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European Network for Rural Development

EU RURAL REVIEW
No 30

CLIMATE ACTION IN RURAL AREAS

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European Network for
Rural Development

European Network for Rural Development

The European Network for Rural Development (ENRD) is the hub that connects rural development stakeholders throughout the European Union (EU). The ENRD contributes to the effective implementation of Member States' Rural Development Programmes (RDPs) by generating and sharing knowledge, as well as through facilitating information exchange and cooperation across rural Europe.

Each Member State has established a National Rural Network (NRN) that brings together the organisations and administrations involved in rural development. At EU level, the ENRD supports the networking of these NRNs, national administrations and European organisations.

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CLIMATE ACTION IN RURAL AREAS

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Introduction

Climate action, particularly climate change mitigation, can provide opportunities for the primary sector, rural communities and businesses to become more sustainable, resilient and competitive. These rural development stakeholders can make a major contribution to the European Green Deal, the roadmap for a sustainable EU economy.[1]

This edition of the EU Rural Review looks at how rural areas are making significant contributions towards climate action with support from the European Agricultural Fund for Rural Development (EAFRD), acting in synergy with other European programmes and instruments.

The effects of climate change are increasingly evident and actions to address its negative impacts are ever more necessary. As 80% of the EU's territory is covered by forests and agricultural land, climate action in rural areas is fundamental to achieving the objectives included in the 2030 climate and energy framework[2] and the European Green Deal's 2050 long-term strategy.[3]

Support for climate action will be aligned with the other principal policy areas of the European Green Deal: clean energy, sustainable industry, building and renovating, sustainable mobility, biodiversity, 'Farm to Fork' sustainable food systems and eliminating pollution.[4] Many of these themes are already part of the EAFRD objectives in the 2014-2020 programming period and of the European Commission's proposal for the CAP post-2020. However, a greater level of ambition is required with regards to the environment and climate objectives[5] and policy makers have put a strong emphasis on the need for a green and digital recovery from the COVID-19 pandemic. This is reflected in the new EU budget for 2021-2027, where 30% of the funding under both the long-term budget and Next Generation EU, will be spent on fighting climate change.[6] The Commission has also emphasised the importance of climate action in its recent recommendations to Members States, which focus on the integration of the European Green Deal in the future CAP Strategic Plans.[7]

All rural development stakeholders have a role to play in addressing climate change.

Rural businesses and communities are central to contributing to climate action in three main ways: by replacing carbon intensive and fossil resources, by reducing greenhouse gas (GHG) emissions and by sequestering carbon in soils and biomass. Options range from adopting clean energy and transport solutions or increasing energy efficiency, to

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

(2) https://ec.europa.eu/clima/policies/strategies/2030_en

(3) https://ec.europa.eu/clima/policies/strategies/2050_en

(4) https://ec.europa.eu/info/energy-climate-change-environment_en

(5) https://ec.europa.eu/info/news/cap-reforms-compatibility-green-deals-ambition-2020-may-20_en

(6) https://ec.europa.eu/info/strategy/eu-budget/long-term-eu-budget/2021-2027/whats-new_en

(7) European Commission (2020) *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Recommendations to the Member States as regards their strategic plan for the Common Agricultural Policy (COM/2020/846 final)*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0846

improving local, circular food systems, waste management and providing ecosystem services.

Options and opportunities for land management practices to sequester carbon and minimise GHG emissions vary between type of production, whether it be arable land or livestock for example and forestry businesses, as well as local conditions such as soil type and climate patterns.

Enterprises in bio-based value chains can adapt their use of resources and reduce their GHG emissions, including by shifting to energy efficient equipment and practices, sourcing inputs with a limited carbon footprint, as well as better managing 'end of life' products, waste and residues.

This edition of the EU Rural Review looks at climate change mitigation in rural areas and the role of rural development funding to support all the types of actions mentioned above.

The work of the ENRD is increasingly looking at synergies and linkages between climate action and other rural development policy priorities – and this Rural Review takes the same approach. The following six articles highlight the connections between different forms of climate action and the most relevant EAFRD agricultural and rural support measures. The diversity of the authors' backgrounds and the use of practical examples enriches both the text and the depth of current discussions on the crucial role RDPs play in promoting climate action.

The first article (page 4) **sets the scene** and highlights the importance of land-based sectors and rural development in addressing the effects of climate change.

The article on **climate-smart agriculture and forestry** (page 11) focuses on actions and measures to enhance resource efficiency as well as sustainable farming and forestry. In addition to their climate benefits, such actions are designed to benefit rural economies and can generate new opportunities for rural areas.

As rural communities are starting to respond to the challenges and seize the opportunities offered by climate action, LEADER and Smart Villages approaches can support bottom-up initiatives leading to **a citizen-led energy transition**. The article on page 20 illustrates how renewable energy communities can also generate jobs and growth in rural areas, thus improving social cohesion and quality of life.

The article on page 26 collects experts' views on **Creating trust in rural value chains**. Given the wide range of climate monitoring and certification systems on the market, rural communities need to be confident that their choices will help combat climate change and benefit their businesses. The article on **rewarding climate action** (page 32) looks at how the current CAP rewards climate action and notes suggestions for the future CAP Strategic Plans to improve on this.

Actual and possible synergies between climate action and environmental goals such as soil health, water quality and biodiversity are explored in the article on **climate and other environmental goals** (page 40), which pays particular attention to the opportunities offered by RDPs.

FURTHER INFORMATION

ENRD Thematic Group on the European Green Deal and rural areas: https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/european-green-deal-rural-areas_en

ENRD Thematic Group on Bioeconomy and climate action in rural areas: https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy_en

LEADER Thematic Lab on climate change mitigation and adaptation: https://enrd.ec.europa.eu/news-events/events/enrd-leader-thematic-lab-climate-change-mitigation-and-adaptation_en

Rural Inspiration Awards 2020 on Bioeconomy and climate action: https://enrd.ec.europa.eu/news-events/events/rural-inspiration-awards-2020_en

1. Why are land-based sectors central to climate action?

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This introductory article illustrates why the land-based sectors – agriculture, forestry, food and bio-based value chains – as well as rural development are central to climate action.

BY LORIE HAMELIN

Lorie Hamelin, senior researcher at the Federal University of Toulouse (France), is a laureate of the French presidential climate call "Make our planet great again", where she works on bioeconomy strategies towards greenhouse gas neutrality in France. With over ten years of experience in bioeconomy-related research, Lorie Hamelin has worked in different EU countries as university assistant professor, researcher and senior scientist. Among other roles, Lorie currently serves as an expert in the International Scientific Reference Group of the Swedish Biogas Research Centre, she co-leads a Sectorial Working Group (SWG) of the Ecosystem Services Partnership (ESP) network on circular bioeconomy and is a member of the European Energy Research Alliance. Her consulting company Hamelinlab is based in France.

INTRODUCTION

Various national, European and international initiatives have been calling with increasing urgency for serious efforts to mitigate the impact of human activities on the planet.

Recognising that "climate change represents an urgent and potentially irreversible threat" to humanity, the Paris Agreement[1] calls for limiting the global average temperature to well below 2°C above pre-industrial levels. It also calls for a "balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century".

According to the several simulations made in the Special Report "Global Warming of 1.5°C" (SR1.5) of the Intergovernmental Panel on Climate Change (IPCC),[2] to limit global warming to 1.5°C above pre-industrial levels, global CO_2 emissions in 2030 need to be about 45% less than 2010 levels and reach net zero around 2050. For limiting global warming to below 2°C, CO_2 emissions reductions of 25% are suggested (by 2030, from 2010 levels), with net zero emissions to be reached around 2070.

Cutting down on fossil fuel CO_2 emissions is crucial to deliver on the Paris Agreement. Yet, this is only one side of the balance. Because human activities are bound to emit GHGs, reaching neutrality also implies inducing carbon dioxide removals (CDR).[3] This refers to the long-term transfer of carbon out of the atmosphere and may be achieved through practices and technologies designated as negative emission technologies (NET). Such removals have repeatedly been shown necessary, at a much faster rate than the existing natural removal processes, to meet the targets set in the Paris Agreement.

The European Green Deal,[4] the EU's new growth strategy, calls for reaching GHG neutrality by 2050. This is to be enforced through legal instruments, such as Europe's first Climate Law, for which a first proposal was made public in March 2020,[5] was amended in September 2020, and is currently in the so-called trilogue negotiation phase.

The Green Deal includes a specific request for aligning the Common Agricultural Policy (CAP) reform proposal (or post-2020 CAP) to the goals set in the Green Deal. Today, the CAP, particularly Pillar II (focusing on rural development and climate-resilient farming methods). alongside other European Structural and Investment Funds (ESIFs) and Horizon 2020, contributes to financing climate action in a complementary way. To fulfil the CAP's environmental priorities, farmers must respect EU standards for public, plant, and animal health and welfare, following the so-called cross-compliance rules. Some of the good agricultural and environmental conditions included in the cross-compliance play a role in ensuring the climate resilience of agricultural soil and landscapes. Under Pillar II, Member States implement Rural Development Programmes (RDPs) funded through the European Agricultural Fund for Rural Development (EAFRD). At least 30% of funding for each RDP must be dedicated to environment and climate change measures, though in practice the share is often much higher. These include grants and annual payments to farmers who switch to more environmentally friendly practices.

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(1) UNFCCC (2016) *Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. FCCC/CP/2015/10/Add.1*, https://unfccc.int/resource/docs/2015/cop21/eng/10.pdf

(2) IPCC (2018) *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels*, https://www.ipcc.ch/sr15/

(3) *Ibidem*

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

(5) European Commission (2020) *Proposal for a regulation of the European Parliament and of the Council establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law). COM/2020/80 final*, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588581905912&uri=CELEX:52020PC0080

CLIMATE ACTION GOAL #1: CUTTING OUR DEPENDENCY ON FOSSIL FUELS

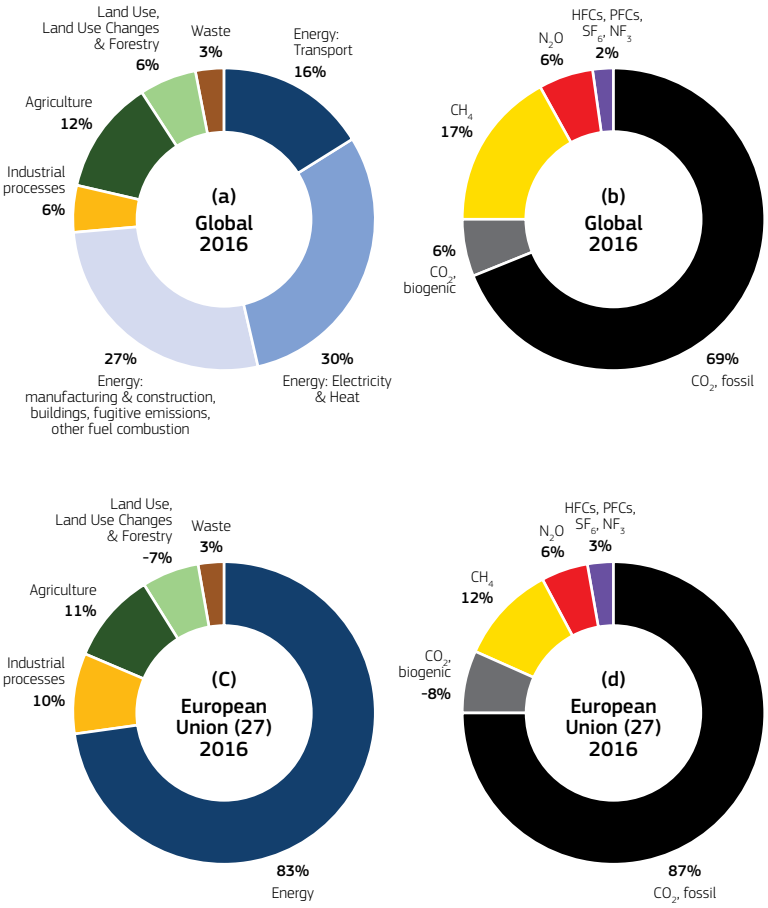
Fossil fuel carbon dioxide (CO_2) emissions are the main cause of human-induced climate change, accounting for circa 69% of GHG (Figure 1b).

Figure 1 presents, on the basis of the sectors of activity defined by the International Panel on Climate Change (IPCC), the distribution of GHG emissions per sector of activity, both globally (Figure 1a) and at the EU-level (Figure 1c), for year 2016. In both cases, it also presents the share of responsibility for each GHG in the total GHG emissions (Figure 1b: global; Figure 1d: Europe).

As shown in Figure 1a, overall, global greenhouse gas emissions are due to five key sectors of activity:[6] energy production and use (73%), industrial processes (6%), agriculture (12%), Land Use, Land Use Changes and Forestry (LULUCF; 6%) and waste management (3.2%). This is also true at the European Union level, though here the LULUCF sector acts as a carbon sink for emissions, so its contribution is shown as a negative figure (-7%; Figure 1c). In other words, this means that at world level, there are more annual releases of biomass-related CO_2 (this non-fossil CO_2 is referred to as biogenic CO_2) from for e.g. biomass burning or deforestation than absorption by forests and crops (Figure 1b), while at EU level the absorption exceeds the emissions (Figure 1d). Hence the negative figure for the European LULUCF biogenic CO_2.

The recent Special Report on Climate Change and Land (SRCCL)[7] by the IPCC has calculated, for the 40 land-based response options they assessed, a

Figure 1. GHG emissions 2016
(a) globally, for key sectors of activity, (b) globally, detailed per GHG source, (c) EU-27, for key sectors of activity, (d) EU-27, detailed per GHG source.



Data for charts (a) and (b) are from the World Resources Institute. World Greenhouse Gas Emissions: 2016-2020, https://www.wri.org/resources/data-visualizations/world-greenhouse-gas-emissions-2016.

Data for chart (c) are from the ClimateWatch database, https://www.climatewatchdata.org/.

Data for (d) stem from the European Environment Agency (2020). Annual European Union greenhouse gas inventory 1990–2018 and inventory report 2020, https://www.eea.europa.eu/themes/climate/eu-greenhouse-gas-inventory.

At the time of publication, these are the most updated available data breaking down GHG emissions per sector of activity.

(6) World Resources Institute (2020) World Greenhouse Gas Emissions: 2016, https://www.wri.org/resources/data-visualizations/world-greenhouse-gas-emissions-2016

(7) IPCC (2019) *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, https://www.ipcc.ch/srccl/. Here we describe in particular the work within Chapter 6 of the SRCCL.

mitigation potential of at best over 13 Gt CO_2e y-1 (increasing soil organic carbon). To put the magnitude of this potential in perspective, the total GHG emissions from the whole EU-27 in 2016 were 3.2 Gt and those of the United States were 5.8 Gt, being the second largest emitter after China (12 Gt).[8] This highlights how important some of these mitigation options may be for climate change.

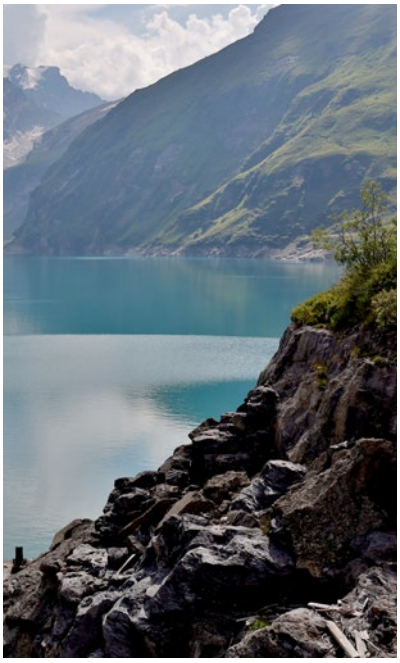
THE BIOECONOMY AND CLIMATE ACTION

In the targeted GHG-neutral future called for by the EU Green Deal, where can we then source the carbon needed to meet our demands for products and services? From the carbohydrates, lipids and proteins we consume in food, to the coke we use to produce steel, the hydrocarbons in our liquid fuels, the wood in our furniture or buildings, to the tens of thousands of end-use chemicals we use, carbon (C) is part of our daily life and is the backbone of all forms of life on Earth.

