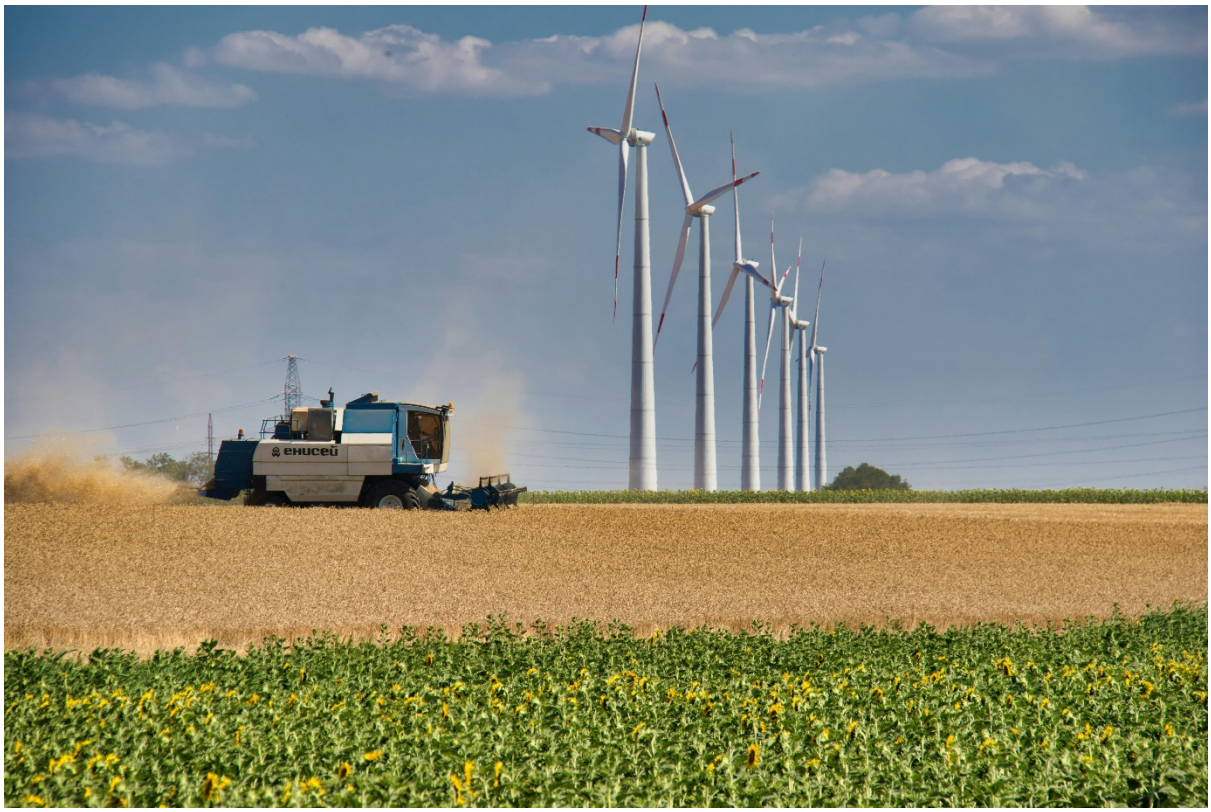
This is the first of two planned batches of practice abstracts. The second and final version will be delivered toward the end of the project (Month 36) to incorporate matured results and insights from pilot implementation. All abstracts have been uploaded in HarvRESt website, in the section "Results & publications", but will also be uploaded to the EU CAP Network platform for wide dissemination and to ensure accessibility of HarvRESt's innovations to the European farming and advisory communities.

This deliverable contains 14 practice abstracts. Those are:

1. Mitigation measures catalogue
2. KPI's for performance monitoring
3. Soil quality methodology
4. Biogas planning tool
5. Forecasting algorithms
6. HavRESt hybrid Models
7. HarvRESt smart energy system algorithms
8. HarvRESt AVPP
9. HarvRESt DSS
10. Strategy for multiactor engagement
11. Capacity building material
12. BM catalogue
13. Co-creation guidelines
14. Knowledge sharing toolkit

3. HARVREST PRACTICE ABSTRACTS (June 2025)

Practice Abstract 1: A Catalogue of Renewable Energy Measures to Reduce Environmental Impact on Farms



COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Supports informed decision-making on renewable energy deployment in agriculture by mapping real impacts.
- Provides an evidence-based catalogue of mitigation measures to guide practitioners and policymakers.
- Promotes more sustainable, effective adoption of renewable energy sources through integrated environmental and technical assessment.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, Mitigation Strategies, Sustainability Assessment, Renewable Energy Integration

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The Mitigation Measures Catalogue will help farmers and advisors understand which renewable energy strategies work best for reducing environmental impact. It identifies gaps in current knowledge and evaluates the technical, economic, and ecological outcomes of different practices related to renewable energy sources.

LONGER DESCRIPTION – IN ENGLISH

The **Mitigation Measures Catalogue** being developed within the HarvRESt project serves as a foundational resource for understanding the effectiveness of renewable energy technologies in agriculture from a sustainability perspective.

Although the final results are still under development, the methodology is well defined. The HarvRESt project will begin by:

- **Identifying key indicators** and knowledge gaps in existing data on renewable energy sources in agriculture
- **Evaluating the economic, environmental, and technical impacts** of different applications of renewable energy sources across farming systems
- **Analysing synergies and trade-offs** involved in deploying renewable energy sources across varying scales and contexts

The outcome will be a **comprehensive technical report** detailing the sustainability contributions of renewable energy technologies. These findings will then be organised into a structured **Mitigation Measures Catalogue** that groups agronomic strategies and assesses their respective performance.

A core objective is to validate these findings with **expert input**, ensuring the relevance, accuracy, and usability of the catalogue by agricultural practitioners. This resource will help guide farm-level and policy-level decisions by clearly mapping which measures offer the most promising mitigation outcomes.

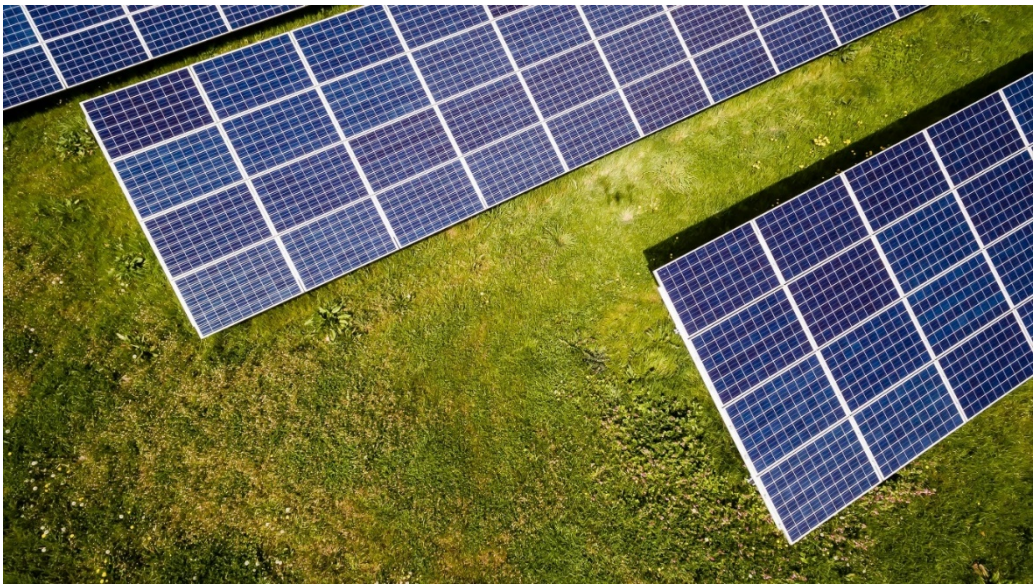
The catalogue aims to be both scientifically rigorous and practically useful – connecting data-driven assessment with on-the-ground decision-making.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Mitigation Measures Catalogue

URL: TBD

Practice Abstract 2: Measuring Sustainability on Farms – Key Indicators for Renewable Energy Integration



SHORT TITLE IN ENGLISH

Practice Abstract 2: KPIs for Performance Monitoring.

