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Greenhouse gas emissions and rural development in the EU

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Climate change objectives are now featured in a wide range of policies, including the European Rural Development Programme, which promotes sustainable agricultural interventions. This study describes the net greenhouse gas emissions for these interventions across Europe. The findings could help policymakers to better meet multiple social, economic and environmental objectives, although the authors say a broader perspective may be needed to determine the overall benefit of interventions.

Climate change has become an increasing political priority over recent years. Today, its objectives are embedded in a host of policies. In Europe for example, the 2020 strategy is tackling climate change as one of its five targets. In this context, mitigation (actions to reduce greenhouse gas (GHG) emissions), and adaptation (actions that increase the capacity to adapt to changes in climate), are key objectives.

As agriculture and land use change are a significant source of GHG emissions (9% of EU emissions and 30% globally), attempts have been made to integrate mitigation and adaptation objectives into agricultural policies. In Europe, the Commission has mainstreamed climate change objectives into its Common Agricultural Policy, including its Rural Development Programmes (RDPs).

RDPs are multi-faceted; they aim to tackle social, economic and environmental objectives in the rural sector. The addition of climate change objectives increases complexity further, and makes it difficult to predict the effectiveness of different actions within RDPs, due to the highly variable nature of GHG emissions, spatially and temporally.

To better understand this variability and help to formulate policies that address GHG emissions from the rural sector, researchers determined the GHG emissions associated with different land-use operations across Europe. The authors calculated the GHG emissions associated with the measures outlined by EU Rural Development regulation. The regulation outlines around 20 measures that Member States can use to formulate their RDPs, such as afforestation. Within these broad measures, specific activities or 'operations' are encouraged. These include converting arable land to grassland, establishing beetle banks and reducing use of inorganic fertilisers.

The authors estimated the GHG emission profiles of 130 of these operations. The estimates were made using a software tool called Optimal Strategies for Climate change Action in Rural Areas (OSCAR).[1] OSCAR was developed to help EU authorities to integrate climate change objectives into RDP measures and operations after 2013, and was adapted for this study to derive net GHG emissions for rural development operations in 1281 regions across the EU-27.

A number of noteworthy findings were made regarding the operations, which were classified into five categories:

- **Long-term benefit:** *There is a net decrease in emissions across all time periods.* Several operations decreased net GHG emissions, including creation of woodland, grassland and beetle banks, hedgerow management, and lower input agricultural systems.
- **Short-term burden, long-term benefit:** *Net increase in emissions in the first year, followed by a net decrease.* Some operations take up to five years before a net decrease in emissions occurs, including management of ancient trees, creation/restoration of grassland and hedgerow planting on arable land.

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- **Medium-term burden, long-term benefit:** *Net increase in emissions over 50–100 years, followed by a decrease.* In some circumstances, the time taken before a decrease in emissions occurs can be longer. For example, adding pollen and nectar seed mixtures to grassland may take up to 150 years to reduce emissions.
- **Variable benefit/burden:** *Emissions depend on location and time.* Some actions showed variable benefits. There may be an overall decrease, but certain areas where emissions increase.
- **Long-term burden:** *Net increase in emissions.* For many operations, there is no decrease in emissions. These tend to have specific environmental objectives, leading to a trade-off with GHG emissions. Examples include forest management activities to improve woodland and activities to cultivate grassland.

It is important to note some limitations to the study. In order to develop a system that could be used for practical decision making, the software used for the analysis involved broad classifications, generalisations and interpolation of data. As a result, the accuracy of the emissions estimates could be questioned. The software also applied simplifications. For example, it only used winter wheat as the baseline for an RDP operation applicable to arable land, while there are other crops that could be used. Finally, the study gave limited considerations to the spatial development of GHG emissions, such as the displacement of activities (and thus emissions). For example, the removal of livestock may simply result in livestock production (and associated emissions) being moved elsewhere. The authors suggest a broader and more strategic perspective may therefore be needed to determine the overall benefit of operations for emissions reductions.

Despite these limitations, the analysis made a number of important findings. The researchers say operations that reduce net GHG emissions in the short and long term and in all regions can be desirable. However, when aiming to meet multiple objectives, such as is the case with the RDP, the authors say it is important to acknowledge that activities that only reduce emissions may not always be practical, or indeed possible. In some cases, policymakers may have to accept an increase in GHG emissions to meet other objectives, and vice-versa. The authors say it is important to evaluate the net GHG emissions of all operations (not only those aimed at climate change mitigation) in order to choose those with the least environmental burden for any given circumstance and facilitate the development of optimal solutions.