The challenge, thus, is to get access to a source of carbon allowing to meet society's demands for products and services, without inducing an additional net transfer of carbon into the atmosphere. Out of the six global carbon pools on Earth,[9] humans have essentially used the carbon from the geological pool (coal, oil, and gas; so-called fossil fuels), the terrestrial biotic pool (vegetation and living organisms) and to some extent other terrestrial pools (e.g. carbonates) and the oceanic pool (marine living organisms). Yet, to avoid a net carbon transfer into the atmosphere, the slow-cycling carbon sources (e.g. carbonates and fossil resources) must remain untouched. These are also referred to as 'non-renewable', because of their slow rate of renewal.

Concretely, this means that in a GHG-neutral future, biomass becomes the main and most accessible supplier of renewable carbon (or fast-cycling carbon). The only other large source of carbon whose use would meet the condition of not inducing a net additional transfer towards the atmospheric pool is the carbon from the atmosphere itself. Atmospheric carbon can now be captured through so-called Direct Air Capture (DAC) technologies[10] and used to produce a variety of hydrocarbons. In spite of recent progress, this sourcing of carbon is still much less accessible, in terms of costs and ease of deployment, than the carbon from biomass.

Using terrestrial biomass as a source of carbon to supply the future food/feed, fibre, energy, material and chemical demands is thus key to achieving a GHG-neutral future and is at the very heart of the bioeconomy. Albeit renewable, biomass-C (the carbon contained in living matter, and in particular forests, grass and crops) is not unlimited in supply, and dependent upon the limited 10.8 Gha of terrestrial ice-free land available on Earth to produce it.[11] A successful bioeconomy, and roadmap towards GHG neutrality, implies thoughtful planning to ensure that the use of the land does not cross the boundary of over-exploitation with negative consequences such as additional ecosystem degradation and greater food insecurity. The bioeconomy, to be successful, must remain within sustainability limits. To be carbon-effective, the bioeconomy must also be as circular as possible, with a minimum of unnecessary C losses. Finally, it must also focus on the demands for which no carbon-free alternatives are available (so-called decarbonisation). Such alternatives exist for supplying electricity (and connectedly heat and transport), through the use of non-C resources to produce, for example, wind, solar and hydropower.



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(8) CAIT Climate Data Explore, Country Greenhouse Gas Emissions 2017, https://www.climatewatchdata.org/ghg-emissions

(9) The stocks of carbon on Earth can be grouped into six categories (pools): Atmospheric, oceanic, geologic (coal, natural gas, oil), pedologic (soil), terrestrial biotic (vegetation & living organisms on terrestrial land) and a pool referred to as "other terrestrial", which includes rocks and the permafrost. See Chapter 6 of the latest IPCC Assessment Report, *Climate Change 2013 - the Physical Science Basis*, https://www.ipcc.ch/report/ar5/wg1/

(10) E. S. Sanz-Pérez, C. R. Murdock, S. A. Didas, C. W. Jones, 'Direct Capture of CO_2 from Ambient Air', in Chem. Rev. 2016; 116:11840–76, https://doi.org/10.1021/acs.chemrev.6b00173.

(11) Retrieved from the FAO stat database: http://www.fao.org/faostat/en/#data/LC

LAND AND CLIMATE: SHARED CHALLENGES

Depending on the choices to be made today, land and the services that depend on it may be both a hero and a victim of climate change. This is best illustrated in the IPCC's Special Report on Climate Change and Land[12] which defines five key challenges related to climate change and land ('land challenges'): climate change mitigation, adaptation to climate change, desertification, land degradation and food security. The report assesses the synergies and trade-offs between 40 response options that could be used to address these five land challenges.

Regarding the land challenge 'Climate change mitigation', the SRCCL identified 13 response options as "largely positive". These are listed in Table 1 (below), which also shows the contribution of these response options to facing the other four land challenges.

Table 1. Response options to the land challenge 'climate change mitigation' identified as largely positive in the SRCCL study

Type of measure	Response option	Effects on the 4 other land challenges			
		Adaptation	Desertification	Land degradation	Food security
Agroecology	Increased soil organic Carbon (SOC) content	★	★	★	★
	Increased food productivity*	★	★	★	★
Forestry	Reduced deforestation & degradation	★	★	★	☆
	Reforestation & forest restoration	★	★	★	★
	Afforestation	★	★	★	★
Carbon dioxide removal	Enhanced weathering of minerals	☆	☆	☆	☆
	Bioenergy & bioenergy with carbon capture and storage (BECCS)	☆	★	★	★
	Biochar addition to soil	☆	☆	☆	★
Demand management	Dietary change*	☆	★	★	★
	Reduced post-harvest losses*	★	★	★	★
	Reduced food waste* (consumer or retailer)	☆	★	★	★
Others	Fire Management*	★	★	★	★
	Restoration & reduced conversion of coastal wetlands	★	☆	☆	★

* indicates that the response option is not associated to a high cost, nor with reversibility & saturation concerns (according to SRCCL)

It should be noted that all response options listed in this table were selected as they obtained the equivalent of the darkest blue shade (large positive effect) for their impact on climate mitigation. The colour shades of the stars refer to the qualitative score obtained on each of the other four land challenges. Blue shades indicate a positive effect (★dark blue: largely positive; ★ bright blue: moderate positive; ☆ light blue: small positive) of the response option on the impact assessed, while brown shades indicate a negative effect (★ dark brown: large negative; ★ orange-brown: moderate negative; ☆ light orange: small negative). A white star ☆ indicates no effect while a yellow star ☆ indicates a variable effect.

(12) IPCC (2019) *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, https://www.ipcc.ch/srccl/. Here we describe in particular the work within Chapter 6 of the SRCCL.

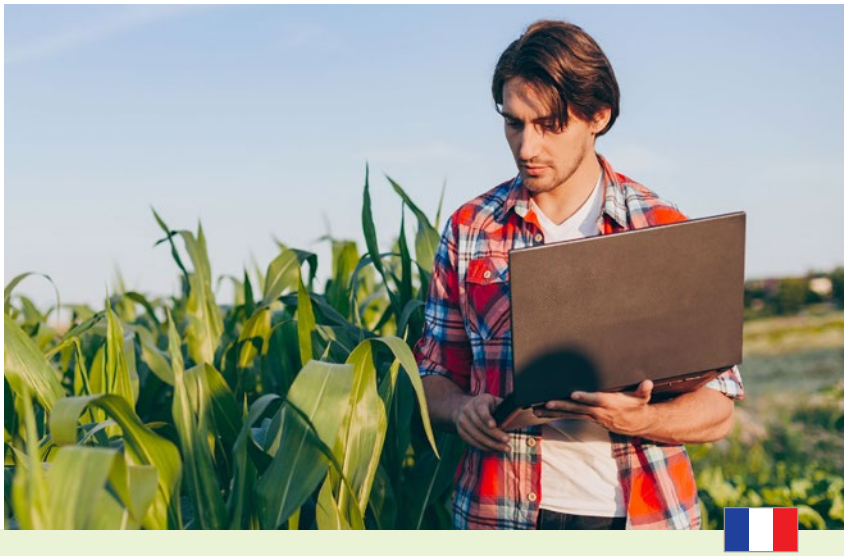
The SRCCL's work aims at enhancing soil organic carbon (SOC) content and increasing food productivity among the most promising land-based options for sustainable climate mitigation. Two other response options can also be highlighted as rather promising: reduced post-harvest losses and forest fire management.[13] It should however be noted that 'medium-level concerns' (based on the SRCCL qualitative scale) on the reversibility and saturation,[14] as well as the costs of increasing SOC contents, are flagged. On the other hand, increasing food productivity alone can also increase post-harvest losses, which highlights again the need for integrated approaches along the whole value-chain.

OPPORTUNITIES FOR FARMING AND RURAL DEVELOPMENT IN THE EUROPEAN GREEN DEAL

Carbon farming

Remaining profitable in a fluctuating global commodity market, with their production highly vulnerable to climate change, is certainly a challenge for European farmers, forest owners, and other stakeholders on the supply-side of the bioeconomy. At the same time, the Green Deal (and the Multiannual Financial Framework 2021-2027 (MFF) it is connected to) offers new opportunities. One is clearly linked to increasing soil organic carbon in arable soils, a measure also explicitly mentioned in the Green Deal's 'Farm to Fork' Strategy. This concept is sometimes called 'carbon farming'. An example of this, Cambioscop, is included below.

Another valuable example is the CIRCASA project,[15] where matchmaking online collaborative knowledge platforms have been built for farmers to let them know what is possible and how more carbon can be stored on their land, as well as a framework for monitoring, reporting and verifying (MRV) the SOC stock in agricultural landscapes. This project led to the development of an ongoing initiative, the IRC (International Research Consortium) involving global private and public stakeholders as well as funders to pursue and harmonise carbon farming efforts.



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CAMBIOSCOP (FRANCE)

One of the six objectives of this research project is to promote a net long-term sequestration of carbon from the atmosphere towards the soil through the cultivation, on marginal uncultivated lands, of targeted plant species designated as biopumps. The carbon benefit is twofold, as a biomass feedstock is simultaneously produced, which can be used as a renewable carbon source to supply the bioeconomy's C-dependent products. Yet, a major issue not covered in the project remains ensuring that an economically viable market will exist for this biomass. In the Horizon 2020 project NEGEM, the biophysical potential of this concept is investigated at the global level.

Further information:

https://cambioscop.cnrs.fr

See also the Horizon2020 project NEGEM - Quantifying and Deploying Responsible Negative Emissions in Climate Resilient Pathways: https://www.negemproject.eu

(13) Defined in SRCCL as measures related to the prevention, detection, control, restriction and suppression of fire in forest and other vegetation. It includes for instance prescribed burning as well as wildfire prevention.

(14) As soils reach a new equilibrium over time, there is a limit both in terms of quantity and of time for which additional carbon can be sequestered in soils.

(15) https://cordis.europa.eu/project/id/774378

Digitalisation

Farmers are constantly facing the need to make crucial decisions based on numerous variables. Deploying advanced information technology, with connected sensors allowing for direct monitoring to favour real-time data-evidenced decision-making and corrective actions represents another opportunity. This can apply to response options such as sustainable agricultural intensification (precision agriculture) or soil organic carbon enhancement through monitoring soil outcomes for immediate corrective actions. Digitalisation, whether through the access and use of remote sensing data (drone imagery or satellites), machine vision or advanced robotics technologies is in fact a key pillar of the EU Green Deal.

Possible new markets for forestry

Emerging revolutionary materials such as nanocellulose (reported to be five times stronger than steel while being five times lighter) or wood-based textiles are also possible new markets for forest managers. Forestry is a key pillar of the EU Green Deal, with the launching of a new EU Forest Strategy.

Funding for the bioeconomy and climate action

Finally, there are also clear opportunities for bioeconomy/climate action and rural development ahead. For instance, as regards research, the EU Green Deal announced that at least 35% of the budget of Horizon Europe[16] will fund new solutions for the climate, which are relevant for implementing the Green Deal. The 2021-2027 MFF, mentions that the share of the CAP expenditure that is expected to be dedicated to climate action shall be 40%, while circa 10% of the financial envelope of Horizon Europe will be dedicated to research and innovation in food, agriculture, rural development and the bioeconomy.

Demonstration projects

Demonstration projects are often highlighted in the scientific literature as key to overcome inertia and promote change. The EU Green Deal in fact calls for increasing the demonstration of new European clean technologies.

Examples of current demonstration projects in the EU connected to land-based climate mitigation include:

- The Interreg North Sea Carbon Farming Demonstration Project[17] (2018-2021), a transnational partnership of researchers, farm advisors, branch organisations and farmers from the Netherlands, Belgium, Germany and Norway promoting Carbon Farming in the North Sea region;
- The LIFE AGRESTIC project[18] (2019-2023) with three demonstration sites of N- and C-Efficient Cropping Systems with a higher potential of carbon storage and nitrogen efficiency and lower GHG emission rates compared to conventional cropping systems;
- The H2020 Ground Truth 2.0 project[19] (2016-2020), with the demonstration of citizen observatories in the EU and Africa. This includes, for example, a Spanish digital platform for phenological data (study of periodic plant and animal life cycle events and how these are influenced by seasonal and interannual variations in climate) collected by citizens in the perspective of increasing agricultural productivity, decreasing fire risks and reducing the use of irrigation water. A similar bottom-up platform was demonstrated in the Netherlands for better rainfall monitoring, with wider coverage than is supplied by the national monitoring network;
- The H2020 (BBI-JTI) GRACE project[20] (2017-2022) aims to demonstrate the upscaling of Miscanthus and hemp genotypes suitable for growing on marginal lands, including the valorisation of the biomass as feedstock or end-use chemical and as a material.
- The LIFE CarbonFarmingScheme project[21] (2020-2022) aiming to (1) increase the maintenance of organic carbon stocks in soils (potentially more important for climate change than inducing additional sequestration) and (2) identify and accelerate the development and adoption of novel incentives for carbon sequestration. The project includes a demonstration work package.

(16) EU's framework programme 2021-2027 for research and innovation, succeeding Horizon2020: https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

(17) https://northsearegion.eu/carbon-farming/what-is-carbon-farming/about-the-project/

(18) https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=6720#PD

(19) https://cordis.europa.eu/project/id/689744

(20) https://cordis.europa.eu/project/id/745012

(21) https://carbonaction.org/en/life-carbon-farming-scheme-2/

2. Climate-smart agriculture and forestry

Agriculture and forestry have a key role to play in climate action and have much to benefit from it. This article explores how actions and measures to enhance resource efficiency and sustainability of farming and forestry can make these sectors more competitive, resilient and nature-friendly, helping manage the risks generated by climate change and generate new opportunities for rural areas.

BY REGINA TRENKLER-FRASER

Regina is an economic development professional with over 30 years of experience in EU rural development, including climate change initiatives. Her experience includes working as an expert assessing Horizon2020 project proposals on smart technology in rural development, interfaces between rural society and science, and climate change and the energy sector.

WHAT IS CLIMATE-SMART AGRICULTURE/FORESTRY?

Climate-smart agriculture and climate-smart forestry are integrated approaches that guide the management of agricultural and forestry activities in the light of climate change. They are based on the understanding that food security, the natural environment and climate change are 'inextricably intertwined'[1] and thus our responses to climate change must be as well.

The concepts of climate-smart agriculture (CSA) and climate-smart forestry (CSF) were launched by the Food and Agricultural Organisation of the United Nations (FAO) in 2009. Initially, CSA and CSF were primarily targeted at the most vulnerable communities around the world.[2] Since then, the approach is used globally and geared to contributing towards the UN's 2030 Agenda and Sustainable Development Goals and the UNFCCC Paris Agreement (2016).

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The CSA/CSF approach has three interrelated aims:

1. Sustainably increase agricultural/forestry productivity and incomes;
2. Adapt and build resilience to climate change; and
3. Reduce and/or remove GHG emissions where possible.

Over the last decade, CSA/CSF projects around the world have proven to be successful in creating effective synergies in securing food production, generating local jobs and transforming local agriculture and forestry into sustainable and climate change resilient sectors.[3] The concept is strongly promoted by the UN and numerous associations and international platforms and networks have been formed to support and further its application.[4]

Picture 1. Main Features of Climate Smart Agriculture

Source: FAO UN (2014) Success Stories on Climate-Smart Agriculture, http://www.fao.org/3/a-i3817e.pdf

(1) FAO UN (2014) *Success Stories on Climate-Smart Agriculture*, http://www.fao.org/3/a-i3817e.pdf

(2) See http://www.fao.org/climate-smart-agriculture/knowledge/practices/forestry/en/

(3) FAO UN (2014 and 2018) *Success Stories on Climate-Smart Agriculture* (10 case studies in each report), http://www.fao.org/climate-smart-agriculture/en/ and L. Lipper, N. McCarthy, D. Zilberman, S. Asfaw, G. Branca, (eds.) (2018) *Climate-Smart Agriculture – Building Resilience to Climate Change*, https://www.springer.com/gp/book/9783319611938

(4) For example, the Global Alliance for Climate-Smart Agriculture, http://www.fao.org/gacsa/en/

For CSA/CSF to work effectively, their **integration** into mainstream policy is key, so that a coherent and effective support system is provided. The integrated approach involves policy-makers, researchers and other institutional partners to ensure that the relevant knowledge, technical resources, policy and investment frameworks are available and harmonised at national and local level. The creation of an effective dialogue with local communities is thereby crucial, as are access to knowledge, resources, training and capacity building.[5]

From a conceptual perspective, the CSA/CSF approach is built on a **holistic** model based on the understanding that eco-systems are assessed in view of their full complexities and 'responsiveness to specific local conditions.'[6] This includes the assessment of agro-ecological as well as socio-economic conditions vis-à-vis their vulnerabilities to climate change.