COUNTRY AND CLIMATIC ZONE

Pan-European

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stefanos@suite5.eu

3 BENEFITS OF THE PRACTICE

- Provides a comprehensive framework for monitoring sustainability in agro-communities.
- Aligns with EU-level monitoring frameworks to ensure comparability and relevance.
- Supports continuous improvement through standardised indicators and conflict analysis.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, KPIs, RES

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt has developed a set of Key Performance Indicators (KPIs) to help farmers and agro-communities track their performance not only in terms of productivity but also sustainability. These KPIs cover areas such as environmental impact, energy use, and economic outcomes. They are tailored to real farming operations and supported by clear data guidelines, making it easier for practitioners to monitor progress and make informed decisions when integrating renewable energy into agriculture.

LONGER DESCRIPTION – IN ENGLISH

The HarvRESt project aims to support a more sustainable and competitive agricultural sector through renewable energy integration. A core part of this goal is the ability to accurately characterise and monitor farm performance across production, environmental, economic, and social dimensions. To this end, HarvRESt has defined a comprehensive set of Key Performance Indicators (KPIs) aligned with European Commission Monitoring Frameworks and tailored to real-world farming operations.

These KPIs were selected through a rigorous process that considered HarvRESt's diverse Use Cases, core project pillars, and previous EU-funded work in the agricultural and energy domains. The final deliverable, *HarvRESt Monitoring KPIs for Use Cases*, categorises the indicators across five domains:

- Agricultural output
- Economic performance
- Energy production and consumption
- Environmental impact
- Social well-being

Each KPI includes a detailed definition, data requirements, calculation methods, and units. A traceability matrix maps each indicator to the relevant Use Cases, enabling practitioners to assess progress at the farm level and across the project.

To ensure reliability and consistency, HarvRESt also outlines steps for standardising data collection and pre-processing. Additionally, a preliminary conflict matrix identifies potential trade-offs between KPIs, laying the foundation for future analysis and decision-making.

This structured KPI set is designed as a dynamic tool for continuous improvement, enabling agro-communities to benchmark, evaluate, and adapt their integration of renewable energy sources over time.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Monitoring KPIs for Use Cases (forthcoming deliverable)

URL: TBD

Practice Abstract 3: Tracking Soil Health – A New Metric to Assess the Impact of Farming Practices

COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Introduces a new metric – the edaphic footprint – for integrating soil health into sustainability assessments.
- Provides a scientifically robust, multi-indicator methodology for evaluating long-term soil impacts.
- Complements existing carbon, nitrogen, and water footprints with a soil-specific dimension.

PRODUCTION SYSTEM

N/A

KEYWORDS

Soil health, edaphic footprint, sustainable agriculture, soil impact assessment

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt introduces the edaphic footprint – a new indicator grounded in the CWA 17898:2022 standard – to measure how agricultural practices affect soil health. This approach helps farmers and stakeholders track soil degradation risks like erosion or nutrient loss, and promote sustainable, long-term soil management.

LONGER DESCRIPTION – IN ENGLISH

Soil is a critical yet often overlooked factor in sustainability metrics. While carbon, nitrogen, and water footprints are widely used to track environmental performance, they do not capture the direct and indirect impacts of agriculture on soil health.

The HarvRESt project addresses this gap by introducing the edaphic footprint, a novel methodology grounded in the CWA 17898:2022 standard. This method quantifies how farming practices affect physical, chemical, and biological soil properties across medium- and long-term timeframes.

Key components include:

- Soil Impact Factor: This aggregates indicators for erosion, nutrient depletion, organic matter loss, salinity, and acidification.
- Compatibility with existing footprints: Indicators will be aligned with carbon, nitrogen, and water footprints, integrating soil impact into broader sustainability frameworks.
- Soil biodiversity assessment: Emphasis is placed on microbial and faunal communities, which influence nutrient cycling, structure, and overall fertility.
- Organic matter dynamics: A modelling approach will be used to track stabilisation and carbon sequestration potential using site-specific and literature data.
- Water retention indicators: A new metric is proposed to assess soil's resilience to drought, linked to farm management practices.

All these dimensions will be integrated into a comprehensive soil sustainability model, providing stakeholders with a holistic view of soil health. The methodology will be validated using HarvRESt Use Case data and additional datasets, ensuring it is robust, replicable, and scalable across diverse agricultural systems in Europe.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Edaphic Footprint Methodology (based on CWA 17898:2022)

URL: TBD

Practice Abstract 4: Planning Farm-Based Biogas Systems – A Tool to Estimate Potential and Environmental Benefits

COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Enables site-specific estimation of biomass availability and biogas potential.
- Assesses the environmental impacts of biogasification, including GHG emissions and nutrient cycling.
- Supports evidence-based planning for biogas deployment at both farm and regional levels.

PRODUCTION SYSTEM

N/A

KEYWORDS

Biogas, Emissions Reduction, Farm-Level Planning Tools

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt's online biogas planning tool helps farmers and planners assess biogas potential and environmental impacts using real farm data. It supports decision-making at multiple scales, from individual farms to whole regions.

LONGER DESCRIPTION – IN ENGLISH

The **Online Tool for Biogas Planning**, developed by HarvRESt, provides agricultural stakeholders with a powerful resource to evaluate **biomass potential, biogas production**, and associated **environmental effects** such as greenhouse gas (GHG) emissions and nutrient cycling outcomes.

What sets this tool apart is its integration of **farm-specific activity data** into well-established biogas and environmental models. The system continuously ingests updated data from participating farms and uses this to feed **dynamic calculation modules** that reflect the latest conditions on the ground.

Key functionalities include:

- **Estimating biogas potential** from diverse organic feedstocks (e.g., manure, crop residues)
- **Calculating GHG mitigation effects** from biogasification, comparing scenarios with and without biogas adoption
- **Evaluating changes in plant nutrient cycles**, such as nitrogen and phosphorus balances
- **Generating spatial analyses**: Results can be queried at multiple geographic scales – from an individual farm to entire regions – making it highly flexible for different planning contexts

The tool supports a wide range of stakeholders, including farmers evaluating on-site biogasification, policymakers designing regional energy strategies, and consultants modelling GHG reductions.

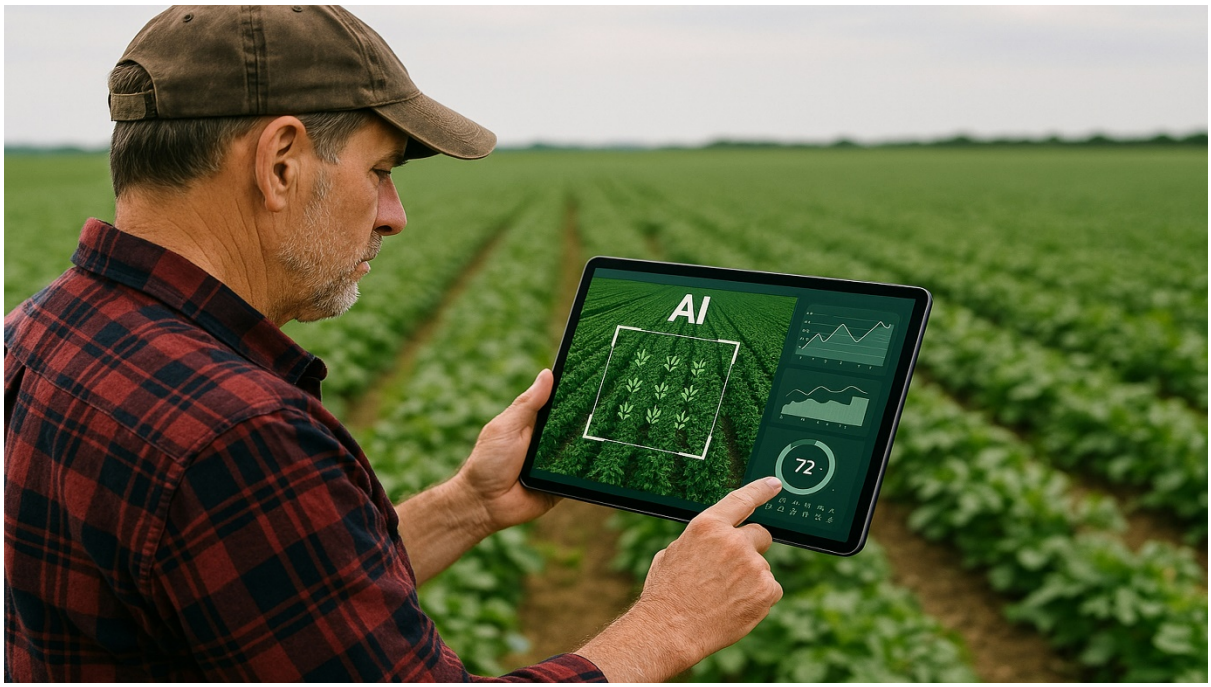
Its visualisation and query options help bridge the gap between technical modelling and practical planning, offering **transparent, data-driven insights** to advance sustainable bioenergy deployment in agriculture.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: Online Biogas Planning Tool (ConTerra)

