European Network for
Rural Development

Effective approaches for facilitating a transition to clean energy in the agriculture and forestry sectors using the CAP

Thematic Group on the European Green Deal and Rural Areas

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1. INTRODUCTION

Overall, energy consumption in the agriculture sector accounted for 3.2% of total consumption in the EU-27 in 2018. Fossil fuels continue to be the main source of energy in the sector, accounting for about 56% of its total energy consumption in 2018 (DG AGRI, 2018). These figures do not take account of the sector's indirect energy use from – inter alia – the manufacture or transport of inputs such as fertilisers and pesticides which remain a significant component of the agri-food sector's total energy use.

This factsheet suggests how Member States could support the transition to clean energy in the agriculture and forestry sectors through the choices they make in designing and implementing their CAP Strategic Plans (CSPs), in particular to meet the new CAP's specific objectives of 'contributing to climate change mitigation and adaptation and also to sustainable energy'. Ideas and examples emerging from the ENRD's *Thematic Group (TG) on the EGD and Rural Areas*[1] are presented as a source of inspiration for Member States' Managing Authorities (MA) and stakeholders (Boxes 3-6).

Clean energy refers to renewable energy generation and energy efficiency, both vital components of the process of decarbonising Europe's energy systems.

Recommendations for CAP Strategic Plans

- Ensure that key energy issues are identified in the SWOT and needs assessment, then used to inform the design and implementation strategy for targeted CAP interventions that have the greatest potential impact.
- Support the uptake of energy saving practices on a large scale, as well as sustainable renewable energy solutions that also benefit the environment.
- Programme CAP Pillar I and Pillar II interventions in a coordinated, integrated way to achieve the CSP's energy priorities in line with – inter alia – environmental objectives.
- Consider all approaches that can be applied to stimulate uptake e.g. individual or joint commitments among farmers and foresters or community-led energy projects involving the wider rural community.
- Make full use of advisory and innovation systems to develop know-how among land managers and other stakeholders, as well as pilot and test new approaches to encourage large-scale uptake.

(1) https://enrd.ec.europa.eu/news-events/events/3rd-meeting-thematic-group-european-green-deal-and-rural-areas_en

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2. IDENTIFY KEY SUSTAINABLE ENERGY PRIORITIES FOR THE CSP

To design effective CAP interventions that support the clean energy transition in the agriculture and forestry sectors, it is first necessary to identify the clean energy priorities for the CSP in the SWOT analysis and needs assessment. This process should be based on the National Energy and Climate Plans, bearing in mind the relevant European Green Deal[(2)] (EGD) objectives, the European Commission's CSP Recommendations to Member States[(3)], and the need to report on CAP indicators of energy savings in agriculture and investments in renewable energy production capacity.

The results of this part of the CSP design process are essential to:

- Orient the choice of CAP interventions targeted at reducing energy consumption and improving energy efficiency in the agriculture and forestry sectors;
- Identify the needs and opportunities of farm and forest businesses to shift to clean energy sources, the added value of targeted CAP support in enabling this, and determine the role that the agriculture and forestry sectors – and rural areas more broadly – can play as producers of clean energy, both for own use and to feed into the energy grid; and
- Ensure the environmental and economic sustainability of CAP support for energy savings and clean energy. This means the identification of possible synergies, as well as addressing any conflicts and trade-offs with other environmental and climate priorities when designing CAP interventions.[(4)]


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3. USE CAP INTERVENTIONS IN A COORDINATED AND INTEGRATED WAY

A wide range of CAP Pillar I and II interventions can be used to support the upscaling of improved energy savings and energy efficiency on individual farms, and to stimulate the increased production of clean energy at rural community level. For example, conditionality, eco-schemes, environmental management commitments, investment and agricultural knowledge and innovation systems (AKIS) could all form part of a package of interventions to support a transition to clean energy, while also contributing to other CAP objectives (see table 1)

(2) https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

(3) COM/2020/846 final

(4) As identified by existing environmental and climate planning tools such as Prioritised Action Frameworks (PAFs) for Natura 2000 and the CBD mandated National Biodiversity Strategies and Action Plans (NBSAPs), National Action Plans for the Sustainable Use of Pesticides and the River Basin Management Plans 2022-2027.

