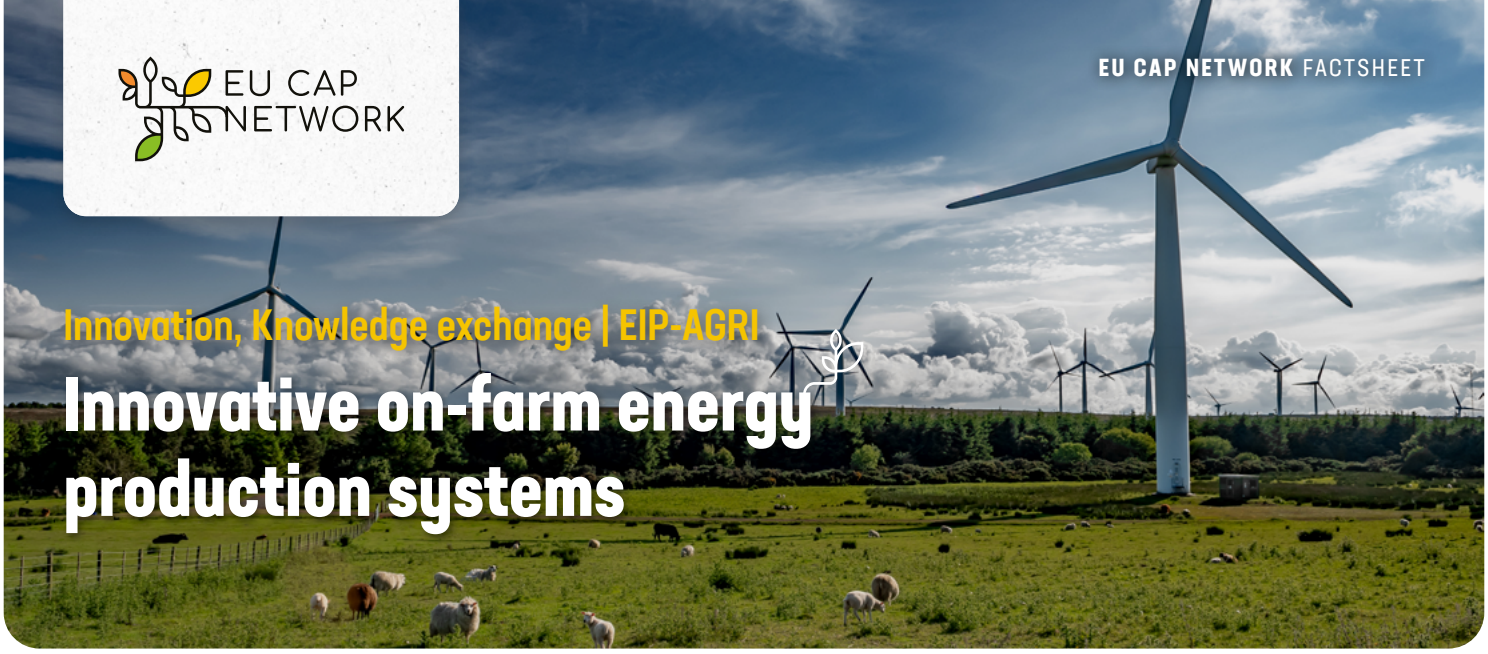

Innovation, Knowledge exchange | EIP-AGRI

Innovative on-farm energy production systems

How to develop and foster the adoption of context-appropriate, resilient, and farmer-centred on-farm energy systems that enhance sustainability and energy autonomy, while supporting farm viability and environmental goals?

Farm-based energy systems can strengthen farm viability, improve energy autonomy, and contribute to more sustainable farming. The EU CAP Network Focus Group 'Innovative on-farm energy production systems' explored practical solutions that can help farmers adopt on-farm energy systems suited to their specific context. The Focus Group experts concluded that successful implementation depends not only on proven technologies, but also on viable business models, farmer-led cooperation, effective advisory services, practical knowledge exchange, and supportive implementation frameworks.

Key takeaways:

- mature technologies such as biogas, solar photovoltaics (PV), and wind are ready for wider uptake.
- hybrid energy systems, energy storage, and energy management systems are promising solutions.
- farmer-led cooperatives and energy communities help share costs, risks, and benefits while strengthening farmers' roles in decision-making.
- independent advisory services, demonstration farms, and peer learning are essential for the adoption of innovative energy systems.
- streamlined permitting, improved grid infrastructure, and stable financing increase adoption.

The Focus Group identified several practice-driven research priorities, such as better understanding the long-term environmental impacts (e.g. biodiversity effects) of on-farm energy installations, and improving energy storage and grid integration solutions tailored to farms. The experts proposed concrete innovation project ideas that could be implemented through EIP-AGRI Operational Groups and other collaborative projects. This includes, for example, pilot initiatives to valorise biogas plant residues in the circular bioeconomy and to demonstrate agrivoltaic systems that combine solar energy with crop production.

Overall, the Focus Group's findings point to an integrated, farmer-centred approach that combines promising technologies with supportive governance. In this approach, knowledge and policy frameworks will be key to accelerating sustainable energy transitions on Europe's farms.

"What matters now is providing farmers with the knowledge, confidence and ongoing support needed to implement tailored, integrated solutions that address their specific needs and challenges."

Marta Lopes (Portugal),
Expert at the EU CAP Network Focus Group 'Innovative on-farm energy production systems'

Innovative on-farm energy production systems

Research needs

- making farm energy solutions attractive to younger generations
- understanding the long-term biodiversity impacts of on-farm energy systems
- improving energy storage technologies for defossilisation
- developing farm-scale energy management systems and microgrids
- biofertilisers from digestate and green ammonia

Ideas for EIP-AGRI Operational Group projects

- anaerobic digestion bioeconomy opportunities
- agrivoltaics for speciality crops with energy storage
- biomass production that minimises land-use competition
- designing blueprints for resilient, hybrid farm energy systems
- demonstration farm networks for on-farm energy innovations

More information

- Focus Group webpage
  - Mini Paper 1: Small-scale biogas on farms
  - Mini Paper 2: Agri-PV for competitive and resilient farms: system options, impacts, and deployment pathways
  - Mini Paper 3: Knowledge transfer in on-farm energy systems
  - Mini Paper 4: Innovative governance models for energy projects in rural areas benefiting farmers and local communities
  - Mini Paper 5: How to make farms more energy-resilient
  - Mini Paper 6: Hydrogen production and use on farms
  - Mini Paper 7: Defossilisation of mobile agricultural machinery and transport
- Focus Group final report and annexes

EIP-AGRI projects

- Small Biogas Demonstration project (Ireland)
- AgroFossilFree

Explore 239 EIP- AGRI Operational Group projects, 23 Horizon multi-actor projects, and 760 practice abstracts on the topic in the EIP-AGRI project database.

Inspirational ideas

- Farm-scale biogas: turning farm waste into energy and reducing costs (Ireland)
- Corn cob as a renewable energy source (Slovenia)

Publications

- Factsheet EIP-AGRI Focus Group 'Renewable energy on the farm'

Feedback and questions:

Support Facility Innovation & knowledge exchange | EIP-AGRI
Koning Albert II laan 15 - 1210 Brussels - BELGIUM
Tel +32 2 543 72 81
innovation-knowledge@eucapnetwork.eu
https://eu-cap-network.ec.europa.eu

Find out more about the EU CAP Network

Visit the EU CAP Network website to discover projects, ideas and resources to catalyse innovation in agriculture, forestry and rural areas.

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