URL: TBD

Practice Abstract 5: AI Forecasting Tools to Predict Renewable Energy Generation on Farms



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Empowers farmers with reliable forecasts for renewable energy generation, improving planning and self-consumption.
- Supports short-, mid-, and long-term operational and strategic decision-making.
- Enables data-driven optimisation of energy resources in agriculture through tailored AI models.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, RES, Analytics, Forecasting, Machine Learning

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt project is developing AI-based tools to forecast renewable energy generation on farms. These forecasting models help farmers and stakeholders anticipate energy production based on weather and other data, so they can better plan operations, maximise self-use of energy, and reduce reliance on the grid.

LONGER DESCRIPTION – IN ENGLISH

The HarvRESt project is designing advanced AI analytics pipelines to accurately forecast renewable energy generation at the farm level. This work is essential for supporting energy autonomy and better resource planning in agricultural communities increasingly adopting on-site renewable energy sources.

The forecasting system is structured around short-, mid-, and long-term timeframes and makes use of AI algorithms such as Artificial Neural Networks (ANNs), Multi-layer Perceptrons (MLPs), and Long Short-Term Memory (LSTM) networks. These models are tailored to the specific conditions and needs of HarvRESt's Use Cases.

Key steps include defining necessary input data (e.g., weather patterns, solar irradiance, wind speed), designing training methodologies, and validating models using both historical and experimental data collected from the project's demonstration sites.

The resulting deliverable – *Forecasting Scenarios and Algorithms* – will include a Generation Analytics Catalogue, which outlines the business relevance, technical configuration, and evaluation criteria of each model. This catalogue will also contain:

- A review of the current state-of-the-art in forecasting research
- Practical guidance on input data types, preprocessing, and feature extraction
- Details on model selection rationale and forecast accuracy metrics
- Limitations and assumptions to ensure transparent application

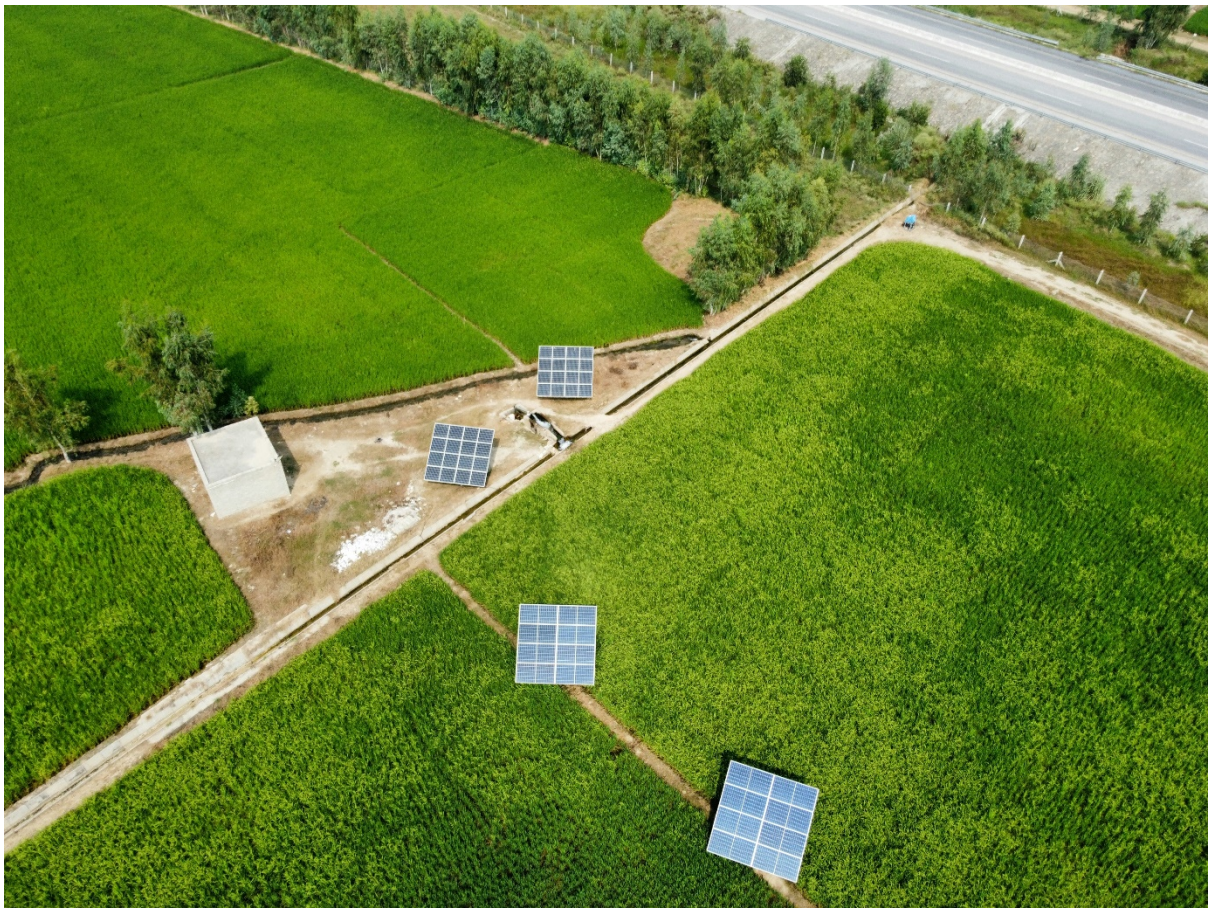
The Generation Analytics Catalogue is designed as a living resource, which will grow with ongoing data collection and modelling work throughout HarvRESt. It aims to provide meaningful insights for both near-term farm planning and long-term energy strategy development, fostering smarter and more sustainable agricultural energy use.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Generation Analytics Catalogue (forthcoming)

URL: TBD

Practice Abstract 6: Smart Energy Modelling for Farms – Balancing Renewable Supply, Demand and Cost



COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Combines multiple data sources and modelling approaches for more accurate energy simulations in farming contexts.
- Supports better integration of renewable energy technologies at different scales.
- Offers scalable tools that can be adapted to varied agro-environmental conditions across Europe.

PRODUCTION SYSTEM

N/A

KEYWORDS

Agro-energy, Sustainable Agriculture, Energy Self-sufficiency, Rural Communities

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt project is developing hybrid simulation models to assess how different renewable energy technologies can be integrated into agricultural systems. These models combine technical, economic, and environmental data to inform smarter energy planning on farms.

LONGER DESCRIPTION – IN ENGLISH

As part of its goal to support the decarbonisation of agriculture, the **HarvRESt project** is building a set of **hybrid models** that simulate the interaction of renewable energy technologies within farm environments. These models are designed to evaluate how different configurations of solar, wind, biomass, and energy storage systems perform under varied agricultural and climatic conditions.

What makes these models "hybrid" is their combination of:

- **Deterministic simulations** (based on physical energy system behaviour)
- **Data-driven approaches** (using real farm data and scenario parameters)
- **Economic modelling** (to assess return on investment and financial viability)
- **Environmental impact analysis** (to estimate emission reductions and sustainability trade-offs)

These models serve both a **diagnostic** and a **planning** function. On one hand, they allow project partners to identify what system designs are most effective in real-world scenarios. On the other, they provide insights that can be embedded into tools such as the HarvRESt Decision Support System (DSS), ensuring that technical feasibility is reflected in strategic decision-making.