Table 1. Opportunities to use CAP interventions to support the clean energy transition

Opportunities	Potential actions	Relevant CAP measures: Conditionality	Eco-scheme & AECM	Investments	Cooperation including LEADER	AKIS
Energy saving/efficiency						
Buildings - on farm and forest holdings, and those used for local processing of farm and forest products	Improve the energy efficiency of existing buildings. Require new buildings to meet minimum energy and water efficiency standards.			●	●	●
	Use sustainable building materials (e.g. timber and other materials with low fossil fuel requirements in production).			●	●	●
Machinery and field operations	Conservation agriculture (minimum soil disturbance, crop diversification, and permanent soil cover).	Soils	●			●
Input saving/efficiency – water	Upgrade irrigation systems to reduce evaporation loss; install energy efficient pumping/distribution systems.		●	●	●	●
	Water conservation, rainfall collection and storage.			●		●
	Dryland cropping systems.		●			●
Input saving/efficiency – mineral fertilisers and PPP	Precision farming (application only when/where needed, using precision equipment). Advanced crop rotation, soil fertility management, mixed livestock/crop systems, organic farming.		●	●	●	●
Clean energy production (farm, forest or community level)						
Agro-Photovoltaic (APV)	Solar PV integrated with glasshouse production, other buildings, to shade crops and permanent pasture.			●	●	●
Anaerobic digestion (AD) for biogas	Use only sustainable feedstocks (e.g. manure, crop residues, non-food energy crops). Coordinated use of digestate as fertiliser to improve soil			●	●	●
Other small-scale heat or power systems	Geothermal, hydro, small wind turbines, pellets from recycled or waste wood, thinning and coppicing.			●	●	●

Source: own compilation

New and innovative approaches to support the energy transition in the agriculture and forestry sectors may need to be tested in the short term prior to a wider scale roll-out. The new CAP will continue to allow such pilot projects using the EIP-AGRI Operational Groups (OGs) under the Pillar II Cooperation measure. The EU LIFE Programme and to some extent the EU Research and Innovation Programme are other EU funds being used alongside the CAP to pilot and test new approaches. Lessons can also be drawn from the results of previous pilots financed through these funds including the now defunct Intelligent Energy – Europe (IEE) scheme to guide the design and implementation of new schemes.

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Box 1: The role of Agricultural Knowledge and Innovation Systems (AKIS)

Farm advisory services (FAS) and knowledge exchange and information schemes have great potential to promote the energy transition, and sustainability objectives in general, across the agriculture and forestry sectors. For instance, all farmers and land managers could be paid to draw up a farm sustainability plan, in partnership with an accredited advisor, to address energy issues as well as other environmental and climate priorities that may be relevant to their business and/or the wider territory. Tailored advice is essential to support the effective implementation of land management schemes, but also for farmers, foresters and rural dwellers to find collaborative solutions for local energy production.

Given the multi-sectoral nature of the energy transition, related knowledge and information services need to go beyond the usual scope of agriculture and forestry, and require cooperation and synergies across values chains including food, feed, and fibre. CAP-supported advice and information may also positively impact the uptake of support for renewable energy technologies provided by other sources.

4. DESIGN EFFECTIVE INTERVENTIONS THAT ENCOURAGE UPTAKE

The widespread uptake of all the CAP interventions discussed above will be essential to achieve the EU clean energy objectives. **Almost all farm and forest holdings have some potential to save energy and improve energy efficiency.** To do so will very often mean upgrading buildings and equipment through investment in new technologies, such as irrigation equipment, heat recovery systems (e.g. from cooling systems and manure storage), as well as precision agriculture and forestry equipment. Farmers need to know both the realistic payback time of energy-saving investments to encourage their uptake, and the benefits for farm competitiveness along with increased energy efficiency; information, advice and peer experiences are key. Small enterprises may benefit from cooperative approaches where they invest as a group in shared machinery.