From a local perspective, CSA/CSF implements a participative and **inclusive** approach seeking to reach all relevant stakeholders. Gender equality is thereby also specifically emphasised. Education, training, addressing barriers to uptake and developing lasting solutions at the local community level are key features of the approach. A wide range of development tools are made available, including modelling systems, assessment models and appraisal kits, learning modules, and monitoring assistance.[7]

WHAT DOES CSA/CSF LOOK LIKE IN PRACTICE IN THE EU?

CSA/CSF actions aim for a 'triple win' by addressing simultaneously:

- The mitigation of GHG emissions;
- Adaptation to the impacts of climate change by increasing the resilience of crops, livestock and forests; and
- Achieving productivity and income gains.

A vast knowledge reserve exists at European level relating to good practices in the application of smart technology and innovations to fight climate change in agriculture and forestry. Although European-based research rarely uses the exact terms of 'CSA/CSF', the intent and aspirations are largely the same.

By reviewing some of the existing research in the context of CSA/CSF, a number of key messages on mitigation and adaptation know-how and approaches stand out.

For example, these include the clear focus on how we can increase the carbon capture in plants and soils; the hugely important role of biodiversity[8] in enhancing soil and plant health to improve resilience in the face of extreme weather conditions, and the significant impact of precision farming technology on GHG emission reductions and safeguarding natural resources while increasing yield.

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(5) FAO UN (2018) *Climate-Smart Agriculture Training Manual – A reference manual for agricultural extension agents*, http://www.fao.org/3/ca2189en/CA2189EN.pdf

(6) Global Alliance for Climate-Smart Agriculture, http://www.fao.org/gacsa/en/

(7) Detailed insight into the various tools and approaches are presented on the FAO website, http://www.fao.org/climate-smart-agriculture/knowledge/methods/en/

(8) "Observations of agricultural performance after extreme climatic events (hurricanes and droughts) in the last two decades have revealed that resilience to climate disasters is closely linked to levels of on farm biodiversity" - source: Alliance Environment, DG AGRI (2019) *Evaluation study of the impact of the CAP on climate change and greenhouse gas emissions, Final Report - Annexes*, https://op.europa.eu/en/publication-detail/-/publication/4632b2e2-9ece-11e9-9d01-01aa75ed71a1/language-en/format-PDF/source-search

Interestingly, a number of research findings indicate that traditional plant and livestock species and traditional farming and forestry techniques tend to cope better, and are therefore more resilient to extreme weather events. At the same time, research also covers the development of new climate change resilient crop species, such as climate-proof and low-emission potato varieties,[9] smart grass[10] and fodder and grass varieties that can help reduce GHG emissions from enteric fermentation by ruminants. Tradition and innovation are thereby going hand-in-hand.

Largely supported by the current and the proposed CAP post-2020 measures, and of course the European Green Deal,[11] a number of key mitigation and adaptation actions are promoted across Europe (see Table 1 below). If used 'smartly', i.e. in combination with each other and in line with current knowledge and available technology, they should – to some extent – resemble the UN-style CSA/CSF integrated approach.

Table 1. Some of the key mitigation and adaptation messages from research

Agriculture	Forestry
Reduce GHG emissions (including by innovative feed additives to reduce enteric fermentation; herd management and animal health)	Increase efforts in afforestation
Change land-use from arable to permanent grassland	Avoid forest degradation
Improve manure management (including use of precision farming and the production of biogas through anaerobic digestion)	Conserve forest land
Apply precision farming to reduce use of fertilisers and water usage	Increase mix of tree species to reduce risk of pests and disease
Use of crop rotation, crop diversification, inter-cropping	
Keep soil covered to preserve carbon in the soil	
Reduce soil disturbance, including through the use of low tillage (to keep carbon locked in the soil)	
Reduce/stop drainage of wetlands	
Use agroforestry to increase biodiversity and improve soil and plant/tree health	
Select traditional crop and tree species that are more resilient	
Decrease crop/wood residue burning	
Increase circular economy activities	
Reduce food/product miles	
Increase energy efficiency	
Increase use of renewable energy sources (machinery/transport/heating)	

(9) EIP-AGRI project 'Development of sustainable and climate-proof robust potato varieties through better rooting', https://ec.europa.eu/eip/agriculture/en/find-connect/projects/ontwikkeling-van-duurzame-en-klimaatbestendige

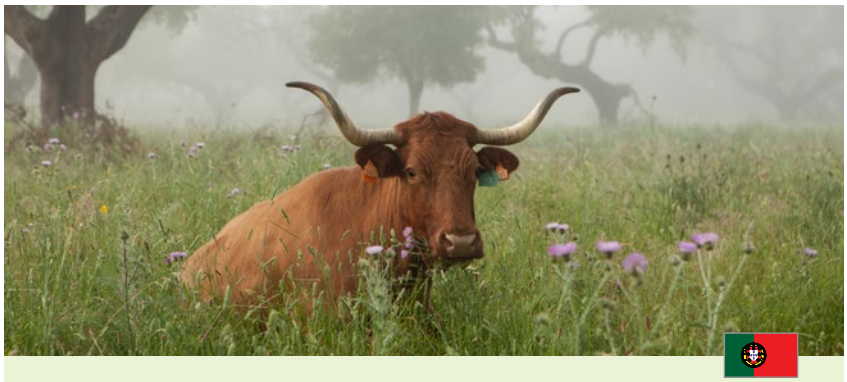
(10) EIP-AGRI Projects 'Smart Grass Production', https://ec.europa.eu/eip/agriculture/en/find-connect/projects/smart-grass-production

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

CLIMATE-SMART AGRICULTURE

According to the European Environmental Agency, the agricultural sector is a significant producer of GHG, particularly because of the emissions from ruminants and manure decomposition.[12] In addition, arable soil has been depleted to such an extent over the years that its current ability to capture carbon is much below its actual potential.[13] However, research also indicates that the farming sector has a great potential to effectively contribute to reducing GHG emissions and relevant knowledge and good practices exist to demonstrate progress.

Some of the solutions seem straightforward: for instance, some grass varieties produce less methane when digested; and when 'animals deposit manure directly on grassland, the emissions are lower than when deposited in a barn.'[14] However, research findings warn that there are considerable differences between type of cattle (beef/dairy), geography, production systems, size of farm, and type of forage. Therefore, successful mitigation measures must be 'smart' and be adjusted according to the distinct local circumstances. This limits to some extent the transfer of good practices and suggests that adaptation and mitigation actions should always be based on a comprehensive localised assessment. Nevertheless, the sharing of good practice always has the potential to generate ideas and inspire with a view of changing behaviours and mindsets.



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CASE STUDY: PORTUGUESE CARBON FUND

Many decades of inadequate agricultural practices in Portugal have led to extensive soil degradation and low-productivity pastures with low soil organic matter content. Soil erosion, land abandonment and depletion of traditional high natural value agro-forestry systems have also increased the risk of wildfires.

The Portuguese Carbon Fund (PCF), approved in 2006 and supported via national funding, aims, among other objectives, to address this situation. The PCF supports farmers willing to sow biodiverse pastures rich in legumes and grasses, which are more productive and resilient than natural pastures and increase soil organic matter. These pastures improve soil fertility, water retention and resistance to erosion, while requiring less concentrated feed and fertilisers (reducing the emissions associated to their production). The mixed pastures sequester approximately 5t CO_2 per ha per year.

The PCF also provides farmer advisory systems to ensure best management practices, thus maximising yields and carbon sequestration. The fund has already helped over 1 000 farmers and has contributed to increase the uptake of this pasture system by 48 491 ha, now covering 4% of the country's agricultural area.[15]

The PCF constitutes an effective, integrated approach to sustainability in pastoral systems.

https://www.fundoambiental.pt/home.aspx

https://climate-laws.org/cclow/geographies/portugal/policies/decree-law-71-2006-on-the-portuguese-carbon-fund

The cases of the Portuguese Carbon Fund (on this page) and the HelpSoil project (page 16) illustrate CSA activities that are simultaneously achieving mitigation, adaptation and productivity.

(12) "According to the European Environment Agency (EEA, 2016a) agriculture is responsible for 94% of ammonia emissions in EU-28. Agriculture also accounts for approximately 10% of Europe's total GHG emissions when excluding emissions coming from Land Use, Land Use Change and Forestry (LULUCF). Out of these 10% of the total emissions of CO_2-equivalents (CO_2-eq), enteric fermentation accounts for 42% and manure management for 15% (...). The main livestock-related GHGs are methane (CH_4) from enteric fermentation and manure, and nitrous oxide (N_2O) from manure." Source: EIP-AGRI (2017) Focus Group on Reducing emissions from cattle farming – Final Report, https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-reducing-emissions-cattle

(13) EIP-AGRI (2019) *Moving from source to sink in arable farming – Final Report*, https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_carbon_storage_in_arable_farming_final_report_2019_en.pdf

(14) EIP-AGRI (2017) *Focus Group on Reducing emissions from cattle farming – Final Report*, https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-reducing-emissions-cattle

(15) EIP-AGRI (2018) *Focus Group on Grazing for carbon – Final Report*, https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-grazing-carbon-final-report

© HelpSoil

CASE STUDY – HELPSOIL - LIFE PROJECT

The HelpSoil project developed and promoted conservation agriculture in Italy through a network of 20 demonstration farms that were monitored from 2014 to 2017. The project provided the opportunity for some farms to test conservation (or minimum) tillage that is less deep and thereby able to maintain up to 30% more plant residues in the soil.(16)

Following the project, several farmers eventually decided to adopt this technique more extensively. For example, the Ruozzi farm, in the Emilia-Romagna region, started its first experience of conservation tillage with 'HelpSoil' and decided to convert almost all of its land (25 hectares) to no-till at the end of the project. Today, the farm successfully implements a typical rotation of the Parmigiano-Reggiano cheese agricultural system, with alfalfa for four years followed by wheat-maize-barley and again alfalfa, using only sod seeding (i.e. no-till or direct seeding into a perennial grass or legume stand)(17) and a few herbicide treatments. Fertilisation is based on cattle slurry distributed with innovative precision fertilisation equipment, to reduce both soil disturbance and ammonia emissions in the air.(18)

http://www.lifehelpsoil.eu

AGROFORESTRY WITH CROPS: COMBINING MITIGATION, ADAPTATION, AND PRODUCTIVITY GAINS AROUND THE EU

The introduction of trees in fields provides shade and shelter from adverse weather conditions for crops and livestock. In addition, it increases biodiversity, improves soil quality and plant health and reduces run-off, particularly by keeping soils covered in the winter.

According to research funded by EIP-AGRI, the use of woody vegetation (tree lines or hedgerows) is key to better productivity in agriculture in various EU countries. In Bulgaria or Czechia, for example, this system has increased wheat production by more than 20% compared to tree-less systems. In France, the cultivation of wheat under walnut trees has been found to be important in periods when temperatures rise above 25°C. Such high temperatures usually reduce wheat productivity.

Agroforestry improves soil macro and micro pores, enhancing water infiltration and avoiding runoff and erosion.

Further information: EIP-AGRI (2017) *Focus Group on Agroforestry Minipaper*, https://www.researchgate.net/publication/321874427_EIP-AGRI_Focus_Group_Agroforestry_MINIPAPER_1_Organising_added_value_of_agroforestry

(16) EIP-AGRI (2019) *Focus Group on Moving from source to sink in arable farmin – Final report,* https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_carbon_storage_in_arable_farming_final_report_2019_en.pdf

(17) https://reducedtillage.ca/article121.html

(18) EIP-AGRI (2019), *Focus Group on Moving from source to sink in arable farming - Final report, cit.*

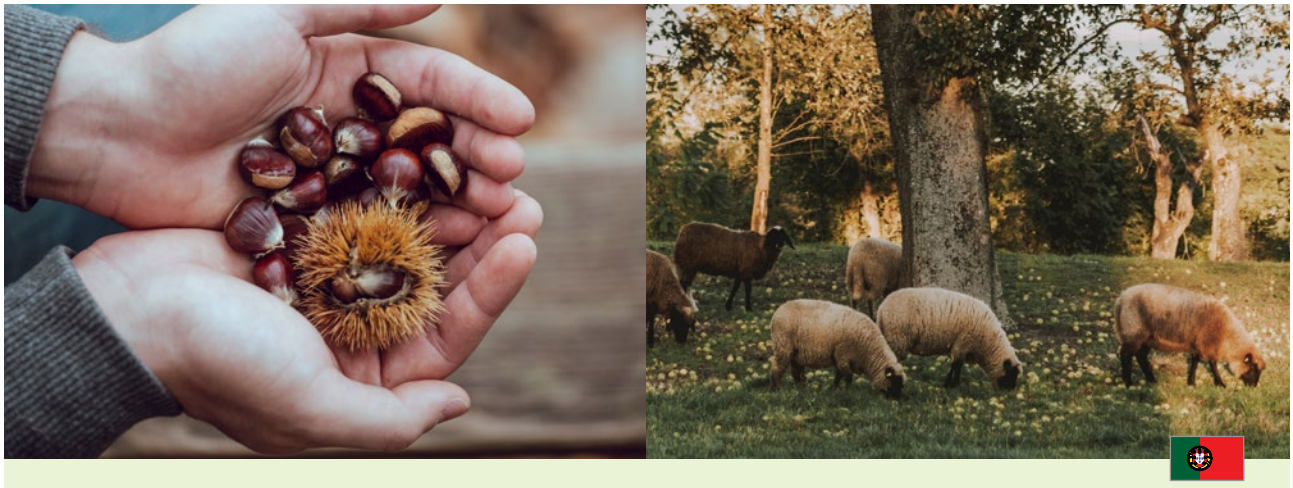
CLIMATE-SMART FORESTRY

Forestry plays a significant role in climate change mitigation through the ability of trees to capture carbon, thereby removing GHG emissions for a given time from the atmosphere. Popular mitigation actions include afforestation, sustainable forest management, the conservation of forests and the regeneration of degraded forests. Additional contributions to carbon sequestration can be achieved by substitution. Here, the increased use of wood in construction and other product lines, and the use of wood as fuel, can provide additional income sources while reducing GHG emissions from other sources.

Research has found that the most resilient forests (in case of heat waves, forest fires, increased wind and storms, increased levels of pests and diseases) are those that have a higher mix and higher share of traditional tree species. Agroforestry approaches (such as silvopasture, silvoarable, hedgerows and riparian buffer strips, forest farming) are instrumental in increasing the biodiversity and, therefore, the resilience of forests. For example, the reduced density of forests in silvopasture enhances biodiversity and promotes undergrowth that can be suitable for grazing. This in turn provides a natural fertiliser that improves the soil and the health of trees and, therefore, their resilience against pests and diseases.

What makes these actions 'smart', is their ability to adapt to climate change, mitigate its effects and reduce costs at the same time. The harvesting of non-wood products (for example honey or fungi) can create further value chains and income sources.[19] In the CSF model, 'well-planned agroforestry design is based on the knowledge of how ecosystems work'[20] and active forest management is considered key for building climate change resilient forests.

As in agriculture, in forestry the use of smart, digital tools to map resources, monitor developments along the value chain and inform management practices contributes effectively to implementing climate-smart approaches and finding new solutions.



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CASE STUDY – SILVOPASTURE

In northern Portugal, a 400 ha farm with 150 livestock units combines chestnut trees for fruit production with sheep grazing. This avoids the use of fertilisers while improving animal welfare and reducing fodder needs, as non profitable chestnut fruit is used as a feed. The farm uses pruned branches as a renewable source of energy for heating and for compost, producing materials that increase soil carbon and reduce the need for fertilisers.