The hybrid models are also being calibrated with data from the HarvRESt Use Cases to ensure they reflect actual farming conditions. This allows for localised recommendations and highlights the flexibility of the approach – something especially valuable in a project with a **pan-European scope**.

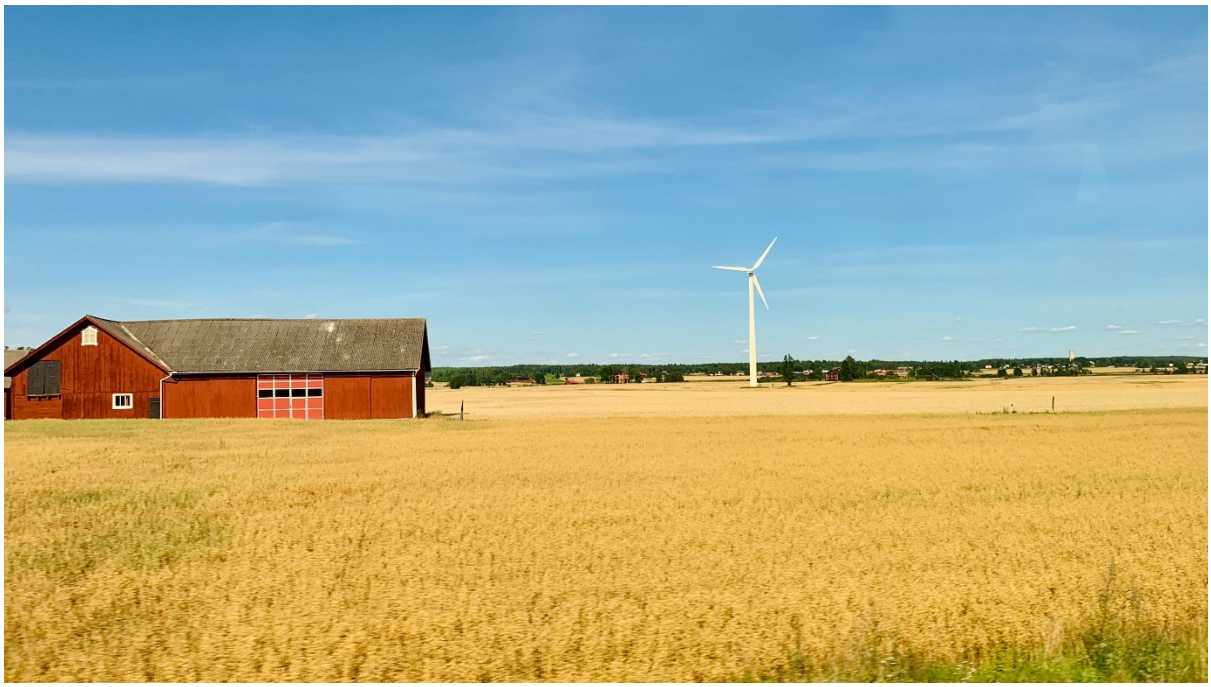
The outputs will eventually feed into public-facing planning tools and policy discussions, showing how digital modelling can accelerate the uptake of renewable energy across agriculture.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Hybrid Simulation Models (forthcoming)

URL: TBD

Practice Abstract 7: Intelligent Energy Management Algorithms for Optimising Farm Self-Consumption



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Enables real-time monitoring and control of energy flows in agro-communities.
- Optimises energy use and boosts self-consumption of on-farm renewable energy.
- Provides actionable insights through AI-driven forecasting and optimisation tools.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, RES, AI, Analytics

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt is developing AI-powered algorithms and energy management tools to improve how farms generate, consume, and share renewable energy. These tools help maximise the use of on-site energy, reduce costs, and potentially support local energy trading.

LONGER DESCRIPTION – IN ENGLISH

In the second half of the HarvRESt project, a suite of **smart energy system algorithms** will be introduced to transform how agricultural communities manage and optimise energy performance. These algorithms form part of a wider **energy intelligence platform** that links on-farm renewable energy assets to a central HarvRESt cloud system.

The system begins by **collecting data** from distributed energy resources (DERs) via existing platforms in the project's Use Cases. This data feeds into the central HarvRESt cloud capable of:

- Forecasting local renewable energy generation and consumption
- Analysing energy usage trends over time
- Generating optimisation strategies to increase self-consumption and minimise energy losses

These strategies will be delivered through a **user-friendly interface**, with future integration possibilities for direct control of local energy assets.

Ultimately, the algorithms are being designed for **scalability and adaptability** across different farming contexts, allowing farms to both manage their internal energy flows more efficiently, and **engage in profitable trading** of surplus renewable energy within local or regional markets.

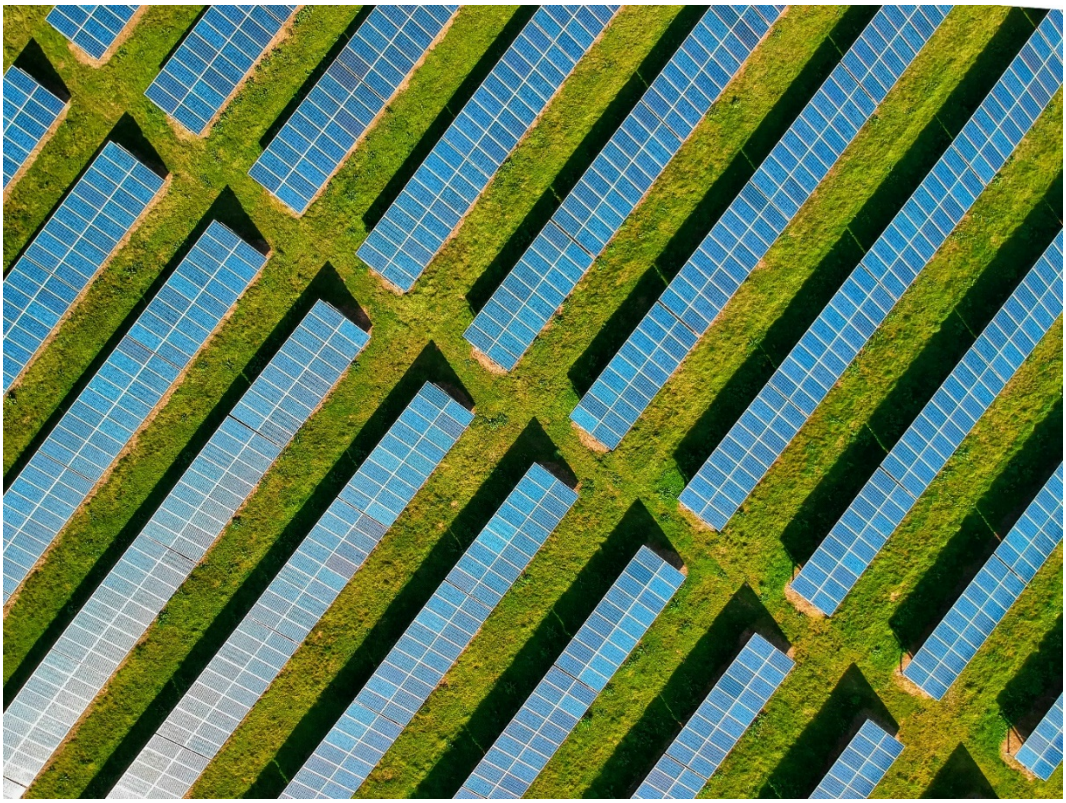
The approach aligns with broader EU energy and digitalisation goals by demonstrating how artificial intelligence can be embedded into everyday agricultural decision-making, enabling energy-aware farming practices.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Smart Energy System Algorithms (under development)

URL: TBD

Practice Abstract 8: The Agricultural Virtual Power Plant – Exploring Renewable Scenarios for Your Farm



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Aggregates energy generation and storage resources from farms into a single virtual power plant.
- Enables participation in energy markets and improves energy self-sufficiency for rural communities.
- Offers a scalable and replicable model for decentralised energy coordination in agriculture.