CAP investment support can also be oriented towards energy efficiency by incentivising more ambitious projects, whereby sustainable investments could be eligible for more support.(5)

Individual or collective voluntary CAP schemes could focus on energy-saving land management practices such as conservation agriculture, water conservation and precision farming that also contribute to resource protection and biodiversity objectives. All require carefully designed packages of CAP support that are attractive to the majority of target farmers in terms of both immediate impact and longer-term business planning. Overall, it is critical that support is carefully targeted at energy-saving practices or technologies that are appropriate for stimulating the sustainable development of agriculture and forestry systems.

Shifting towards renewable energy solutions is a much wider endeavour that goes well beyond the limits of the agriculture and forestry sectors. When programming limited CAP resources to promote renewable energy production, MAs should seek to ensure that the interventions have a specific added value in terms of supporting multiple CAP objectives, or potential leverage to other policy sectors and funding that can benefit rural stakeholders.

The CAP can provide support for capital and installation costs for rural clean energy generation, but markets and regulations need to be in place to make them financially attractive and viable in the long term. Targeting CAP support to renewable energy production will also require MAs to develop robust sustainability criteria to exclude investments that could be damaging to the environment, climate action and sustainability objectives (see Box 2).

LEADER and Local Action Groups (LAGs) can effectively support the transition to clean energy production within their territory by raising awareness, providing support to first movers, and creating local partnerships for local clean energy systems and business models. The integration of clean energy objectives in local development strategies is an effective catalyst for rural energy transition (see box 3 and examples 2 and 3).

(5) The BE-Flanders RDP 2014-20 included such incentive system for the measure M04.

Box 2: Ensuring that the CAP supports only environmentally sustainable clean energy production

MAs face many possible trade-offs when considering the most appropriate clean energy options to meet their CSP needs. They must ensure that land used for biomass production does not compete with land for the sustainable production of food or threaten the preservation of land of high environmental and socio-cultural value. Failure to do so could lead to direct and indirect land use change, which can negatively impact the environment or climate. Biomass production should lead to the further mitigation and capture of CO_2 emissions, and not offset gains or create additional CO_2 because of land use change.

An example of a strategy to control negative impacts of the energy transition is the Slovakian criteria for the sustainable use of biomass, which are applied to forest biomass-related projects financed by the European Structural and Investment Funds (ESIF) – see ENRD case study https://enrd.ec.europa.eu/publications/wood-biomass-sustainability-criteria-slovakia_en.

The installation of new technologies or cultivation of crops may carry certain sustainability risks in terms of damage to natural resources or the loss of eco-system services. For example, the production of industrial energy crops could have negative effects on soil, water quality or biodiversity. Large installations of solar panels or wind turbines may also have a visual impact on landscapes or compete for agricultural land, while wind energy or biogas generation could cause noise or air pollution. On the other hand, the cultivation of industrial crops on unused, abandoned and/or degraded land could have positive environmental benefits, depending on the land conversion, the types of crop produced, and types of land management practices that are applied.

Box 3: Renewable Energy Communities

The role that citizens and communities have in the energy transition is being increasingly recognised. This includes the ability of rural communities to access and benefit from renewable energy generation. Evidence from existing renewable energy projects shows that returns to the local economy can be up to seven-fold when initiatives are community owned. Moreover, community ownership can help to promote buy-in amongst rural dwellers looking to transition towards a decarbonised rural economy. This recognition is now embedded in the EU energy framework, whereby community energy initiatives support inclusive development by creating positive economic and social benefits for the local area. Under the current Renewable Energy Directive (RED II), the EU defines a 'Renewable Energy Community' (REC) as a legal entity in which citizens – in partnership with other bodies such as local authorities and SMEs – can establish projects to produce renewable energy as well as take part in other energy-related activities. While CAP and other EU funds already support several community energy projects, the emphasis on RECs provides MAs with a clear legal framework to ensure community-led development; this is a key part of the energy transition. With different ESIF and recovery funds available to support the energy transition, MAs can pool resources across sectors and create new opportunities to support economic resilience and social cohesion in rural areas. More information can be found in the ENRD publication Smart Villages and Renewable Energy Communities https://enrd.ec.europa.eu/publications/smart-villages-and-renewable-energy-communities_en.