Further information: EIP-AGRI (2017) *Focus Group on Agroforestry - Minipaper: Agroforestry as a mitigation and adaptation tool*, https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/fg22_mp9_cc_adaptation_mitigation_2017_en.pdf

(19) EIP-AGRI (2019) *Innovation for European forestry*, https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_brochure_innovation_for_european_forestry_2019_en.pdf#page=5

(20) EIP-AGRI (2017) *Focus Group on Agroforestry – Final report*, https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_agroforestry_final_report_2017_en.pdf

HOW IS THE CSA / CSF APPROACH FACILITATED IN THE EU?

In EU-funded research and related documentation, CSA/CSF approaches are often referred to as 'smart technology and climate change', 'climate action in agriculture' or 'smart and resilient agriculture'. While not called exactly the same, many of the key features of the CSA/CSF approach are also present in current EU programmes and several EIP-AGRI projects aim to contribute towards climate-smart actions in the full sense of the CSA/CSF concept.

For example, the **intensive investment in research** across Europe (H2020 and EIP-AGRI activities) encompasses a **multi-actor, multi-sector collaborative approach** ensuring that all relevant stakeholders are involved in informing the practical applicability of the research and project knowledge. In addition, considerable efforts are made to ensure that the findings are communicated widely and disseminated effectively to reach practitioners.

In terms of providing a **facilitating policy and financial framework**, the EU has progressed in mainstreaming climate change adaptation and mitigation actions.[21] There is scope to support CSA/CSF type-approaches under current rural development policy and this is reinforced in the Commission's CAP reform proposals. Most of the nine key objectives of the post-2020 CAP relate well to the various components of a CSA/CSF approach. The new CAP Strategic Plans are expected to ensure that the European Green Deal[22] and a joined-up approach between Pillar I and II of the current CAP are effectively implemented at national level.[23] In terms of resources, 40% of CAP funding is expected to contribute to climate objectives. In addition, interventions to address climate and wider environmental action such as the Eco-schemes are foreseen to be 100% funded by the European Agriculture Guarantee Fund (EAGF) while the Agri-Environment-Climate Measures have favourable EAFRD co-financing levels, providing particular incentives for their uptake.[24]

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Many years of rural development policy in Europe have demonstrated the effectiveness of **integrated and community-focused approaches** in overcoming barriers, sharing ownership in decisions and bringing about change. A substantial knowledge pool exists with relevant capacities developed based on the mainstreamed LEADER method.

In view of the complexity of addressing the impact of climate change, and in line with CSA/CSF approaches, current research frequently emphasises the **need to localise adaptation and mitigation actions** to the specific agro-ecological and socio-economic circumstances at local level.[25] Existing Farm Advisory Services work at that level and represent a key bridging mechanism between research, policy and practice. In the post-2020 CAP, more emphasis has been given to the obligation of Farm Advisory Services to support the dissemination of research findings and to facilitate an increased uptake of smart technology.

(21) The European Climate Law aims to ensures that all EU policies contribute to the climate neutrality objective and that all sectors will play their part: https://ec.europa.eu/clima/policies/eu-climate-action/law_en

(22) The European Green Deal demands significant change in energy use, farming, housing, transport, trade etc.: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en - See also European Commission (2020) *Analysis of the links between the CAP and the Green Deal*, https://ec.europa.eu/info/news/cap-reforms-compatibility-green-deals-ambition-2020-may-20_en
The Farm-to-Fork Strategy focuses on farm performance and rewards for climate action. The plan is also to develop a new strategy to protect nature, including afforestation and restoration of forests, improve air and water quality: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en

(23) IFOAM (2020) *Using Eco-schemes in the new CAP: a guide for Managing Authorities*, https://www.organicseurope.bio/content/uploads/2020/06/ifoam-eco-schemes-web_compressed-1.pdf?dd

(24) However, the overall expectation that 40% CAP funding should contribute to climate change action is controversial: does this represent a sufficient commitment to reflect the urgency of action required by the EU Green Deal, particularly in light of the long duration behaviour and system change it will demand.

(25) For example, "Technology and mechanisation should follow ecological needs and not vice versa." Source: EIP-AGRI (2019) *Workshop Cropping for the future – Final report*, https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-workshop-cropping-future-final-report

However, beyond a list of potential local actions,[26] it remains to be seen how the above-mentioned mechanisms and knowledge resources will be joined-up across the EU and within each Member State in the CAP post-2020. It will also be interesting to see how the new EU and national CAP Networks will embrace and help implement a CSA and CSF approach. According to current research, a given innovative good practice example is still too often presented as an isolated case within its wider local community. This indicates that we still do not have the 'smartest' approach in addressing climate change and we lack the necessary coherence and effectiveness to reach rural communities as a whole. At the moment, the vision for implementing a fully integrated approach in climate-smart adaptation, mitigation and sustainable rural development, particularly at local level, remains unclear.

ARE WE SMART ENOUGH TO BRING ABOUT CSA AND CSF?

Achieving climate neutrality is a massive challenge that will require the full commitment of the agricultural and forestry sectors. It is also an urgent task, so that relevant decisions and actions can be taken to achieve policy targets. We need to be smart indeed.

So as to speed up our climate smart actions, and to use instruments such as the new Eco-schemes and Agri-Environment-Climate Measures (AECMs) to their full potential by following the CSA/CSF approach, we need to ensure that:

- Research is focused on the necessity to act now (research findings need to tell us more clearly what could and should be done) and findings are actually used within a CSA/CSF context (i.e. integrated and participative approach);
- Dissemination and communication of research findings and good practices are targeted in a bespoke manner and accompanied with relevant decision-making tools. Applying new CSF/CSA approaches and combining a number of new techniques effectively can be complex. Strong support and advisory services are required to allow for the successful implementation of CSA/CSF approaches.
- Relevant mechanisms are strengthened to raise awareness, educate and make change happen at the national, regional and local levels. For example, there are ongoing processes at the EU level supporting climate change mitigation (including the EU Methane Strategy), but a clearer structure and mechanism of their implementation at the local level would be desirable to provide more confidence vis-a-vis the urgency of the climate change challenge.

While the enhanced subsidiarity of the post-2020 CAP might represent a step in the right direction, a number of questions remain in the context of enabling an effective CSA/CSF implementation process:

- Do Member States have sufficient capacity and know-how to apply climate-smart approaches (fully integrated and participative)? For example, will the national Farm Advisory Services be sufficiently resourced and trained in the CSA/CSF approach so that they can access and use the existing knowledge effectively and assist their farming and forestry communities accordingly?
- What mechanisms and support structures exist to build capacity in CSA and CSF development? While a lot of relevant climate smart knowledge and good practice already exists, it is not clear how this knowledge will be successfully converted into practical action on the ground and who might take the lead in CSA/CSF capacity building.
- Who or what will ensure that the national CAP Strategic Plans are sufficiently regionalised and localised to act as active change agents for CSA/CSF in rural communities? There is a strong message from research that climate smart action needs to be localised and bespoke as soils, climates, farming practices, climate change impacts etc. vary greatly within individual Member States.
- Although the Farm Advisory Services will be further integrated within the wider Agricultural Knowledge Information System (AKIS), it remains unclear who or what will ensure that the Farm Advisory Services will be sufficiently resourced and capable of bringing about the urgently required CSA/CSF action?

(26) European Commission (2018) *Proposal for a Regulation of the European Parliament and of the Council 2018/0216 (45), p. 27*, https://eur-lex.europa.eu/resource.html?uri=cellar:aa85fa9a-65a0-11e8-ab9c-01aa75ed71a1.0003.02/DOC_1&format=PDF

3. Reviving rural economies and their communities through a citizen-led energy transition

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This article looks at how rural communities around Europe are starting to respond to challenges posed by climate change and seize the opportunities offered by climate action. Rural development policy instruments like LEADER and Smart Village approaches can support citizen-led energy transition initiatives. The text also considers how such initiatives can generate jobs and growth in rural areas, improving social cohesion and quality of life.

BY MYRIAM CASTANIÉ AND DIRK VANSINTJAN

Myriam Castanié is the Strategy Manager at REScoop.eu. After working extensively with island communities through the Clean Energy for EU Islands Secretariat in past years, she is currently focusing on developing the strategy and services of REScoop.eu to help strengthen the community energy movement and build collaborations between cooperatives, municipalities and other stakeholder groups.

Dirk Vansintjan has been involved in the renewable energy sector in Belgium since 1985. He is one of the founders of Ecopower, a renewable energy cooperative with more than 60 000 members. He is the president of the European federation of citizen energy cooperatives, REScoop.eu.

A CITIZEN-LED ENERGY TRANSITION

In the coming decades, our energy system needs to de-carbonise. The European Green Deal,[1] launched at the end of 2019, implies a shift from fossil fuels (and for some Member States like Germany and Belgium also nuclear power) to renewable energy, from centralised to decentralised production, and from a society that wastes energy to one that uses energy in an efficient way. This transition will require a considerable investment which, as it turns out, will mainly be paid for by citizens in a number of EU Member States: as consumers, tax payers or money savers. Some Member States, including Austria[2] and Denmark, are already working hard on transitioning to a carbon-free society.

The problem is that renewable energy installations are often not well received by communities today. This is particularly the case for wind turbines in rural areas, and for understandable reasons. Too often, renewable energy projects in rural areas are developed by large, often foreign, energy companies, investment or pension funds that harvest the profits and leave only a small part of the revenues locally. In these cases, local inhabitants often oppose these installations since profits and inconveniences are not evenly shared.

The issue of local revenues is particularly pressing in rural communities, as young people migrate to cities for job opportunities, leaving behind an ageing population. This creates a vicious cycle: as the local workforce decreases, the local economy suffers, which in turn acts as a further disincentive for people to stay in or move to rural areas.

But there may be a simple solution to help revive rural economies, and it lies precisely in the energy transition – one where the rural communities themselves take ownership of the transition.

Studies by the Institute for Distributed Energy Technologies in Germany[3] and the civil society network Énergie Partagée in France[4] have shown that the return to the local economy is three to seven times higher when renewable energy projects are community-owned. Energy communities often decide to invest the profits from their energy installations into other community projects (such as the refurbishment of community facilities and infrastructure), and additional projects can create new local jobs (see the example of Ecopower, page 23). As members of the community can witness these improvements first-hand, their approval of renewable energies increases. And the fact that the return on investment stays locally makes local citizens, farmers, SMEs and policy-makers favour renewable energy. Consequently, community ownership clearly fosters acceptability of the energy transition to a carbon-free economy and society. This is illustrated in the examples from France, the UK and Germany on page 22.

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

(2) http://www.caneurope.org/publications/press-releases/1907-the-last-coal-plant-in-austria-shuts-down-leaving-only-seven-eu-member-states-without-plans-to-do-the-same-by-2030-deadline

(3) Institut dezentrale Energietechnologien (2016) *Local added value from a community wind farm*, http://www.erneuerbareenergien.de/local-added-value-from-a-community-wind-farm/150/437/96249/

(4) https://energie-partagee.org/wp-content/uploads/2019/12/Note-technique-Etude-Retombees-eco-Energie-Partagee.pdf

CASE STUDY: ÉNERGIES CITOYENNES EN PAYS DE VILAINE (FRANCE)

The association Énergies Citoyennes en Pays de Vilaine (north-west France) is a citizen-led initiative that involves the locals in the design and development of projects aiming at renewable energy production and the reduction of energy consumption.

The association has been growing in the last 16 years, with the energy and societal transition as its goal. The project started in 2003, with the first employee hired in 2005. Between 2003 and 2012, the association received subsidies from private foundations and regional authorities. Since then the association's activities are funded by local and regional subsidies, and they are a very active partner in the Interreg ECCO project (creating Energy Community Cooperatives - ECCOs).

As a result of the association's work, three citizen wind farms are operating today in the countryside around Redon, financed and managed by local citizens and involving public authorities (EUR 42 million of investment in 13 large citizen-led wind-turbines with 26 MW of operational power). These projects are respectful of the environment and its inhabitants, with a transparent and socially responsible governance, they are not speculative and the benefits stay in the community.

Since the beginning, the association has been built around the principle of linking energy savings to renewable energy production. It also aims to transmit its experience to help create other projects in other areas. The association shows that community energy is possible and it tries to shake up local, regional, national and European policies.

https://www.enr-citoyennes.fr

Interreg project 'ECCO - Creating new local Energy Community Co-Operatives': www.nweurope.eu/ecco

© PaysdeVilaine

CASE STUDY: CARE – CWM ARIAN RENEWABLE ENERGY (UK)

In south-west Wales, the LEADER LAG Arwain Sir Benfro helped establish a community renewable energy network of experts, community groups and businesses. This led to the development of the Cwm Arian Renewable Energy (CARE) scheme, which secured LEADER funding in 2015 to support and develop 13 community renewable energy projects, including a 500 kW wind energy project that will generate an income of GBP 200 000 /year (around 220 000 €/year) for an estimated 20-25 years. These projects demonstrate that local communities can make a strong contribution to delivering and influencing national and wider global policy priorities. In the process of developing these projects, CARE also supported wider awareness raising and capacity building for improving the knowledge of communities on emissions reduction.

https://www.planed.org.uk/projects/leader/

https://enrd.ec.europa.eu/sites/enrd/files/s9_leader_handout_lag-arwain-sir-benfro.pdf

CASE STUDY: ODENWALD ENERGY COOPERATIVE (GERMANY)

In Odenwald (Germany) the local municipality supported the foundation of a local energy cooperative that has raised over EUR 10 million from local citizens to finance projects within the community. An overall budget of EUR 36 million (combining citizens' contributions and bank loans) has so far been invested in renewable energy production installations, so that the members could get access to locally produced energy from renewable sources. Part of the revenues were used to renovate a former brewery and transform it into the 'House of Energy', a space where public institutions sit side-by-side with energy consultants, architects, craftsmen and mortgage lenders willing to answer customers questions relating to energy. The House of Energy also has a canteen, a kindergarten, parking lots and public event and exhibition spaces. The local cooperative Volksbank sponsored part of the refurbishment to celebrate their 150th anniversary.

https://eg-odenwald.de/index.php?option=com_content&view=article&id=14&Itemid=127

ENERGY TRANSITION: BUILDING RESILIENT SOCIETIES

The COVID-19 crisis has shown that moving forward, we will need to think not only about climate change and the energy transition, but also about a broader transition of our society, our environment, our way of living and we will have to find a new balance between a globalised economy and the local economy.

As we discover the scale of the impacts of the pandemic on our families, our livelihoods and our economies, our recovery efforts must go into addressing the root causes of such crises, in addition to the immediate recovery measures. Unless we start integrating the environment into our economic decisions, all we are doing is putting a band-aid on the wound without treating the cause – and hence inevitably setting ourselves up for more crises of this sort.

One very concrete way to move towards such a society will be to strengthen the growth of energy communities in Europe. By investing in and operating clean energy technologies and measures, renewable energy communities across Europe strengthen the social and economic welfare of their community whilst taking measures to reduce CO_2 emissions and preserving the environment. Ecopower (see below) is an example of this.

© Ecopower

CASE STUDY: ECOPOWER (BELGIUM)

In 1991, a group of friends sat around a kitchen table in an old watermill and decided that they wanted to produce their own renewable energy. They started by making the water turbine of the mill functional again, combining public funding for monument renovation (as the watermill is a national monument) and private funding, and setting up a renewable energy cooperative. The returns from the energy produced in the watermill was later used to invest in additional renewable energy projects, supplying more and more households in Flanders with their own renewable energy. Throughout its history, Ecopower participated in several Intelligent Energy Europe and Horizon2020 projects, and used ERDF support to establish a cogeneration plant running on rapeseed oil in the city of Eeklo.

Today, Ecopower employs 44 persons, and supplies almost 50 000 households with green electricity. The 60 000 members of Ecopower jointly decide how to invest the cooperative's revenue, thus practicing a truly democratic decision-making process. Other cooperatives might decide to invest their returns differently – sometimes to build additional renewable energy installations, like Ecopower, or sometimes to refurbish a school, a cultural centre, a retirement home, a hospital, or to fund social, economic or educational projects within a community.

http://www.ecopower.be

CASE STUDY: BOILER SUBSIDIES (CZECHIA)

The LAG Opavsko tried a unique financial model to promote low-carbon investments, combining so-called 'boiler subsidies' grants financed from European funds with repayable 'boiler loans' from national sources. This project helped reduce CO_2 emissions and increased the share of clean sources of heat and electricity used in the area. It also led to significant financial savings for municipalities, companies and citizens, and created skilled jobs in the region.