PRODUCTION SYSTEM

N/A

KEYWORDS

Farming Decisions, Digital Tools, RES Integration

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt is creating an Agricultural Virtual Power Plant (AVPP) that enables farms to pool their renewable energy resources and act as a single coordinated energy unit. This helps maximise energy use locally, reduce costs, and allow participation in energy markets.

LONGER DESCRIPTION – IN ENGLISH

The **HarvRESt Agricultural Virtual Power Plant (AVPP)** is a forward-looking solution designed to enhance the role of farms and rural energy producers in the energy transition. The AVPP allows geographically distributed agricultural energy assets – such as solar panels, wind turbines, and batteries – to be managed **as one unified entity.**

This concept is drawn from the world of smart grids and decentralised energy systems, adapted to the **unique conditions and operational rhythms of agriculture.**

Key functions of the AVPP include:

- **Real-time energy coordination** across multiple farms
- **Aggregation of surplus energy** for local use or market participation
- **Demand-response mechanisms** to reduce strain on local energy infrastructure
- **Integration with forecasting and optimisation tools** from other HarvRESt components

By acting as a "virtual" utility, the AVPP helps rural communities **collectively balance supply and demand**, increase local energy resilience, and potentially generate income by selling surplus power back to the grid or other users.

From a technological standpoint, the AVPP uses a **cloud-based control system** with data input from smart meters, sensors, and predictive models. The system can send signals to individual farms, adjusting generation or storage behaviours based on network needs or price signals.

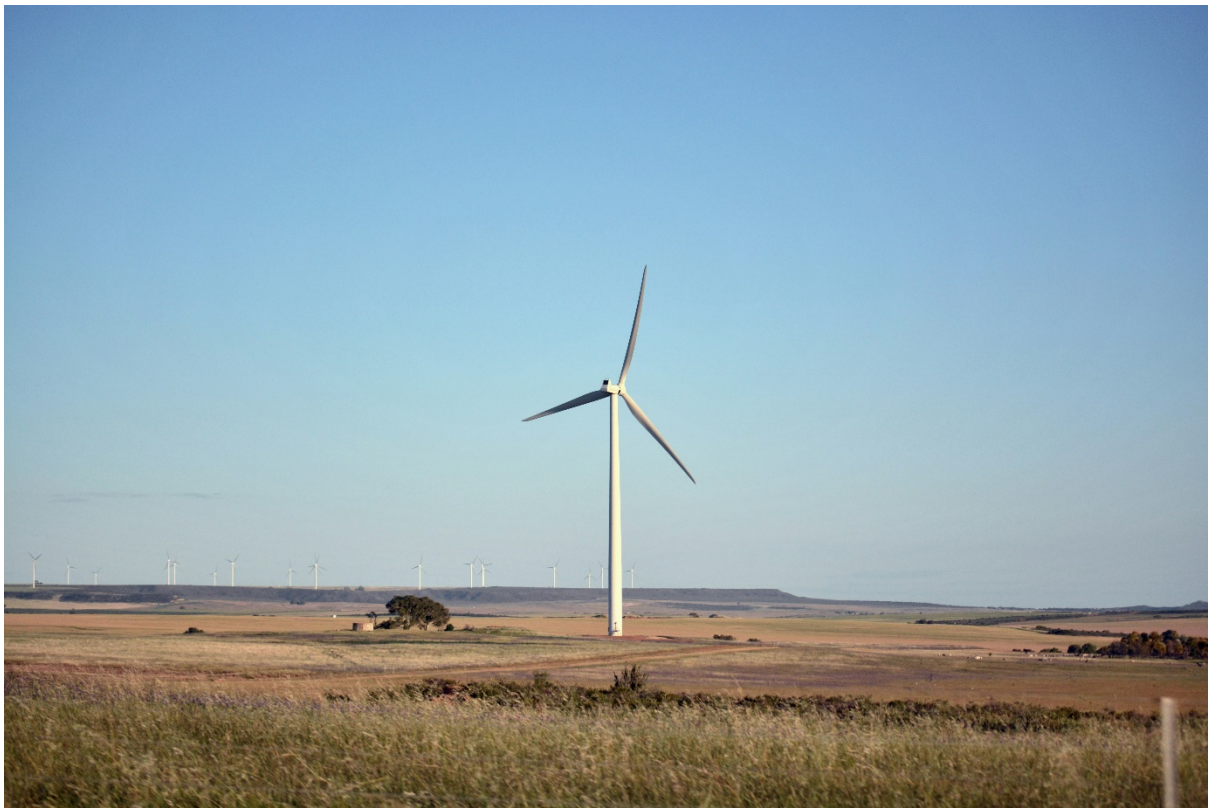
This innovation not only supports **carbon neutrality goals** but also creates a new space for farmers to be active participants in the energy economy – not just consumers, but **smart producers and service providers**.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Agricultural Virtual Power Plant (AVPP) architecture and use case report (forthcoming)

URL: TBD

Practice Abstract 9: A Decision Support Tool for Planning Smart Renewable Energy Investments on Farms



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Helps farmers and agro-advisors make data-informed investment decisions in renewable energy.
- Incorporates sustainability, technical, and economic criteria into one unified decision tool.
- Supports optimised sizing and deployment of renewable energy source infrastructure in agricultural systems.

PRODUCTION SYSTEM

N/A

KEYWORDS

HarvRESt, RES, MCDA, DSS

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

HarvRESt is developing a Decision Support System (DSS) to help farmers and agricultural stakeholders evaluate different renewable energy investment scenarios. It blends farm-specific constraints with energy forecasts to guide optimal renewable energy source choices and system sizing.

LONGER DESCRIPTION – IN ENGLISH

The **HarvRESt Decision Support System (DSS)** is designed to support strategic decision-making in the deployment of renewable energy solutions within the agricultural sector. Building on the forecasting and optimisation tools developed in other parts of the project, this DSS integrates a wide range of **agro-economic and technical data** to guide investments.

Key features include:

- **Multi-Criteria Decision Analysis (MCDA):** The DSS uses this methodology to evaluate various scenarios of the adoption of renewable energy sources, considering trade-offs across environmental, economic, and technical factors.
- **Hybrid modelling approach:** It combines energy forecasting results, local constraints (e.g. farm size, energy needs, regulatory limits), and optimisation strategies to generate tailored recommendations.
- **User-centred design:** The tool is being developed with practical application in mind, allowing agricultural users to input relevant parameters and receive clear, actionable insights.