Source: ENRD (2020)

5. EXAMPLES OF CLEAN ENERGY SOLUTIONS WITH CO-BENEFITS FOR CLIMATE AND ENVIRONMENT

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Example 1

Using geothermal energy to grow crops in Slovenia

Several Slovenian companies are taking advantage of locally available geothermal wells for heating greenhouses to reduce the climate footprint of greenhouse grown crops and plants. **LUŠT, a subsidiary of the Paradajz company, specialises in high added-value products, such as tomatoes, to cover the cost of the geothermal heating installation**.

The greenhouse in Renkovci (9 ha) is heated with geothermal energy from a 1 483 meter deep well. Summer varieties of large **tomatoes are grown** between January and April. During the winter cycle (October-December), a greenhouse in Mala Polana (2.4 ha) is home to small to medium sized tomatoes. There, the heating is provided with the help of cogeneration of heat and electricity. The CO_2 produced in the process is immediately channelled to the plants to be transformed into oxygen through photosynthesis.

A short supply-chain approach has also been encouraged to reduce GHG emissions from transport whilst favouring the local economy. To achieve this, **LUŠT** partnered with several local actors to implement a €45 000 project running for 10 months in 2020, financed by the EAFRD with the assistance of the LAG "Pri dobrih ljudeh 2020"

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Example 2

Certification label for the sustainable management of hedgerows and bioenergy production in France

A certification scheme was developed to reverse the decline of hedgerows in the French landscape and increase sustainable management practices to increase biodiversity, and decrease pesticide use and soil erosion risks. The scheme also sought to enable farmers to develop markets for sustainable woody by-products. The Label Haie was initiated in the Normandy, Brittany and Pays de la Loire regions by three cooperatives and an association of municipalities under the coordination of the French Agroforestry Association (AFAC). Launched in 2019, the project received initial funding for the period 2017-2020 under the EAFRD's LEADER measure. This included €178 459 of EU funds, combined with national and private funding of €131 000 each.

Hedgerow management was seen as a financial burden by farmers, with cutting commonly performed by private companies at a net loss. The scheme is an answer to the situation: it allows wood obtained from the sustainable management of hedgerows to be certified and then sold. Farmers, wood traders and consumers along the value chain, brought together by the initiators of the project, are part of a participatory guarantee system (PGS), which functions as a locally-focussed quality assurance system. All actors co-participate in the management of the label, keeping track of the hedge wood production sites via a national digital cartography tool. Sustainable hedgerow management is ensured by a set of managements principles, which are translated into certification indicators and supported by training and advice.

The results of the project are twofold. From an environmental perspective, there is a renewed interest in sustainable hedgerow management, leading to the potential to increase biodiversity as well as greater carbon capture. On the socio-economic side, participating farmers have diversified their income. AFAC has now expanded the label to a national scale with the target of reaching 3 500 farmers, 35 000 km of sustainably managed hedgerows, and 175 000 tonnes of certified wood annually by 2024.

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Example 3

Austerland Energi – The emergence of a local energy system in Sweden's Gotland

On the island of Gotland (Sweden), dependency on imported power from fossil fuels is high. The project Austerland Energi aims to improve the local energy mix and establish smart grids for rural communities. The initiative resulted from the Swedish government's designation of Gotland as a national pilot area for conversion to a fully renewable energy system. Austerland Energi is a first "model within the model" test in the parishes of Östergarnslandet county. The project was initiated by a local development group, Nygarn Utveckling AB, in partnership with the Gotland Region, GEAB (Gotland's public electricity network) and Uppsala University.

The project aims to develop an approach which could be extended to cover the whole of Gotland. It combines assessing local energy needs with creating a development strategy focused on producing renewable energy and the circular use of locally available biomass such as agriculture and forestry waste or water purification sludge.

The results of an initial survey on household energy use and costs were used to develop an energy transition scenario covering an energy mix of solar, wind energy and biomass. Pyrolysis of local biomass is intended to enable the production of biochar, to be used by farmers to enhance soil carbon content and fertility. An operational plan based on this transition scenario will then be promoted among the local community.