Further information:

EU Rural Review 29 'LEADER Achievements', https://enrd.ec.europa.eu/publications/eu-rural-review-29-leader-achievements_en

http://www.masopavsko.cz/dotacni-podpory/kotlikove-dotace/?ftresult_menu=dotace

ENERGY COMMUNITIES AND CAP STRATEGIC PLANS

As illustrated in the examples in these pages, energy communities provide an economically sound model that tackles the exact challenges we need to solve to build a sustainable future for ourselves. Consequently, we believe that community energy should be considered in the SWOT analysis and the prioritisation of needs for the future CAP Strategic Plans, in particular for the Specific Objective for Vibrant Rural Areas. While the CAP Strategic Plans cannot on their own solve the underlying problems of rural community energy, they can play two important roles.

Firstly, through the use of the LEADER method and other forms of cooperation such as Smart Villages approaches, local and national stakeholders can come together to develop a community vision and a business case for community energy. Smart Village strategies aim to support rural communities to test new solutions to some of the fundamental challenges they face – as well as exploring the new opportunities created by technological and other forms of innovation. Renewable energy is, therefore, without a doubt, a key theme and focus for future Smart Village strategies.[5]

On the other hand, by creating a local network of projects, initiating their own projects and connecting people, LEADER Local Action Groups (LAGs) – typically acting on a wider local scale – can add power and momentum to the transition process. Community involvement and interest are key, and LAGs are ideally placed to engage with local communities and local politicians as well.[6]

Forms of cooperation like those mentioned above can be used to test new or alternative solutions and to invest in small-scale, but vital, grassroots projects, possibly triggering further public and private funding.

However, to be effective, these initial investments need to be aligned and linked with other more substantial ways of supporting renewable energy and energy efficiency projects provided by the European Union and national legislation. CAP Strategic Plans can better support sustainable renewable energy communities in rural areas if CAP interventions combine and articulate support to meet the needs for community renewable energy identified through the SWOT analysis. It is also important to identify where and how CAP interventions can best add value to other EU and national policies.

© Pixabay

(5) See the ENRD briefing *Smart Villages and Energy Communities*, https://enrd.ec.europa.eu/publications/smart-villages-and-renewable-energy-communities_en

(6) See the report of the ENRD LEADER Thematic Lab on 'Climate change mitigation and adaptation', https://enrd.ec.europa.eu/news-events/events/enrd-leader-thematic-lab-climate-change-mitigation-and-adaptation_en

CONCRETE MEASURES TO SUPPORT RURAL COMMUNITIES IN THE ENERGY TRANSITION

Access to energy is a basic right – people depend on energy for heating, lighting, transport and economic activity. Wind, sun and water are common goods, and fair access to the energy generated by these renewable sources should be ensured for all citizens. This is particularly true for rural areas, where these resources are plentiful and can generate much-needed economic and social benefits.

Up until recently, communities that wanted to engage in renewable energy production found little dedicated support in EU or national legislation and policy to assist them. With the new Clean energy for all Europeans package directives, and the recast Renewable Energy directive (RED II) in particular, the EU's energy legal framework now acknowledges and supports renewable energy communities (REC) as an essential component of the energy transition. Citizens and communities across Europe now have a number of guarantees to ensure they are able to invest in renewables and directly benefit from the energy transition. As Member States begin to put national enabling frameworks for RECs into place, there are a number of opportunities citizens and politicians of rural communities should be aware of.

As identified in the framework of the ENRD work on Smart Villages,[7] there are different opportunities for accelerating the energy transition in rural areas. These relate to the different steps of implementing energy transition projects, as shown in the table below.

In the context of the climate crisis and the European Green Deal, the need and the potential for people - individually and through their community - public entities and small enterprises to actively engage in the energy transition is significant. By 2050, at least half of EU citizens could be producing their own renewable electricity.[8] But if we really want the transition to succeed, we need to mobilise all policies, local authorities and other stakeholders and aggregate the renewable energy and energy efficiency projects that they identified in their sustainable energy and local energy action plans.

Table 1. Opportunities for accelerating energy transition in rural areas

Project Awareness	**Create awareness and build community and municipal buy-in for renewable energy projects.** Animation, facilitation and transparent communication are key for involving local stakeholders in Renewable Energy Communities (RECs), e.g. clear information about the local costs and potential savings of energy projects (for example see Enegest, a tool developed by 11 Spanish LAGs). http://www.ripollesgesbisaura.org/enegest/?lang=en
Project emergence & development	**Set up effective systems for providing technical assistance and capacity building** for rural communities that want to develop a REC. Support energy intermediaries (agencies), networks and brokers at different levels. For example, the Community and Renewable Energy Scheme CARES managed by Local Energy Scotland provides communities, businesses and other organisations with advice and flexible funding packages for each stage of project development. https://www.localenergy.scot
Project construction & operation	**Start small with seed funding that spreads risk and allows testing the business model of projects.** The future CAP Cooperation intervention and LEADER/CLLD can support the communities in the early stages of developing and testing a concept. If successful this can lever in financial resources for larger investments (e.g. from Banks, ELENA programme of the EIB, ERDF, EU Invest or national sources). https://www.eib.org/en/products/advising/elena/index.htm
Regulatory environment	**Set target indicators.** Scotland has a target of 2 Giga Watts produced by RECs. Indicators can also be designed for specific interventions such as technical assistance and investments. https://www.gov.scot/policies/renewable-and-low-carbon-energy/local-and-small-scale-renewables/
	Ensure a stable regulatory framework that supports the long-term viability of RECs. Monitor and control the transposition of the Renewable Energy directive (as an enabling condition) through for example Feed-in Tariffs, access to the grids or including provisions in State Aid Regulations for RECs. https://www.rescoop.eu/toolbox/all/all/all/policy-paper

(7) See the ENRD Briefing *Smart Villages and renewable energy communities*, https://enrd.ec.europa.eu/publications/smart-villages-and-renewable-energy-communities_en

(8) CE Delft (2016) *The potential of energy citizens in the European Union*, https://www.cedelft.eu/publicatie/the_potential_of_energy_citizens_in_the_european_union/1845

4. Creating trust in rural value chains

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Monitoring, certification systems, effective and transparent communication are key to create trust in bioeconomy rural value chains. Trust is also important in enabling the take-up of climate-friendly measures by the market. This article provides expert and stakeholder views on how to encourage rural stakeholders to choose climate-friendly projects.

The text is based on interviews with Pekka Pesonen, secretary general of European Union (EU) farm body Copa-Cogeca; Eamon O' Hara, Executive Director of ECOLISE – the European Network for Community-Led Initiatives on Climate Change and Sustainability; André Vizinho, part of the ECOLISE research team and the Climate Change Impacts and Monitoring research group at Lisbon University, Portugal; Pieta Jarva, Communications Director of the Baltic Sea Action Group (BSAG); and the European Environmental Bureau.

BY LIZ NEWMARK

Liz is a multi-lingual journalist and editor with 24 years' experience covering EU and cultural affairs in Brussels. After editing environmental and packaging publications, Liz turned freelance in 2016, broadening her journalistic experience. Working for a range of business and Brussels-focused publications, she has covered diverse fields from cosmetics to confectionery, textiles to trade and has also written several articles on agriculture.

INTRODUCTION

Rural bioeconomy actors – producers, entrepreneurs, companies as well as rural communities – can contribute to climate mitigation in many ways. To get these actors on board, it is essential they trust the measures in place – notably monitoring and certification systems, data and reporting – to help them engage in climate action.

Trust is necessary on many levels. Financially, institutions have to trust that the projects they are asked to support will be successful to justify monetary aid. Environmentally, rural communities need to be confident their initiatives will be ecologically beneficial or climate friendly. Meanwhile, policy makers at EU, national and regional/local levels have a role in promoting and building up trust in the bioeconomy and understanding of the benefits and opportunities it can offer.

Financial aid, for example from the European Agricultural Fund for Rural Development (EAFRD), can play a key role in motivating rural businesses and communities to act and trust that the measures they use will be economically and environmentally effective. Communication and working together at all levels of the rural 'value chain' are equally important to inspire trust in climate-friendly measures.

"For farmers and their cooperatives, one of the crucial points is their involvement in these measures," Pekka Pesonen, secretary general of European Union (EU) farm body Copa-Cogeca, said.

Trust in value chains will be created, "if farmers can contribute to the design of any of these specific measures, make sure they fit well into their everyday practices and also make sure they are viable and sustainable from the economic point of view."

Creating social trust and working together is also key when optimising the outcome, Pesonen added, as "partnerships between farmers, environmentalists and scientists on biodiversity-related actions have proven very promising."

Pieta Jarva, Communications Director of the Baltic Sea Action Group (BSAG), that works with the Finnish Meteorological Institute (FMI) on Carbon Action projects,[1] also emphasises that "co-creation with involved parties, especially farmers, researchers and food system companies," is the way forward to create trust in rural value chains.

Both agree involving companies, especially in the food chain, is essential to mainstream carbon sequestration in farmland. As Jarva said, this also "provides the consumer interface".

MONITORING AND CERTIFICATION SYSTEMS

Measures to build up trust and create market take-up can focus on standardisation systems, labelling and green public procurement. But with the bewildering range of climate monitoring and certification systems on the market, rural businesses and communities need to be confident what they choose will both combat climate change and have positive economic effects.

In the rural domain, one notable example is the EIP-AGRI cooperation project CARBOCERT[2] in Spain that tests certification schemes for carbon sequestration in soil and has developed good practice guidelines for farmers.

France's national Label Bas Carbone (Low Carbon Label)[3] qualifies rural projects for carbon offsetting funding and recognises different climate mitigation methods in agriculture and forestry. Approved methodologies include the French CarbonAgri[4] approach, that builds on the implementation of several practices such as manure or crop management to increase carbon storage or cut emissions on cattle farms.

Authorities and advisory services are probably best placed to monitor these processes. Depending on what is monitored, different institutions

(1) The Carbon Action Platform includes a range of rural community projects promoting climate change focusing for example on agroforestry, carbon sequestration or soil: https://carbonaction.org/projects/

(2) https://ec.europa.eu/eip/agriculture/en/find-connect/projects/grupo-operativo-carbocert-cuantificación-y

(3) https://www.ecologique-solidaire.gouv.fr/label-bas-carbone

(4) https://france-carbon-agri.fr/methodologie-carbon-agri/

should be involved (such as authorities for satellite data and advisory services for qualitative monitoring that needs on-site visits).

"There are many certification schemes covering lots of different areas. I think there is a real danger of public confusion and lack of trust, especially if they are not rigorously monitored," said Eamon O' Hara, Executive Director of ECOLISE – the European Network for Community-Led Initiatives (CLI) on Climate Change and Sustainability. ECOLISE schemes (see on this page) focus on community involvement to create trust.

O' Hara said that to be successful it was necessary to look separately at verification aspects. He said one example would be, "where a community seeks funding to set up a solar farm and needs to verify the associated emissions reductions and certification schemes, such as where products or services are traded and the public needs reassurance that they meet certain criteria."

The type of verification to choose depends on the size of the funding. "For smaller projects, verification by the equipment supplier or own verification supported by documentation may be sufficient, but for larger projects, independent verification may be needed (such as that used by carbon offsetting schemes)."

Ecological and carbon footprint tools/ calculators may also be useful here, O' Hara adds, "but good outputs depend on good inputs".

© ECOLISE

CASE STUDY: ECOLISE

Meta networks such as 2014-founded ECOLISE bring together networks of organisations representing community-led initiatives (CLI) across Europe, many in rural areas.

ECOLISE's 2019 status report on community-led action on sustainability and climate change[5] notes that carbon footprints of sustainable communities and ecovillage residents are much lower than national averages, due to promoting renewable and low energy lifestyles and enabling low-carbon transport.

Recommendations to policy makers include recognising and supporting agroecological smallholdings that demonstrate high levels of economic, environmental and social sustainability and enabling dialogue between funders and CLIs to facilitate collaborative proposal development and allowing funders to be more sensitive to local contexts.

For ECOLISE, community-led action is essential and requires appropriate legislation and the right information and support – e.g. technical assistance, accessible funding and support for networking and exchange. Rural communities need to trust any climate-friendly legislation and so participation in policy development must be facilitated and actively supported.

"The message is very clear," O' Hara said. "Engaging citizens in local, community-level responses leads to transformative change; without such engagement, such transformation will not be achieved."

https://www.ecolise.eu

(5) https://www.ecolise.eu/wp-content/uploads/2016/02/Status-Report-on-Community-led-Action-on-Sustainability-Climate-Change-in-Europe-2019.pdf

DATA AND TOOLS

Rural actors engaged in climate change mitigation need data at several steps: the initial baseline situation; to set targets; monitor progress; amend the approach if it does not work; and, communicate the difference they are making.[6]

Copa-Cogeca's Pesonen highlighted the importance of data tools including satellite, open source, or Life Cycle Assessment (LCA) data to boost climate-friendly measures and create trust in rural value chains.

"Open source data is essential to ensure transparency within the value chain (e.g. for unfair trading practices - business-to-business relationships that deviate from good commercial conduct and are contrary to good faith and fair dealing). This is crucial to create trust, so rural communities, farmers and retailers can rely on each other when taking production and buying decisions."

Satellite data is used for environmental and field applications (not only for emission purposes, but also to track plant species, weeds and growth status of plants). For Pesonen, "This is essential for mitigation - to be able to produce more with less environmental impact, e.g. increase efficiency."

Pesonen added that satellite monitoring to justify financial support for climate action was one of the most efficient systems, in particular when vegetation is geographically monitored.

The French Low Carbon Label has incentivised climate action in rural bioeconomy value chains, he noted. Other examples are carbon credits, the worldwide carbon removal marketplace puro.earth[7] and peatlands scheme MoorFutures[8] in Germany. Action must be based on the share of 'value' in the chain – farmers and rural communities need to be rewarded economically, he said. Consumers too must be willing to pay more for better climate performance.

SCIENCE – NOT JUST FOR SCIENTISTS

For the BSAG's Jarva, trust is created by focusing on scientific verification – for example of carbon sequestration in agricultural soil. But successful projects also need "co-creation with involved parties, especially farmers, researchers and food system companies".

An example of this co-creation is Carbon Action, a Finnish platform that develops and researches ways of accelerating soil carbon sequestration and verifying the results scientifically.[9]

Its newest project STN MULTA (see page 30) that builds on the Carbon Action pilot, which, from the outset, has been planned with farmers and researchers. More than one hundred farms have committed to the five-year project to test carbon farming practices and providing data. Beyond that, farmers have been actively participating in training and have been in dialogue with the researchers.

Similarly, in Copa-Cogeca's five-step approach to help farmers adopt biodiversity and climate measures,[10] farmers must be able to participate in designing them and receive suitable good quality training and advice, Pesonen said.

If communities understand the science, clearly trust in taking up climate measures will follow, Jarva says. Community-led initiative (CLI) activities must be visible and intelligible to municipalities and other local/regional stakeholders. With Carbon Action projects, both farmers' and businesses' experience are needed to produce solutions that are implementable in practice. "Engaging these parties has also created trust in general."

(6) See the ENRD Factsheet *Monitoring data and raising awareness of rural actors' contribution to climate action,* https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/bioeconomy_factsheet-monitoring_climate_action.pdf

(7) Puro.earth: Go Climate Positive – The world's first carbon removal marketplace for businesses, https://puro.earth/

(8) MoorFutures is a results-based voluntary scheme to encourage the rewetting of peatlands to decrease GHG emissions, https://www.moorfutures.de

(9) https://carbonaction.org/projects/

(10) Copa-Cogeca's five-step approach to help farmers adopt biodiversity and climate measures: farmers should be able to make a choice; have the possibility to participate and design CAP measures; the financial factor should be sufficient; there should be affordable, fit-for-purpose and good quality training and advice; and, creating social trust and working together is key.