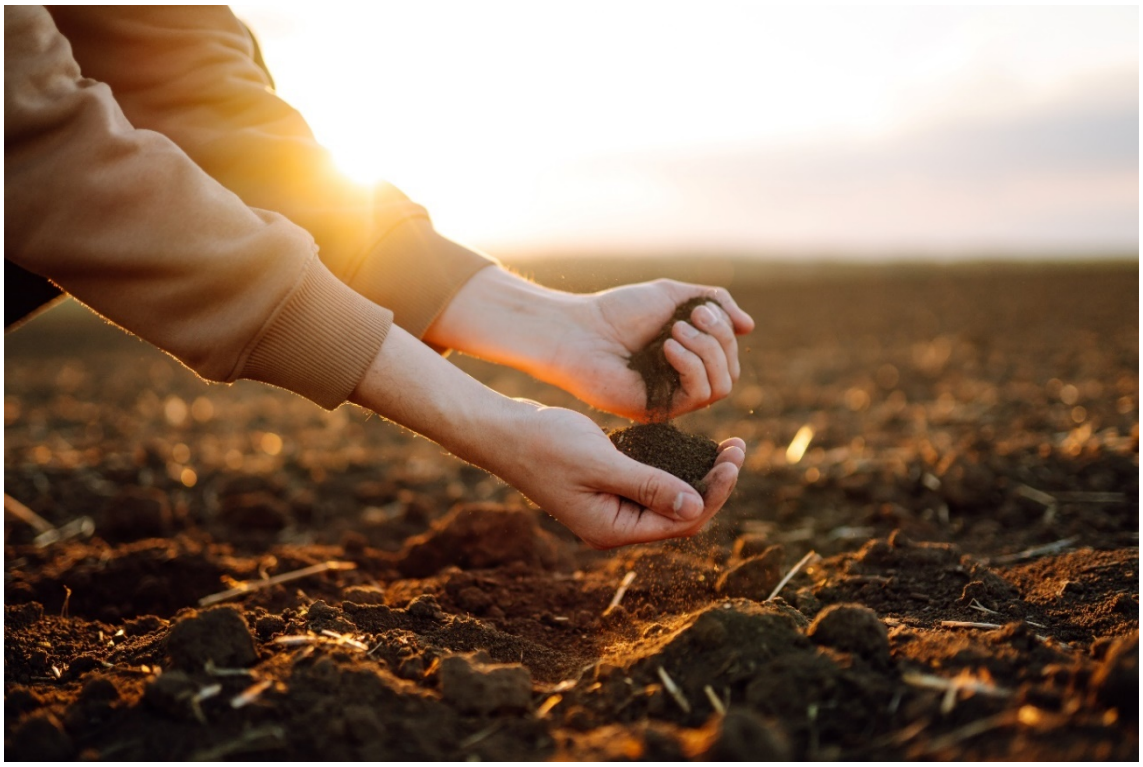
The ultimate aim is to reduce the uncertainty and complexity that farmers face when making long-term energy investment decisions. It empowers users with a transparent tool that reflects both **technical feasibility** and **economic viability**, while aligning with broader EU goals for climate neutrality and rural sustainability.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt DSS (forthcoming decision support platform)

URL: TBD

Practice Abstract 10: Bringing People Together – A Strategy to Engage Stakeholders in Farm Energy Transitions



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Fosters collaboration across different agricultural, energy, and policy actors to support the uptake of renewable energy sources.
- Builds local ownership of renewable energy solutions through inclusive dialogue and stakeholder mapping.
- Enhances outreach and awareness in agro-communities using tailored engagement tactics.

PRODUCTION SYSTEM

N/A

KEYWORDS

Renewable Energy Integration, Multi-actor Engagement, Agricultural Innovation

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

This strategy outlines how to engage farmers, cooperatives, rural communities, and local institutions in meaningful dialogue around renewable energy solutions. It builds trust and alignment across actors, enabling more effective and sustainable implementation of renewable energy sources in agriculture.

LONGER DESCRIPTION – IN ENGLISH

The **HarvRESt strategy for multi-actor engagement** is a key foundation for ensuring that renewable energy solutions are not only technically sound but also socially accepted and locally embedded. This approach places multi-stakeholder collaboration at the heart of the project's implementation across Europe.

The strategy builds on the belief that **energy transition in agriculture must be co-created** with the people it affects – including farmers, advisors, rural cooperatives, energy providers, and policymakers. It therefore outlines a structured methodology for identifying, understanding, and engaging these actors from the early stages of project development.

Key components of the strategy include:

- **Stakeholder identification and mapping:** Who are the relevant actors in each region or value chain?
- **Engagement planning:** What are the most appropriate formats (e.g. interviews, workshops, field visits, webinars)?
- **Trust-building and value alignment:** How can renewable energy sources be framed in ways that resonate with farmers' priorities (e.g. cost savings, independence, environmental care)?
- **Feedback loops:** How will stakeholder insights shape technical tools like HarvRESt's Decision Support System and **Agricultural Virtual Power Plant**?

The strategy also reflects lessons learned from previous EU projects and rural innovation initiatives, ensuring that engagement activities are **context-sensitive and culturally relevant.**

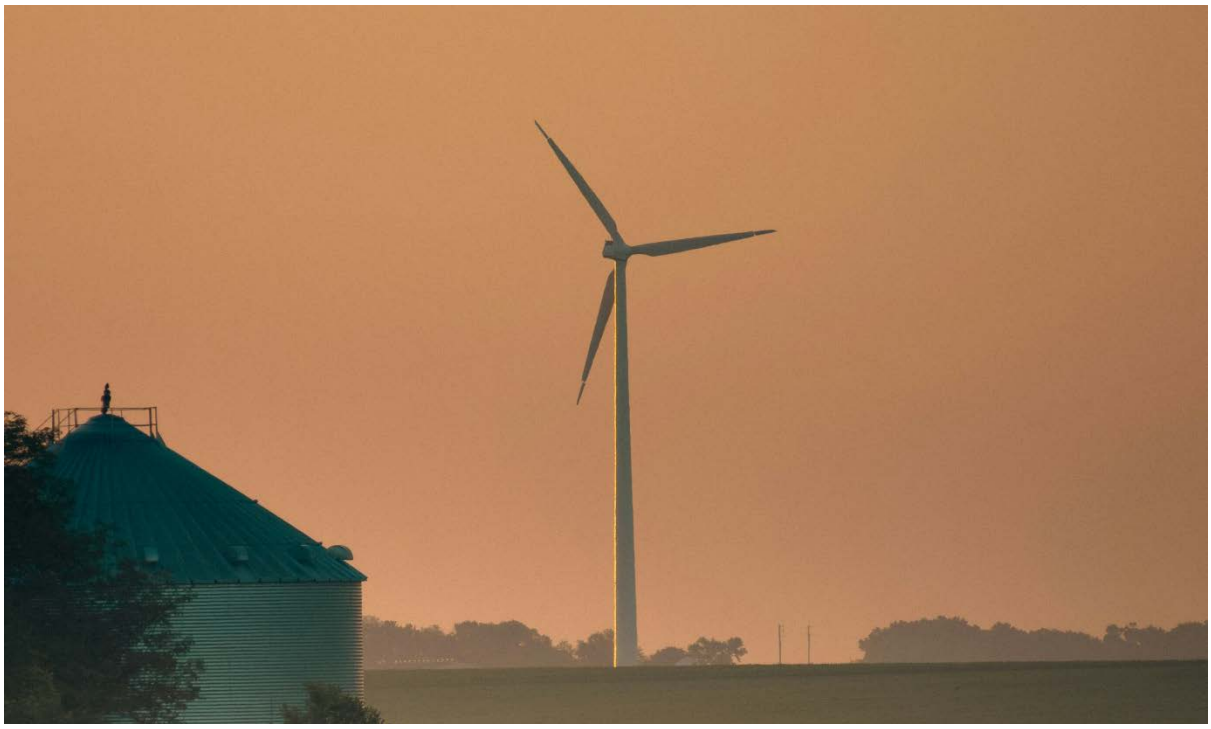
It emphasises the importance of **reciprocity** in engagement: practitioners are not just recipients of information, but contributors to knowledge production. This approach ensures better project uptake and sustainability of results, while also supporting behavioural shifts in how energy is produced and consumed in agricultural settings.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Multi-Actor Engagement Strategy

URL: TBD

Practice Abstract 11: Training Modules to Help Farmers and Rural Stakeholders Adopt Renewable Energy



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Supports farmers and practitioners with tailored training resources on renewable energy integration.
- Enhances knowledge and confidence for decision-making on sustainable energy practices.
- Encourages long-term behavioural change through accessible and adaptable learning materials.

PRODUCTION SYSTEM

N/A

KEYWORDS

Capacity Building, Renewable Energy, Farm-level Training, Agro-communities, Practical Modules

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt Capacity Building Material offers practical training content for farmers and rural actors. It focuses on how to understand, evaluate, and adopt renewable energy systems in agriculture, based on real project insights and community feedback.

LONGER DESCRIPTION – IN ENGLISH

The upcoming **Capacity Building Material** developed by **the HarvRESt project** is designed to deliver targeted learning content to support farmers, advisors, and other rural actors in navigating the complex landscape of renewable energy technologies in agriculture.

This material will include a variety of **practical training components**, structured around the needs and profiles of different user groups identified during HarvRESt's engagement work. The aim is to build not just knowledge, but also **capacity and confidence** to make informed choices about renewable energy options.