The initiative plans to empower and involve the local population, companies and local authorities, so that every actor is aware of the way the local grid functions, and to initiate a collaborative approach to ownership of energy supply sources. The plan is to redeploy the energy grid into a "smart energy network" incorporating all locally produced energy.

As of 2021, an 18-month feasibility study has been carried out, funded by the LEADER measure of the EAFRD (€ 40 000). The project has not yet entered its implementation phase.

Example 4

Sun'Agri & Amarenco – Agri-PV and agrisolar benefits to farm revenues and climate change adaptation in France

In France, the R&D programme Sun'Agri has developed agrivoltaic systems to enhance the resilience of crops to climate change events whilst creating solar energy as a diversified income stream for farmers. Agrivoltaics refers to combining a crop and photovoltaic solar panels over an agricultural surface, the latter raised above ground and controlled for shade according to the physiological needs of the plants.

The Sun'Agri programme, in partnership with the French research centre INRAE, focused on three crop sectors: market gardening, viticulture, and arboriculture, characterised by their high added value and their sensitivity to weather or pest events induced by climate change. After several years of research, Sun'Agri launched three pilot schemes in 2017 in the South of France covering these three sectors.

The agri-PV installations have led to positive environmental outcomes. The "world's first agrivoltaic power plant" consisted of a 4.5 ha vineyard in the western Pyrenees. The system led to a 20% reduction in water consumption for irrigation, and a decrease in the occurrence of growth arrest and leaf burn during heat waves. The vineyard also experienced economic benefits as the adaptive panels improved the wine's profile, and raised its commercial value. The agrivoltaic power plant produces 2.1 MW, the equivalent of half a small photovoltaic power plant in France.

In the Amarenco region of Corsica, a photovoltaic installation company supported low-income farmers to access investment in facilities equipped with solar panels. It built fodder storage barns equipped with PV panels. The electricity produced and the feed-in-tariffs received were to amortise the installation cost of the barns for the farmers. Ultimately, 3000 small farmers were able to take advantage of these storage facilities (previously they had to store fodder on the mainland, resulting in significant transport costs), leading to improved income, increased feed availability for cattle, and improved energy independence for Corsica.

Example 5

Renewable energy consumption and increased efficiency using photovoltaic irrigation in Spain

The BOSOLA project tackles the fossil fuel consumption of conventional irrigation systems. It aims to reduce GHG emissions from irrigation methods and produce cheaper power for local farmers. To this end, the local Las Planas Irrigation Community of Alfaro in the La Rioja region (Northern Spain) joined a multi-disciplinary group to develop a closed renewable energy grid, using photovoltaic panels to power their water pumps. The pumps are supplied by a water reservoir fed from a local canal.

The project ran for 25 months from 2017 to 2019 with the financial support of the EAFRD cooperation measure and regional funds, which provided € 123 529 each. A top-up of € 70 045 was financed by the community. In total, 600 solar panels were installed, producing 213 kWp, which is equivalent to the power required to pump 30% of the total annual water consumption for the irrigation of the 246 ha of vineyards. As the region faced skyrocketing electricity prices (+ 1 250% between 2008 and 2013), the initiative was seen by farmers as a viable investment to improve the long-term resilience of their farms and become more autonomous from the regional grid.

A major success factor was the cooperation of the local beneficiaries with the public, private and academic sectors throughout the project, which ultimately led to the launch of the first high power photovoltaic irrigation project in the region. Energy consumption was reduced by 50% during irrigation months, and by 18 times during non-irrigation months. This resulted in 117 tonnes of CO_2 emissions avoided per year.

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Authors: Stephen Meredith, Clunie Keenleyside, Gauthier Schefer and Kaley Hart (IEEP)

ENRD Contact Point
Rue de la Loi / Wetstraat, 38 (bte 4)
1040 Bruxelles/Brussel
BELGIQUE/BELGIË
Tel. +32 2 801 38 00
info@enrd.eu