STN MULTA (MULTI-BENEFIT SOLUTIONS TO CLIMATE-SMART AGRICULTURE)

STN MULTA is a research consortium led by the Finnish Meteorological Institute (other members are the Baltic Sea Action Group, University of Helsinki, Natural Resources Institute, Finland, Finnish Environment Institute SYKE and University of Zurich).

The consortium works with major food companies who want to mitigate greenhouse gas emissions while producing healthy food sustainably. STN MULTA designs climate-smart agricultural solutions beneficial to food systems, testing their application on its network of 108 Carbon Action farms in Finland.

For example, one of the most effective measures, dubbed "an unused asset of agriculture", is the ability to regenerate soil so as to sequester atmospheric carbon dioxide (regenerative carbon farming). The project develops verification systems for this carbon sequestration and other climate impacts by combining various measurements (for example atmospheric and plant diversity) and modelling. These include soil and microbial analyses to be used in policy and markets. The consortium then studies measures and policies that support climate-smart farming, promoting the implementation of similar solutions in Finland and abroad.

True collaboration between different scientific disciplines and interaction specialists has been designed to reach this aim. A testament to the success of the project is the fact that even companies from sectors not initially contacted trust in the project and its outcomes. Policymakers are interested in applying Carbon Action's knowledge and results, and various municipalities have contacted the consortium.

While the project is focused on Finland, its results and solutions are hoped to be applied throughout the EU. The project's duration is 2019-2022, with possible continuation from 2022 to 2025.

https://carbonaction.org/en-stn-multa/

© Pieta Jarva

COMMUNICATION IS KEY

Good communication is essential to create trust in the rural value chain. "Trust comes from consistency and continuity in the communication," said André Vizinho, part of the ECOLISE research team and the Climate Change Impacts Adaptation and Monitoring research group at Lisbon University, Portugal. He warns that, "As procedures, subsidies and incentives are changing and the carbon market is unstable both at international and European levels, it is hard for farmers and stakeholders involved in the rural value chains to keep trust and design their practices accordingly."

"Farmers trust and also distrust knowledge from universities", Vizinho said. "They do, however, trust farmer organisations and adhere to practical clear measures and incentives."

Farmers will trust fellow farmers most and disregard ideas that come from high up, Pesonen agreed. "This is why the 'bottom-up' approach is successful and work done by rural networks is valuable as it brings together all relevant stakeholders in a friendly and constructive environment."

Sharing best practices among farmers and their cooperatives on a national level and across borders is crucial for action in many areas such as climate change. Advisory services, part of the CAP structure, are also important to teach new techniques and create trust in these new approaches, providing vocational training and knowledge exchange.

Communication, meanwhile, will boost not only trust, but also the image of some parts of the rural value chain, Pesonen emphasised. "In recent times, farmers are taking a lot of undeserved blame for the state of the environment and state of the climate. One of the ways to amend this might be by providing clear communication channels through which the different stakeholders can find consensus and agree on solutions that would benefit everyone."

New contracts to achieve climate targets, as shown in the EFFECT project (see page 31) run by Copenhagen University, are also essential to promote communication and trust across the rural value chain, involving farmers at every step.

EFFECT

EFFECT is a European Horizon 2020-funded multi-actor research project. Started in May 2019 and due to end in April 2023, it aims to analyse, develop and test contracts to improve environmental performance in the agricultural sector.

The project develops and co-designs contractual frameworks with local farmers and stakeholders, testing them around Europe. To boost trust, farmers are fully involved in the process. The social and behavioural aspects of their decision making and the need to reconcile farmers' private benefits with the achievement of climate and environmental public goods is taken into account in contract design.

With 19 partners from academia, public and private sectors, EFFECT aims to build an international consortium to give inputs to decision makers and the agricultural community on effective design of agri-environmental contracts.

The project is currently at the stage of launching the local case studies.

http://project-effect.eu

LOOKING AHEAD

Environmental groups like the European Environmental Bureau (EEB) stress that, "farmers are the guardians of our environment in rural areas and should be rewarded for preserving it".

Pesonen agrees financial aid should incentivise the farmer to trust and adopt climate friendly measures. "The CAP post-2020, European Green Deal and Farm-to-Fork strategy set up new ambitions for the farming sector but decrease financial support," he regrets.

Farmers are not being incentivised adequately and must be compensated for contributing to climate and environment goals, if for example, lower yields result from ecosystem services, he said. The higher the conservation ambition and related risk, the greater the incentive should be.

Ultimately, farmers will trust more any climate incentive that will help them produce food for the market, he argues: "Even if we had a separate carbon sequestration scheme with economic incentives (from the market or support schemes), producing food remains the first responsibility of the farming sector."

Payment is not everything, Vizinho said. Incentives needed depend on the size of the farm. "Larger farmers require more payments to act and decide to do so. Smaller farmers tend to adopt environmentally friendly measures due to their own motivation, despite payments."

All communication and measures must be transparent, he continued: "This is the first guideline for trust building, relevant when setting expectations, when producing, reporting, and sharing information; and also when making clear the interests of stakeholders and duration of projects."

At EU level, the single European CAP network,[11] planned in the scope of the CAP post-2020, should help transparency and trust, Pesonen said. It will bring together rural actors, use complementary knowledge to achieve the best results; and, enable "cutting-edge scientific approaches to be applied on the ground. We welcome this approach as it will ensure better coordination of activities at both EU and national level."

On the ground, farmers appear to already trust carbon-friendly measures, given the positive feedback to Carbon Action's regenerative carbon farming training, Jarva said: "More farmers want to join than we can take, so we have launched a 'Carbon Action Club' for farmers wanting to stay posted on the results and experiences we gain together in carbon farming."

© Unsplash

(11) A European network for the Common Agricultural Policy (European CAP network) shall be put in place for the networking of national networks, organisations, and administrations in the field of agriculture and rural development at Union level. European Commission (2018) *Proposal for a Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) COM/2018/392 final* (Article 113), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A392%3AFIN

5. Rewarding climate action in agriculture

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Discussions on RDP support for climate action have been at the core of the ENRD's work on 'greening the rural economy' over the last few years. How is the current CAP rewarding climate action, and how can the future CAP Strategic Plans go further?

BY SILVIA NANNI

Silvia has over seven years of experience in EU policy analysis and project management related to the bioeconomy, rural development and climate mitigation. As part of the Institute for European Environmental Policy, Silvia contributed to the ENRD thematic work on bioeconomy and resource efficiency, as well as the evaluation of the Common Agricultural Policy from a climate delivery perspective. Currently a project manager at Climate Alliance, Silvia is working on the further development of bioeconomy approaches at local and municipal level.

POLICY SUPPORT FOR CLIMATE ACTION IN AGRICULTURE: THE CAP

The Common Agricultural Policy (CAP) operates as a partnership between the agricultural sector and society, between farmers and the EU. Farmers face both a challenge and an opportunity when it comes to securing food production and rural development, whilst ensuring that natural resources are safeguarded and that the CAP is instrumental in steering these processes. This comes with an additional important societal benefit, in the form of the strengthened resilience of the surrounding environment and climate.

The CAP was originally established in 1962, and since then has evolved up to the point of including an explicit climate objective in 2007. Since 2013, 'the sustainable management of natural resources and climate action' is one of the three core objectives of the CAP, which need to be addressed under two 'pillars' – direct payments (Pillar I) and Rural Development Programmes (RDPs) (Pillar II).

Sustainable farming practices that are resilient to climate pressures and/or bring climate benefits have been encouraged as a result of the CAP support mechanisms. Direct payments account for € 293 billion (approximately 72% of the overall CAP budget) in the 2014-2020 programming period. This pillar has supported practices aimed at the maintenance of permanent grassland and environmentally sensitive permanent grassland (as part of the greening measures – under which 30% of a farmer's direct payment is conditional to the performance of a series of environmental actions), and the scope of Farm Advisory Services (which can be supported under PII) has extended to cover practices with climate benefits (such as those included in the greening measures).

In addition, the maintenance of soil organic matter and carbon (as defined by the Good Agricultural and Environmental Conditions (GAECs) – which are specified by Member States) are conditions upon which farmers receive direct payments (as well as area-based payments under Pillar II).

RDPs for the 2014-2020 programming period can equally offer support to climate action in agriculture and are co-financed by the European Agricultural Fund for Rural Development (EAFRD) and national or regional budgets. The EAFRD defines six EU level priorities, with one particularly relevant for promoting climate action: Priority 5 'Resource-efficient, Climate-resilient Economy'.

In their RDPs, Member States or regions set out the selected programme measures and the available funding to be used to achieve climate mitigation and adaptation objectives and targets. One of the advantages of these programmes is that, among the 19 potential measures to be included, Member States retain the flexibility to select the most appropriate measures for their needs, with the exception of the Agri-Environment-Climate Measure, which has to be included in all programmes. To support climate action in agriculture, at least 30% of the EAFRD contribution to each RDP must be assigned to measures relevant to climate change mitigation and adaptation and the environment, though in practice the actual share is typically significantly higher.

THE CARBON NAVIGATOR (IRELAND)

In Ireland, which aspires to achieve climate neutrality by 2050, agricultural emissions represent a high share of total carbon emissions and are therefore identified as a priority. To take stock of the current emissions from farms, the Carbon Navigator was designed as a tool for farmers to understand how their farms produce GHG emissions, to set mitigation targets and put in place tailored measures.

Over the 2014-2020 programming period, the Carbon Navigator was used by 33% of Irish livestock farmers benefitting from RDP Measure 1 (knowledge transfer and information actions). The tool functions in dialogue between the farmers and their adviser, and has resulted in significant reductions in farm-level emissions due to farmers becoming more aware of the consequences of their practices and so taking mitigation measures. Despite the use of the Carbon Navigator, Ireland's overall emissions from the livestock sector have increased due to increased production. A broad approach for dealing with emissions on farms would need to be considered.

Research projects, such as those funded by Horizon 2020, have promoted similar tools dedicated to move towards on-farm practices that have climate benefits. One example is the multi-actor Landmark project,[1] which has developed the Soil Navigator.

Further information:

ENRD TG on Bioeconomy and Climate Action in Rural Areas – Event highlights, https://enrd.ec.europa.eu/sites/enrd/files/tg2_beca_highlights_report.pdf

(1) http://www.soilnavigator.eu

Within the minimum EAFRD share to be programmed for measures relevant to climate and environmental action, the Agri-Environment-Climate Measure received a sizeable portion of the EAFRD budget, accompanied by other measures such as: knowledge sharing and capacity building (see box below), support for organic farming, payments attached to Natura 2000 areas, payments related to areas facing natural or other constraints, forest-environmental and climate services and forest conservation, 'non productive' investments linked to environmental and climate priorities, and investments in forest development and their viability.

One of the benefits of all the instruments and measures mentioned in the above paragraphs is that they are subject to monitoring and evaluation, which requires Member States to report on a number of indicators and follow formal reporting procedures to help track whether climate and other objectives are being fulfilled.

UNDER THE SPOTLIGHT: THE ECONOMICS OF CLIMATE ACTION IN AGRICULTURE

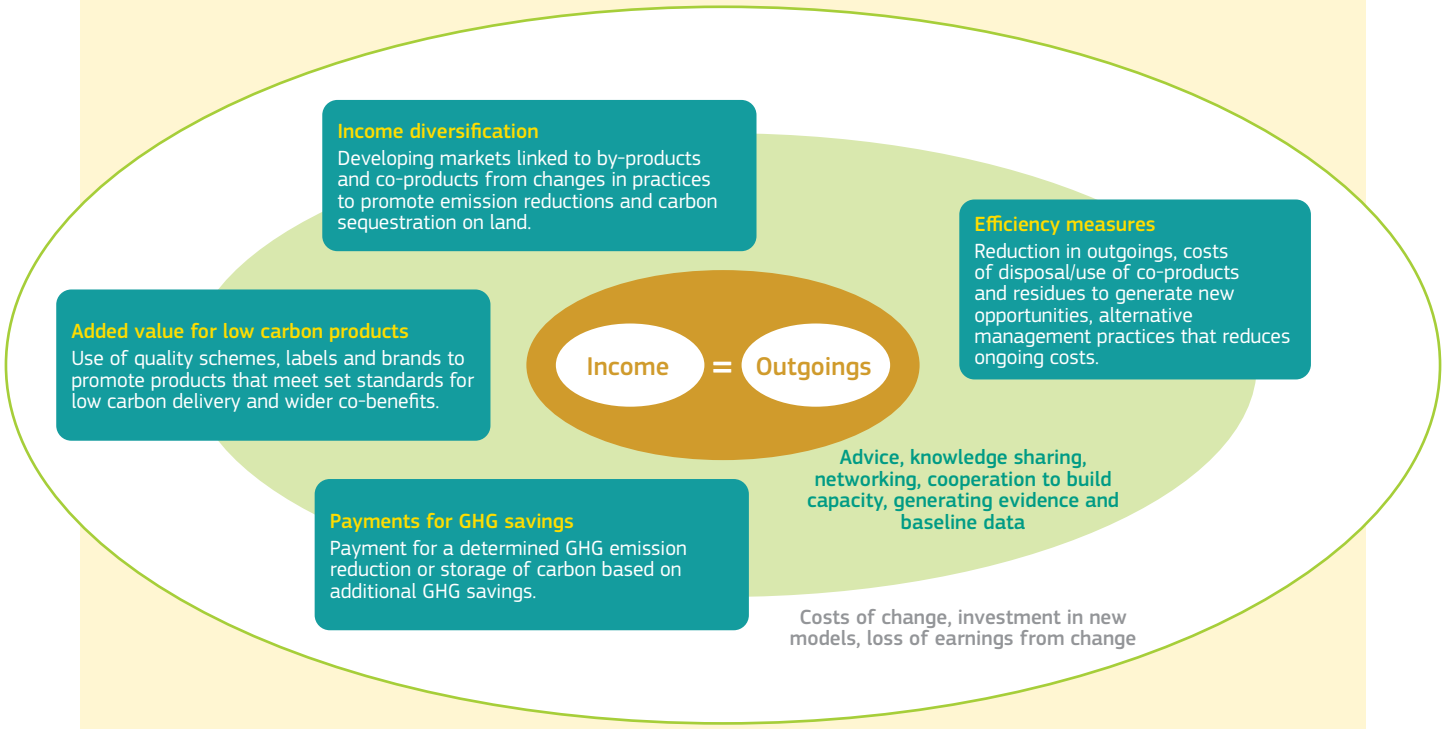
Often, discussions on how to support climate action in agriculture tend to focus more on the environmental benefits than on the economic (and social) benefits of climate action. A sector that looks at all aspects in synergy may achieve greater benefits in the long-term.

An interesting example of bringing together both environmental and economic aspects for achieving climate action in agriculture is the development of a sustainable, circular bioeconomy. The bioeconomy promotes climate action and, in that context, supports the development of green jobs in rural areas, stimulates innovation and a just transition away from a fossil-based society.

The bioeconomy has the potential to mitigate climate change through emission reductions and the capturing of carbon in soils, biomass and ultimately in bio-based products. The development of value chains that promote greater resource efficiency, the circular use of materials and storage of carbon also offer rural areas new opportunities to generate economic value. Recognising the economic opportunities that arise from pursuing climate action within the rural bioeconomy is a key incentive to upscale sustainable and climate-friendly practices to achieve the objectives set out in the European Green Deal.[2]

Many current RDP measures mention explicitly climate mitigation or adaptation, and even some of the other measures can be relevant for climate action, although the regulation does not spell it out.

The graph below shows how RDP measures (blue rectangles) support several economic opportunities for undertaking climate action within the rural bioeconomy, supporting advice, knowledge sharing, networking and cooperation (grey circle) as well as compensating the costs of investments and change or potential loss of earnings (white circle).