Key features include:

- **Modular training content**: covering technology basics, economic feasibility, regulatory issues, and social considerations
- **Use-case driven scenarios**: drawing directly from HarvRESt pilot experiences to ground learning in real situations
- **Interactive formats**: such as videos, infographics, quizzes, and printable guides for in-person or online delivery
- **Adaptability**: materials will be customisable for different regions and language contexts

The capacity building approach reflects a **participatory philosophy**, involving stakeholders in the co-design and testing of learning tools to ensure relevance and usability.

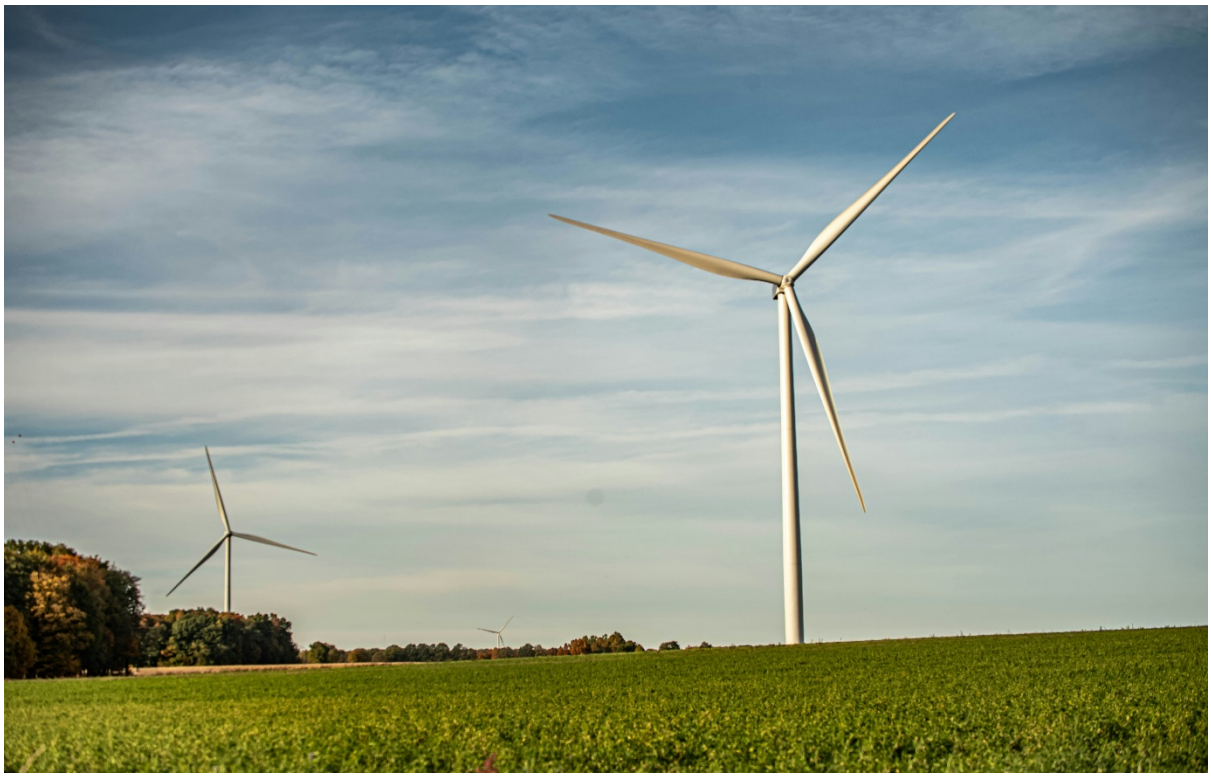
Ultimately, the deliverable aims to **nurture energy literacy** in rural communities and reinforce HarvRESt's other tools (like the Decision Support System and Knowledge Toolkit), helping ensure long-term uptake of sustainable energy solutions in agriculture.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Capacity Building Material

URL: TBD

Practice Abstract 12: Business Models for Renewable Energy in Agriculture – A Catalogue of Options and Case Studies



COUNTRY AND CLIMATIC ZONE

Pan-European

CONTACT

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3 BENEFITS OF THE PRACTICE

- Identifies viable business models to support the uptake of renewable energy in agriculture.
- Helps farmers and cooperatives match technical solutions with financially sustainable approaches.
- Offers replicable business cases that can be adapted to diverse regional or farm-specific contexts.

PRODUCTION SYSTEM

N/A

KEYWORDS

Business Model Canvas, Innovative Agri-business, Agricultural Transition to Renewable Energy

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt Business Model Catalogue presents a range of renewable energy business models tailored to the agricultural sector. It helps practitioners identify economically sustainable ways to implement and scale renewable energy sources.

LONGER DESCRIPTION – IN ENGLISH

The **Business Model Catalogue** developed under the HarvRESt project provides agricultural stakeholders – including farmers, cooperatives, and rural energy communities – with a structured overview of business models that can support the successful deployment of **renewable energy sources (RES)** in agriculture.

Recognising that technology alone is not enough, this catalogue focuses on the **economic, organisational, and policy dimensions** of energy transition. It gathers and analyses examples of viable business structures observed across Europe and presents them in a form that is accessible and actionable for practitioners.

Key features include:

- **Model typologies**: e.g. prosumer models, energy cooperatives, partnerships with energy service companies, third-party ownership, community-shared assets
- **Cost–benefit breakdowns**: including capital expenditure, operational costs, return on investment, and payback times
- **Legal and regulatory considerations**: identifying enablers and barriers across countries
- **Replicability factors**: scalability, financing access, governance, stakeholder roles

The catalogue draws from real-world case studies and ongoing HarvRESt Use Cases. It also maps how these models align with **different types of agricultural operations** – from smallholders to larger enterprises – and how they relate to HarvRESt's technical tools such as the DSS and AVPP.

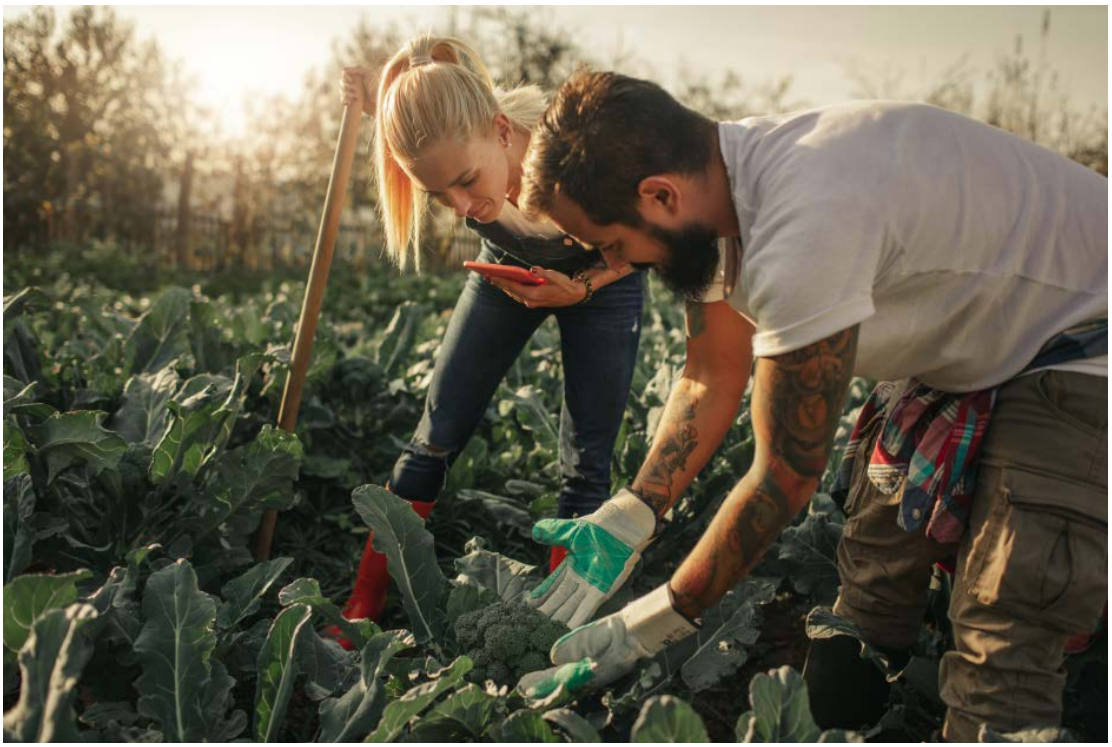
Ultimately, this deliverable serves as a **decision-making aid** for those considering renewable energy adoption but unsure how to approach it from a business perspective. It supports bottom-up innovation and ensures that the deployment of renewable energy sources is both **environmentally and economically sustainable**.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Business Model Catalogue

URL: TBD

Practice abstract 13: How to Involve Farmers and Stakeholders in Renewable Energy Projects – Practical Engagement Guidelines



COUNTRY AND CLIMATIC ZONE

Pan-European (with regional focus: Italy, Denmark, Spain, and Norway)

CONTACT

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3 BENEFITS OF THE PRACTICE

- Provides a clear and replicable framework for engaging local stakeholders in renewable energy transitions.
- Encourages stakeholder buy-in and collaboration through practical, region-specific communication activities.
- Supports increased adoption of renewable energy sources through demonstrated economic, environmental, and social benefits.