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

Table 1. Current CAP instruments and measures and their relevance to climate change mitigation and adaptation in agriculture

Instrument / Measure code	Instrument / Measure name	Mitigation explicitly targeted	Adaptation explicitly targeted
-	Direct payments	No	No
-	Voluntary redistribution payment	No	No
-	Greening measure – Crop diversification	No	No
-	Greening measure – Permanent grassland ratio	Yes	No
-	Greening measure – Environmentally sensitive permanent grassland	Yes	No
-	Greening measure – Ecological focus area	No	No
-	Voluntary payment for farmers in areas with natural constraints	No	No
-	Voluntary coupled support	No	No
-	Small farmers' scheme	No	No
-	Cross compliance SMR 1	No	No
-	Cross compliance GAEC 1 – Establishment of buffer strips along water courses	No	No
-	Cross compliance GAEC 2 – Compliance with authorisation procedure for irrigation water	No	No
-	Cross compliance GAEC 3 – Groundwater protection	No	No
-	Cross compliance GAEC 4 – Minimum soil cover	Yes	No
-	Cross compliance GAEC 5 – Site specific erosion control	Yes	No
-	Cross compliance GAEC 6 – Maintenance of soil organic matter	Yes	No
-	Cross compliance GAEC 7 – Retention of landscape features	No	No
-	Farm advisory systems	Yes	Yes
1	Knowledge transfer and information actions	No	No
2	Advisory services, farm management and farm relief services	Yes	Yes
3	Quality schemes for agricultural product and foodstuffs	No	No
4	Investments in physical assets	Yes	Yes
5	Disaster risk reduction	No	Yes
6	Farm and business development	Yes	No
7	Basic services and village renewal in rural areas	No	No
8	Investments in forest area development and improvement of the viability of forests	Yes	Yes
10	Agri-environment-climate	Yes	Yes
11	Organic farming	No	No
12	Natura 2000 and Water Framework Directive	No	No
13	Areas facing natural constraints	No	No
14	Animal welfare	No	No
15	Forest-environmental and climate services and forest conservation	Yes	Yes
16	Cooperation	Yes	Yes
17	Risk management	No	Yes
19	Support for LEADER local development (CLLD)	No	No

Source: Alliance Environnement (2018) *Evaluation study of the impact of the CAP on climate change and greenhouse gas emissions*, https://op.europa.eu/en/publication-detail/-/publication/29eee93e-9ed0-11e9-9d01-01aa75ed71a1

REWARDING CLIMATE ACTION IN THE POST-2020 CAP

For the new programming period, the European Commission's proposal for the CAP, which should enter into force in 2023 after a two year transition period, is currently being negotiated by co-legislators. The proposal brings with it a renewed infrastructure condensed in a single programming approach, while maintaining the two-pillar structure of the CAP mentioned earlier. It is geared towards greater results-orientation under the umbrella of the CAP Strategic Plans set at national level. This is reflected, in particular, in one of the three general objectives of the CAP, which aims 'to bolster environmental care and climate action and to contribute to the environmental and climate-related objectives of the Union'.[3] Under the general objectives, a specific one is dedicated to contributing to 'climate change mitigation and adaptation, as well as sustainable energy'.[4]

As a result of the CAP reform proposals, Strategic Plans are being drafted by Member States who, based on identified specific needs will design their priorities and the types of interventions needed to contribute, among others, to the general and specific climate objectives.

The new Green Architecture of the CAP offers three sets of voluntary and mandatory tools to farmers to foster their climate objectives. These include new, enhanced conditionality provisions (mandatory), Eco-schemes (voluntary) and Agri-Environment-Climate Commitments (AECM - voluntary). The latter are shown in Table 2. Whereas conditionality and AECM are part of the current CAP, the Eco-schemes are a new feature of the post-2020 CAP.

The Eco-schemes are to be funded through the CAP's direct payments budget. They are a voluntary feature offered to farmers to incentivise more sustainable and climate-friendly farm and land management practices. In the context of the Eco-scheme instrument, Member States will be able to establish 'a list of agricultural practices beneficial for climate change and the environment', based on specific needs. One benefit of such an instrument is that it would give Managing Authorities the flexibility to define tailor-made environmental and climate actions using direct payment funding. More recently, in January 2021, the Commission published a list of potential agricultural practices that the Eco-schemes could support.[5] This list aims to contribute to the debate around the CAP reform and its role in reaching the European Green Deal targets.

The post-2020 CAP also requires that Member States propose to farmers Agri-Environment-Climate Commitments under Pillar II. They can design a wide range of AEC commitments that will respond to the specific environmental and climate-related needs of each Member State, while also addressing the EU general and specific objectives concerning the environment and climate. Member States will continue enjoying important flexibility in setting these commitments with the underlined possibility of implementing them through innovative approaches, such as result-based payments or collective approaches.

In addition to the dedicated tools described above, advisory services, training and knowledge sharing instruments will play an important function to enable farmers to fully utilise enhanced conditionality provisions, Eco-Schemes and Agri-Environment-Climate Commitments in support of climate action.

Whilst these are concrete instruments with the potential to scale up climate action in agriculture under the new CAP, for this potential to be realised and deliver on European Green Deal targets, it is necessary to increase the level of climate and environmental ambition. This is encouraged in the recently adopted Commission recommendations to Member States regarding the preparation of their CAP Strategic Plans.[6]

(3) European Commission (2018) *Proposal for a Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) COM/2018/392 final* (Article 5), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A392%3AFIN

(4) *ibidem*, Article 6(1)

(5) Bas-Defossez F. and Meredith S. (2019) *CAP 2021-27: A comparative analysis of the environmental performance of the COMENVI and COMAGRI reports on the Commission's proposals, report for NABU by IEEP*, https://ieep.eu/uploads/articles/attachments/bcf16988-c14f-4049-a528-a1760d0f6efc/IEEP%20AGRI%20ENVI%20analysis%20September%202019.pdf?v=63734829544

(6) European Commission (2020) *Recommendations to the Member States as regards their strategic plan for the Common Agricultural Policy COM/2020/846 final*, https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-strategic-plans_en#recommendations

Table 2. Comparison between the key features of 'Eco-schemes' and 'Agri-Environment-Climate Commitments'

	Eco-schemes	Agri-Environment-Climate Commitments
Source of funding	Pillar I budget – **without** co-financing by Member States	Pillar II budget – **with** co-financing by Member States
Possible beneficiaries	Farmers	Farmers, other land managers (e.g. environmental NGOs)
Payments' link to land	Payment per hectare Land concerned must be eligible for direct payments *	Payment per hectare Land concerned need not be eligible for direct payments
Obligatory/voluntary?	Member States must make provision for them Participation voluntary for farmers	Member States must make provision for them Participation voluntary for farmers and other potential beneficiaries
Nature of commitments	Annual (i.e. "one year at a time")	Multi-annual contracts (usually of 5-7 years)
Calculation of premia	Compensation for additional costs / income losses arising from commitments concerned, OR Additional payment to basic income support (no particular rules over premium level)	Compensation for additional costs / income losses arising from commitments concerned

* Direct payments are a group of types of area-based payments for farmers provided through CAP Pillar I – including several varieties of income support, and the Eco-schemes.

Source: European Commission (2019) – The post-2020 Common Agricultural Policy: Environmental benefits and simplification, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/cap-post-2020-environ-benefits-simplification_en.pdf

RENEWED EU POLICY COHERENCE

Driving change towards climate resilience and mitigation in agriculture requires using the CAP in coherence with other EU policy instruments. This ensures a consistent vision of how the European agricultural sector can contribute to climate action and how it needs to adapt to the changing climate.

At the EU level, the European Green Deal defines the growth strategy for Europe in order to reach climate neutrality by 2050. This strategy foresees a key role for the CAP to deliver on climate action, as well as to continue ensuring a decent living for farmers. In order to set in law the conditions for a fair transition to 2030 and 2050, the European Commission proposed a Climate Law this year, which foresees all sectors across the economy to play a role in delivering on the climate objectives. In addition, initiatives such as the 2030 Climate and Energy Framework – including the recast Renewable Energy Directive (RED II) – aim to support the shift towards a low-carbon economy. A range of more detailed policy commitments and initiatives are in place to promote climate action in agriculture, as shown in the box page 39. This is especially the case in response to the development of international commitments for both climate mitigation and adaption, such as the 2015 Paris Agreement.(7)

It is important to note, however, that there are no sector-specific targets at EU level for emissions from agriculture. Mitigation efforts for non-CO_2 emissions by all sectors outside the Emission Trading Scheme (ETS)

(7) https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

are covered under the Effort Sharing Regulation (ESR) and CO_2 emissions are addressed primarily by the Land Use, Land Use Change and Forestry (LULUCF) Regulation. EU action on climate adaptation, including in the agricultural sector, is outlined separately in the Climate Adaptation Strategy. The new Adaptation Strategy, adopted in February 2021, sets out how the European Union can adapt to the impacts of climate change and become climate resilient by 2050.[8]

As put forward in the previous section, the new CAP Strategic Plans offer an opportunity to bring together the strategies of different EU policy instruments and frame their objectives in a coherent way. One example of how the future CAP can jointly contribute to agricultural, climate and energy objectives is the SMARTGAS project (see box below). Its aim is to produce sustainable biogas in Italy.

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SMARTGAS (ITALY)

In Tuscany, one of Italy's most fertile and productive agricultural areas, a joint effort between agricultural and biogas stakeholders aims to bring forward the testing of practices with lower GHG emissions, as well as the economic benefits of the resulting products.

Between 2019 and 2021, the SMARTGAS project will aim to increase carbon sequestration in farmland soils through a more efficient use of digestate and tillage techniques in cropping systems producing food, feed and bioenergy. Such a project brings together a consortium including a farmers' association, a university, six farms, and private training and consulting agencies. The farmers involved in the project are implementing various practices and techniques, including conservative and minimum tillage, sub-superficial distribution of the digestate, digestate microfiltration, combined use of double-crops, cover-crops and catch-crops and of conventional and alternative multiannual species. The field tests are due to be evaluated in the first half of 2020.

The initiative benefitted from RDP support through measures M1 on knowledge transfer and information activities, and M16.1 on support for the establishment and operation of EIP-AGRI Operational Groups. This example of a local initiative aimed at increasing soil carbon sequestration could be supported under the future CAP by making use of one of the voluntary agri-environment-climate commitments planned to be available within the Strategic Plans of each Member State. The EAFRD Projects Brochure on the 'Bioeconomy' showcases interesting projects for the production of sustainable biogas that have benefited from RDP funding and could be replicated further under the future post-2020 CAP.

Further information:

EAFRD Projects Brochure 'Bioeconomy' (2019), https://enrd.ec.europa.eu/publications/eafrd-projects-brochure-bioeconomy_en

EIP-AGRI Operational Group database: https://ec.europa.eu/eip/agriculture/en/find-connect/projects/smartgas

(8) https://ec.europa.eu/clima/policies/adaptation/what_en

EU INITIATIVES RELEVANT TO RURAL CLIMATE ACTION POST-2020

Overarching

- European Green Deal (2019) and related initiatives – Farm to Fork Strategy and EU Biodiversity Strategy for 2030 (2020)
- European Climate Law (proposal for a Regulation)
- European Climate Pact (2020)

Climate mitigation

- 2030 Climate and Energy Framework (2018);
- Land Use, Land Use Change and Forestry (LULUCF) Regulation (2018);
- Effort Sharing Regulation (2018). This sets mandatory 2030 targets for Member States' non-ETS and non-LULUCF emissions and the trajectory to reach them;
- Emission Trading Scheme (ETS);
- Recast Renewable Energy Directive (RED II) (2018). The Directive sets out sustainability criteria for all types of biomass for energy, including biofuels, bioliquids, biogas and solid biomass. This has significant implications for the agricultural (and forestry) sector by driving demand for biomass in the energy and gas sectors.

Climate adaptation

- EU Strategy on Adaptation (2021). The new Strategy sets out how the European Union can adapt to the impacts of climate change and become climate resilient by 2050.

Source: Author's compilation based on the official legislative texts.

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FURTHER INFORMATION

The ENRD Thematic Group (TG) on Bioeconomy and Climate Action in Rural Areas,[8] which ran until July 2020, brought together rural development practitioners from different Member States to examine which types of activities within rural bioeconomy value chains provide the most significant climate benefits. Its objective was to identify how such activities can be supported under current RDPs and through relevant interventions under the post-2020 CAP Strategic Plans.

The TG produeced a Factsheet on The Economic Value of Climate Action within the Rural Bioeconomy: https://enrd.ec.europa.eu/publications/economic-value-climate-action-within-rural-bioeconomy_en

It also produced a Factsheet on *Delivering Climate Change Mitigation and Rural Development – Lessons from EAFRD Support 2014-2020*, https://enrd.ec.europa.eu/publications/delivering-climate-change-mitigation-and-rural-development-lessons-eafrd-support-2014_en

As a complement to the work of the TG, the ENRD's Rural Bioeconomy Portal[9] is a useful repository of European and national policy documents, bioeconomy project examples, news and events about the rural bioeconomy.

A new ENRD TG (2020-2021) is looking at the European Green Deal in rural areas: https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/european-green-deal-rural-areas_en

(9) https://enrd.ec.europa.eu/enrd-thematic-work/greening-rural-economy/bioeconomy_en

(10) https://enrd.ec.europa.eu/greening-rural-economy/bioeconomy/rural-bioeconomy-portal_en

6. CAP climate and other environmental goals

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RDPs offer opportunities for synergies when addressing different environmental goals, including soil health, water quality and biodiversity. This article discusses the ways in which the CAP has evolved to support action on environment and climate, focusing on water, renewable energy, bioeconomy, biodiversity and resource efficiency. It illustrates how different policy instruments work in practice and how they can work together – including under the future CAP Strategic Plans - to achieve a more sustainable future development.

BY JOHN M BRYDEN AND KAREN REFSGAARD

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INTRODUCTION

European action to address growing problems relating to the natural environment and climate change started with the first Action Programme for the environment in 1973 and has intensified ever since.

After 1990, the requirement to integrate EU environmental objectives in all common policies led to important reforms of the Common Agricultural Policy (CAP).

Reviewing the impacts of its policies, the Commission's 2018 proposals for the future of the CAP recognised that, while the CAP had been relatively successful, more had to be done in the future to respect further EU commitments to cut greenhouse gas emissions, reduce pressures on key natural resources,[1] and improve farm and forest biodiversity. The need for improvements is also emphasised in, among others, the State of the European Environment[2] report and in the Court of Auditors report on Greening.[3]

Since 2013, both Pillars I and II of the CAP contain instruments aiming to enhance its environmental performance (see article 5 of this publication, page 32).

The following pages look at all the elements required for the development of a circular, sustainable and resource-efficient society and assesses both where synergies can be enhanced and what lies ahead.

WATER

Clean water is important for plants, wildlife, human consumption, recreational and commercial activities in rural as well as urban areas.

Agriculture accounts for around 44% of total water use in the EU[4] and is the largest source of nutrient pollution in water in Europe. Agriculture therefore has a major role to play in the sustainable management of water quantity and quality.[5]

The EU policy is to support sustainable agricultural production while mitigating the impact on water and ensuring that water-related ecosystems are protected, managed and used sustainably. The delicate balance between agriculture and water-related objectives has been addressed at EU level by the evolving

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(1) See https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/cap-post-2020-environ-benefits-simplification_en.pdf

(2) European Environment Agency (2019) *The European environment - state and outlook 2020: knowledge for transition to a sustainable Europe*, https://www.eea.europa.eu/soer/2020

(3) European Court of Auditors (2017) *Special Report 21/2017, Greening: a more complex income support scheme, not yet environmentally effective*, https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=44179

(4) https://www.globalagriculture.org/report-topics/water.html

(5) See also *European Commission (2019) Evaluation of the impact of the CAP on water*, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/ext-eval-water-final-report_2020_en.pdf

EU environmental and agricultural legislation, in particular the Water Framework Directive and the Common Agricultural Policy (CAP).[6]

The CAP has addressed pollution arising from agriculture and water issues through:

- Cross compliance and greening, which link payment of subsidies with specific environmental requirements; and
- The European Agricultural Fund for Rural Development (EAFRD) which incentivises actions going beyond regulatory compliance.

While there is still scope for improvement, it is interesting to note that cross-compliance plays an important potential role because of the encouragement it gives to farmers to comply with relevant legislation and good practice rules without expenditure.

The Swedish example on this page shows how agronomic practices that reduce nutrition leakage to waterbodies can also lead to reduced GHG emissions and illustrates the synergies that can exist between measures mainly aimed at water pollution, but which also reduce GHG emissions. In a similar vein, the Norwegian case on page 43 illustrates how synergies can be developed to stop pollution while encouraging local development as well as enhancing quality of life and biodiversity, and ultimately reducing climate emissions.