PRODUCTION SYSTEM

N/A

KEYWORDS

Renewable Energy, Sustainable Agriculture, Stakeholder Engagement, Agrivoltaics, Biogas

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

This strategy provides clear and practical guidance for involving local stakeholders in renewable energy adoption in farming communities. It includes templates, case studies, and recommended activities such as workshops and campaigns that help farmers and others collaborate to adopt renewable energy sources.

LONGER DESCRIPTION – IN ENGLISH

The HarvRESt Strategy for Multi-Actor Engagement and Awareness Creation developed by White Research outlines a comprehensive and regionally tailored framework for stakeholder engagement in the context of integrating renewable energy sources (RES) within agricultural communities.

Focusing on pilot regions in Italy, Denmark, Spain, and Norway, the strategy details how to identify, classify, and involve local stakeholders — including farmers, technology providers, energy suppliers, researchers, and policy actors — based on their specific ecosystem roles and needs.

Key components of the strategy include:

- Stakeholder mapping methodologies
- Warm-up events and awareness campaigns to introduce concepts
- Targeted training workshops that support hands-on learning and local adaptation
- Communication templates and guidelines to maintain consistency across regions
- Use of successful local case studies and demo activities to build trust and legitimacy

The report provides practical recommendations that demonstrate clear benefits of renewable energy source integration for agricultural stakeholders. These include cost savings, energy independence, improved sustainability, and enhanced productivity.

By promoting active collaboration and mutual understanding among stakeholders, the strategy helps overcome resistance to change and facilitates a smoother transition to cleaner energy models. It ultimately serves as a roadmap for building resilient, engaged, and low-carbon agro-communities across Europe.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Co-Creation Guidelines

URL: TBD

Practice Abstract 14: A Toolkit to Share Knowledge and Inspire Renewable Energy Action in Agriculture

COUNTRY AND CLIMATIC ZONE

Pan-European

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3 BENEFITS OF THE PRACTICE

- Facilitates the sharing of renewable energy practices, challenges, and lessons across European agro-communities.
- Supports peer learning and capacity building by packaging knowledge in accessible formats.
- Encourages replication and scaling of successful solutions through open, modular resources.

PRODUCTION SYSTEM

N/A

KEYWORDS

Dissemination Toolkit, Stakeholder Engagement, Replication and Scalability

SUMMARY FOR PRACTITIONERS ON THE MAIN FINDING(S)/INNOVATIVE SOLUTION(S) – IN ENGLISH

The HarvRESt Knowledge Sharing Toolkit supports farmers, advisors, and rural actors in understanding and applying renewable energy solutions. It gathers useful content, real-life stories, and resources from across Europe in one place to support learning and action.

LONGER DESCRIPTION – IN ENGLISH

Developed by the HarvRESt project, the **Knowledge Sharing Toolkit** is designed to facilitate accessible, practical knowledge exchange about renewable energy adoption in agriculture. It brings together a variety of content formats and experiences from across the project's Use Cases, co-creation activities, and technical work packages.

The toolkit is intended to empower users – particularly farmers, cooperatives, advisors, and local authorities – to take **informed steps** toward integrating renewable energy on farms. Rather than being a static document, it is conceived as a **modular, dynamic resource** that grows as the project matures.

Key components of the toolkit include:

- **Practical summaries** of HarvRESt outputs, designed for non-technical audiences
- **Videos and case studies** showcasing on-the-ground applications of renewable energy sources
- **Guides and factsheets** for using HarvRESt tools like the Decision Support System, forecasting models, and the **Agricultural Virtual Power Plant**
- **Stories and testimonials** from multi-actor engagement sessions
- **Links to EU-level policy resources and regulatory guidance**

A central feature of the toolkit is its focus on **storytelling and peer learning**, recognising that behaviour change is often inspired by seeing what peers are doing. The content is curated not just for information, but also for **inspiration**, helping practitioners imagine how renewable energy might work in their own context.

Importantly, the toolkit supports HarvRESt's broader vision of **capacity building and knowledge democracy** – ensuring that all actors in the value chain, regardless of size or location, have access to meaningful support on their energy transition journey.

ADDITIONAL DISSEMINATION AND COMMUNICATION MATERIAL(S)

Title/Description: HarvRESt Knowledge Sharing Toolkit

URL: TBD

4. CONCLUSIONS

The HarvRESt project has developed 14 draft practice abstracts (PAs) in this first batch, following the common EIP-AGRI format to meet the project's objective of sharing innovative renewable energy practices with practitioners at the farm level. These PAs illustrate replicable solutions and provide actionable insights to support the energy transition in European agriculture.

The practice abstracts highlight the following key insights:

- A modular Knowledge Sharing Toolkit facilitates accessible peer learning and supports replication of renewable energy solutions across diverse farming communities.
- A comprehensive Business Model Catalogue helps farmers and cooperatives align technical renewable energy solutions with financially sustainable approaches tailored to different agricultural contexts.
- A user-friendly Decision Support System (DSS) integrates technical, economic, and environmental criteria to guide farmers' investment decisions in renewable energy technologies.
- The Agricultural Virtual Power Plant (AVPP) aggregates distributed farm energy resources, enabling collective energy market participation and enhancing local energy self-sufficiency.
- Hybrid energy simulation models provide scalable, data-driven insights for optimising renewable energy integration in various agro-environmental conditions.
- AI-powered forecasting tools deliver reliable renewable energy generation predictions to improve operational planning and maximise on-farm energy use.
- The innovative edaphic footprint metric introduces soil health into sustainability assessments, supporting climate-smart soil management alongside renewable energy adoption.

Theses PAs can be checked in HarvRESt website, in the section "Results & publications". Moreover, these PAs will be submitted to the EU CAP Network platform and will be made publicly accessible to encourage widespread uptake. The next step will be to update and expand the collection with a second batch of practice abstracts by the end of the project.

HarvRESt
Greener Farming with RES

The project

The HarvRESt project aims to enhance the sustainable production of renewable energy at farm-level. This approach not only makes farms climate-neutral but also optimizes production, reduces their impact on natural resources and biodiversity, and provides energy services to communities, thereby diversifying economic income. However, deciding how best to integrate renewable energy sources (RES) on a farm is not without its challenges. The decision is a complex one, with many factors to consider. Due to this, HarvRESt seeks to identify, understand, and overcome the existing barriers hindering the widespread adoption of this innovative approach. Current initiatives often overlook the complex interactions and factors within the farming and RES context, resulting in ineffective support for decision-making based on accurate projections, estimations, and forecasts. HarvRESt will therefore consolidate and enhance existing knowledge, creating an Agricultural Virtual Power Plant capable of running diverse scenarios and farm configurations. This tool will determine the best operational procedures for a given RES solution, providing valuable data to a decision support system. This system will weigh trade-offs and key indicators, offering tailor-made recommendations to farmers and policymakers.

PARTNER		SHORT NAME
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Confagricoltura	Confagricoltura	CONFAGRI
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Viñas del Vero	Viñas del Vero	VdV
Viñedos del Rio Tajo	Viñedos del Rio Tajo	VRT
sorigué	Sorigué	ACSA
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