The complexity of multiple goals, interests, governance structures and policies involved in water management illustrate the challenges to sustainable development, green growth and the circular economy. The case of the Morsa river basin (page 43) highlights the importance of a collective local approach, coordinated policies at all levels and the importance of combining natural and social science.

© Greppa Näringen-Focus on Nutrients

GREPPA NÄRINGEN (SWEDEN)

The Swedish Greppa Näringen farm advisory project (Focus on Nutrients), financed by the Swedish RDP 2014-20, aims to reduce GHG emissions and eutrophication by improving the efficiency of nutrient management on farms. Free advice on good practices is provided during regular farm visits. At the end, the farm's nutrient balance is calculated, to show changes in nutrient excess and nitrogen leaking.

Through the use of key indicators, the farmer gets a good idea of which management practices can increase resource efficiency, reduce costs, increase profitability and lead to fewer emissions and nutrients leaking into the environment. The project promotes measures required by quality labelling organisations, Svenskt Sigill and KRAV.

Further information:

ENRD Factsheet *Monitoring data and raising awareness of rural actors* contribution to climate action', https://enrd.ec.europa.eu/publications/monitoring-data-and-raising-awareness-rural-actors-contribution-climate-action_en

(6) European Commission (2019) *Fitness check of the Water Framework Directive, its associated Directives, and the Floods Directive*, https://ec.europa.eu/info/news/evaluation-eu-water-legislation-concludes-it-broadly-fit-purpose-implementation-needs-speed-2019-dec-12_en

MORSA RIVER BASIN (NORWAY)

Morsa is a large river basin comprising 80% forest and 16% agricultural land in south-east Norway. It covers nine municipalities and two counties, serving around 65 000 people.

In 1999 the watershed suffered from chemical pollution, a top-down and separated management and divisions between stakeholders. These three issues were solved through collective action by stakeholders from local governments, national water, energy and food authorities, the inter-municipal drinking water association; the nearby paper mill; the farmers' association and NGOs.

Organising a collective multi-level local water governance helped stakeholders develop mutual trust. They analysed abatement measures objectively and based on sound scientific evidence. Collectively they agreed on the sources of water pollution, the split between sources/sectors and the actions to take.

By the time the new river basin plan was presented in 2003:

- Plans for waste water treatment were put in place in every municipality;
- Agri-environmental plans for agriculture were adopted at municipal and regional level; and
- An action plan for Morsa was adopted by local authorities.

Collective action led to common local regulations and control systems and a common monitoring programme for the whole river basin. This resulted in clean water for all, a perfect illustration of how efficient synergies can bring a plethora of societal benefits.

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CLIMATE EMISSIONS – RENEWABLE ENERGY

Renewable energy has been seen in recent years as an important way of reducing greenhouse gas emissions and air pollution, and also as a new source of rural innovation and development (OECD, 2012).

In December 2018, the revised Renewable Energy Directive (RED II) entered into force raising the overall EU target for energy consumption from renewable energy sources to 32% by 2030. Recital 2 of RED II refers to the opportunities for renewable energy in remote and rural regions. An important innovation in RED II was the recognition of community energy as an important contributor both to renewable energy goals and to rural development. The EU Green Deal[7] goes further and aims to cut greenhouse gas emissions to net zero by 2050, among other things through further expansion of green energy and decarbonisation.

In 2019, renewable energy represented 19.7% of energy consumed in the EU-27, only 0.3% short of the 2020 target of 20%.[8] However, the targets for emissions reduction for 2030 and, especially, 2050 under the new Green Deal are challenging, and imply ever greater efforts on both energy saving and renewable energy. Moreover, the potential synergies between renewable energy and environmental and rural development goals have not yet been sufficiently realised.[9]

Renewable energy is supported at EU level through quotas for admixture of renewables in energy mixes and other regulatory tools through the Renewable Energy Directives, as well as through the emerging European Energy Market. Investment support is also provided through EAFRD (Priority 5 - resource efficiency, climate resilient economy) and ERDF. Renewable energy is further supported at regional and municipal levels in many EU countries through planning and other mechanisms, such as municipal district heating systems where renewables are now often used, building insulation rules and other regulations on new buildings' energy efficiency.

The Polish project described on page 44 encourages the shift to renewable energy as a way to improve air quality and reduce GHG emissions. In addition to the synergies between reduced carbon emissions, climate change and health, local renewable energy production can create new jobs and income for rural people (see also article 3 of this publication, page 20).

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

(8) https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics

(9) European Court of Auditors (2018) *Special Report 05/2018 Renewable energy for sustainable rural development: significant potential synergies, but mostly unrealised,* https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=44963

RENEWABLE ENERGY SOURCES AS AN OPPORTUNITY TO IMPROVE AIR QUALITY (POLAND)

This EAFRD project was funded under RDP Measure 20 - Technical Assistance (facilitating knowledge exchange between entities participating in rural development and sharing and dissemination of findings). It encourages the shift to renewable energy to improve air quality and reduce GHG emissions by raising awareness among the inhabitants of Poland's Wielkopolska region.

It offers training for agricultural advisors, representatives of local governments, Local Action Groups and farmers to encourage the use of renewable energy in businesses, municipal investments, construction and transport in rural areas.

A 'RES guide' - a compendium of knowledge about renewable energy sources is provided to training participants, agricultural and forestry school students and rural residents. They receive information about air quality improvement, the use of renewable energy technologies and their application in private projects and private business.

https://www.cdr.gov.pl/aktualnosci/57-cdr-informuje/3081-konkurs-naukowy-wiedzy-o-oze

Climate emissions – The circular bioeconomy

The circular bioeconomy, deployed at local levels, has evolved as an important part of the EU bioeconomy strategy.(10) The bioeconomy is at one and the same time seen as a new opportunity for rural regions, a means of reducing reliance on fossil fuels and so of reducing climate gas emissions, a route for improving resource efficiency and as a key part of the circular economy. This means that waste streams (including emissions) are minimised by becoming resources for new processes producing many everyday items including fuels, pharmaceuticals, building materials, bioplastics, and other materials including energy.(11)(12) A Circular Economy Action Plan is also part of the new European Green Deal.(13)

RDPs can help in the sphere of circular bioeconomy in rural regions, as identified by the ENRD Thematic Group on 'Mainstreaming the bioeconomy'.(14)

If the circular bioeconomy is to lead to environmental, social and economic sustainability, it is particularly important to avoid the mistakes caused by a lack of joined-up governance identified in the OECD and ECA reports on renewable energy. This conclusion is reinforced by the GreenLab case from Denmark (see box page 45). In Denmark, there were 578 694 jobs in the bioeconomy in 2017, which is 20% of the total number of jobs in the country. 70 738 jobs were in traditional bioeconomy sectors of agriculture, forestry and fishing, and 507 956 jobs in other bioeconomy sectors.

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(10) European *Commission (2018) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A sustainable Bioeconomy for Europe: Strengthening the connection between economy, society and the environment* (COM/2018/673), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0673

(11) K. Refsgaard, J. Teräs, M. Kull, G. Oddsson, T. Jóhannesson, I. Kristensen (2018), 'The rapidly developing bioeconomy', in *State of the Nordic Region*, J. Grunfelder, L. Rispling and G. Norlén, Red., Stockholm, Nordic Council of Ministers, 2018, pp. 146-159, https://www.norden.org/en/publication/state-nordic-region-2018

(12) Karen Refsgaard, Michael Kull, Elin Slätmo, Bjørn Tore Erdal, Torfi Jóhannesson, Þór Sigfússon and Thea Lyng Thomsen (2020), 'The biobased circular economy - employment and other outcomes', in State of the Nordic Region (2020) https://pub.norden.org/nord2020-001/#18513

(13) https://ec.europa.eu/commission/presscorner/detail/en/fs_20_437

(14) https://enrd.ec.europa.eu/publications/recommendations-use-rdps-mainstream-bioeconomy_en

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GREENLAB (DENMARK)

GreenLab is a local circular bioeconomy initiative in the rural Midtjylland region of Denmark.

Funded through a public-private partnership, GreenLab is an industrial green business park, a national research facility, and a technology enabler. It generates green, sustainable energy for the industrial park businesses and partners. The green energy is stored – in the form of power, heat and electrofuels – to be used when needed. An intelligent grid of energy and data allows the industrial business park to share the surplus energy.

GreenLab's infrastructure and proactive identification of waste streams creates synergies between renewable energy, blue biomass, synthetic fuels and chemical products produced from non-recyclable waste. Its carbon emissions are less than half of comparable activities, thanks to the introduction of new local products and processes and energy-saving systems in particular while also delivering improved water quality, reducing waste and providing additional income and jobs to the rural community.

According to GreenLab's Thea Lyng Thomsen "the green transition is not only a feasible, but also a profitable, solution. Being a first mover always puts you in a challenging position, but all that is needed is a continuous dialogue at all levels."

https://www.greenlab.dk

Biodiversity

Biodiversity is good for humans and nature because it helps protect water resources, soils, ecosystems and resilience. It also helps to store and recycle soil nutrients and contributes to climate stability. Greater biodiversity helps us maintain healthy food supplies and diets, reduce chemical use in farming, and clean up water. Encouraging biodiversity thus creates synergies with climate, nutrition, health and water goals.

Pollution and loss of habitats are the major causes of contemporary loss of biodiversity.

The current CAP framework aims to increase biodiversity through the Green payments, cross-compliance and RDP measures for ecosystems.[15] The Green payments have rules about crop diversity to improve soil quality, and the maintenance of permanent grassland, which both sequesters

(15) See article 5 of this EU Rural Review, page 32.

carbon and helps biodiversity. The menu of 19 types of Ecological Focus Areas (EFAs) include, among other things, provision for landscape elements and buffer strips that can be important for biodiversity.

The Italian example on this page shows how RDP measures can be used to adapt to climate change (and its impacts, like new insect threats) without harming biodiversity.

The need for joint, collective and cooperative approaches to biodiversity improvement has been recognised for many years – for example in relation to wildlife corridors, which usually need to cross several farm and even non-farm boundaries. For the 2014-2020 period, it became possible to fund these approaches within the RDP framework. The most widely discussed 'collective/cooperative approach' is the one taken by the Dutch government for the delivery of their Agri-Environment-Climate Measure (AECM) from 2016 onwards (see box page 47). This is a very specific example where AECM agreements, focused on biodiversity conservation, are delivered via 40 certified collectives accepted as the beneficiaries of the AECM support. There is room for a significant expansion of this type of approach in the future.

As with other areas of environmental and climate action, more needs to be done if future sustainable development goals and targets are to be met. This is emphasised in the ECA reports on Greening and Agri-Environment, as well as in the EEA State of Environment reports. The possible reforms include a better intervention logic for CAP measures, shared agreement on the principles for action, tougher compliance penalties, and specific targets for biodiversity. In addition, measures that support local collective action could be strengthened to add value to individual farm action, which is often at too small a scale to make a difference.

© Bioconvito

BIOCONVITO (ITALY)

The EAFRD-funded project BIOCONVITO (2016-2018) promotes effective and eco-friendly grapevine pest control techniques in the Bolgheri region of Tuscany.

A cooperative effort between a university, industry and wine growers, it aims to manage growing pest populations due to warmer temperatures, while reducing pesticide use to protect the environment and human health. It applies tailor-made biological control strategies (joint use of biological control agents and mating disruption) on high-value vineyards thereby reducing pesticides, benefiting farmers' health and the environment while minimising residues in grape and wine.

https://enrd.ec.europa.eu/projects-practice/introducing-and-testing-biological-pest-control-techniques-wine-producing-sector_en

THE COOPERATIVE APPROACH UNDER THE DUTCH AGRI-ENVIRONMENT-CLIMATE SCHEME

In 2016, the Dutch government, realising that the decline in farmland biodiversity could only be reversed through a cross farm approach, introduced a new scheme for Agri-Environment-Climate Measures. Individual applications were no longer possible and only joint applications were accepted. This cooperative approach had an objective to deliver better value for money, improve scheme results and lower implementation costs.

Under the scheme, the government signs a six-year result-based contract with regional cooperatives, sets the agri-environment targets and describes the types of conservation activities to be used to achieve these targets. The cooperatives then conclude contracts with individual land users and fine-tune the conservation activities and payments for the local specificities.

This flexible approach successfully increased the compliance levels and environmental output, and lowered the Paying Agency's expenses and error rates.

https://enrd.ec.europa.eu/sites/enrd/files/w12_collective-approach_nl.pdf

RESOURCE EFFICIENCY

Resource efficiency is key for climate change mitigation and adaptation, for efforts to de-couple economic growth from harmful environmental impacts, and for the long-term functioning of agriculture and forestry.[16]

Resource efficiency consists of:

- improving soil and water quality through efficient land and nutrient management;
- improving water use efficiency to reduce the pressure on water systems and improve water availability; and
- carbon conservation and sequestration in soils.

Both the EU's cross-compliance and RDP measures help achieve resource efficiency objectives. But complementarity with other policies is also important, because building a truly sustainable and resource-efficient rural economy requires multi-stakeholder engagement, involving actors along agri-food supply chains from farmers to consumers and also policy-makers. Healthy soil gives better yields, helps mitigate climate change effects and improve the resilience of agriculture. The Finnish project featured below is an example of using RDPs to achieve these synergetic results.

© OSMO

OSMO (FINLAND)

Farmer know-how and the soil's ability to grow are the most important agricultural resources. The EAFRD-funded project OSMO (2015-2018) improved farmers' soil management skills and know-how on profitable and resource-efficient farming.

The project took place in four Finnish regions with different types of soil and was led by a team of experts in agriculture, horticulture, soil management, farmer education and rural advisory services.

It tested methods to assess soil health, organised training/education activities for farmers, and developed and disseminated practical tools and study materials for planning soil health management. The exchange of knowledge among the participants was also encouraged.

https://enrd.ec.europa.eu/projects-practice/osmo-resource-efficient-agricultural-soil-management-collaborative-network_en

(16) See the United Nations' Sustainable Development Goals and the Cork 2.0 Declaration. See also chapter 2 of this EU Rural Review on 'Climate-smart agriculture and forestry' (page 11)

CONCLUSIONS AND PATHWAYS AHEAD

The examples presented above illustrate the origins of the CAP and other related interventions designed to address climate and environment goals over a prolonged period. They also show that CAP actions that target other types of environmental benefit can have complementary benefits for climate. They further show that these interventions are still relevant and in use, which validates the approach of CAP (and associated) reforms leading through to the new EU Green Deal.

The Green Deal suggests that efforts to move the CAP into a more economically, environmentally and socially sustainable future will be intensified in the future. The Farm-to-Fork[17] and Biodiversity strategies[18] are a case in point as they address the most pressing issues relevant to Europe's agriculture – respectively making the European food system the global standard for sustainability and developing a far-reaching EU nature restoration plan to reverse the growing loss of biodiversity.

The COVID-19 pandemic has demonstrated both the fragility of the global system, and the need to adapt rapidly to a changing world. The CAP beyond 2020 will be an important streamlined instrument in managing the transition to sustainable food production systems while strengthening the efforts of farmers to contribute to the climate objectives of the EU and protect the environment.

Finally, experience shows that joined-up thinking and better coordination among sectoral policies at all governance levels will seek to facilitate synergies and eventually lead to more effective interventions in Europe's just transition to the 2050 horizon.

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(17) https://ec.europa.eu/food/farm2fork_en

(18) https://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm

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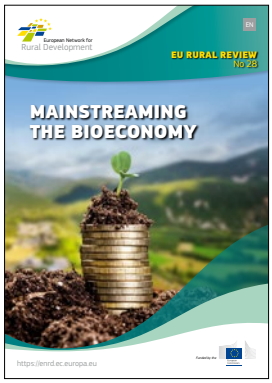
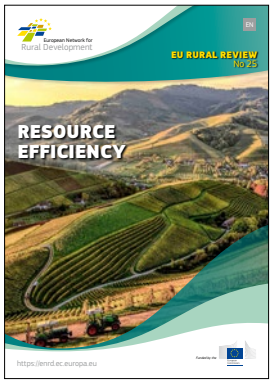


EU Rural Review 25
'Resource Efficiency'



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