Land use change to reduce greenhouse gas emissions in Europe

A recent analysis has summarised the findings of a range of studies into land-based strategies to reduce greenhouse gas (GHG) emissions. The compiled findings suggest that expanding forests and using traditional agricultural land to grow bioenergy crops instead could contribute between 13-52 per cent of the EU’s 20 per cent GHG reduction target. However, limitations to the scope of many land use change studies leave a question mark over these figures.

Land use change is often associated with increased GHG emissions, but it has also been proposed as a means of reducing emissions, whether directly or indirectly, depending on how the land is used. For example, land can be afforested/reforested, forests can be managed to increase carbon stocks, agricultural land can be used to grow bioenergy crops and using farming practices which sequester carbon in soils.

The researchers, supported by the EU TranSust.Scan project, surveyed studies which analyses GHG reductions from converting agricultural land to forests or for growing bioenergy crops. The results from all studies were rescaled into an estimate for the EU-25, which created a wide range of values. The authors emphasise that land is a finite resource. Ideally, the competing demands of bioenergy, afforestation and food production should be studied jointly. Unfortunately, many studies in the past have not accounted for competing demands or the indirect consequences of land use change, for example, the transfer of food production to other countries following establishment of biofuel crops.

The potential of using land to mitigate carbon emissions in Europe depends on how much land is available. In theory, about 88 per cent (339.8 million hectares) of total land area in the EU-25 would be suitable for conversion to forests or for growing bioenergy crops. However, the actual amount available for use depends on competing requirements for the land, especially for growing food. Other issues include the cost of conversion and the effects of climate and social policies. For bioenergy crops, the estimated yields and technology for producing bioenergy are also significant factors.

The studies suggest that between 7 to 23 per cent of land currently used for agriculture in the EU-25 could potentially be diverted to forestland by 2050. Estimated amounts of sequestered carbon in the period 2050-2100 through increasing forest cover thus vary widely, ranging from about 20 million tonnes of carbon per year (MtCyr⁻¹) to about 150 MtCyr⁻¹.

Changing farm management practices could sequester carbon in agricultural soils. For example, by converting arable land to grassland, setting aside land or using low- or no-tille systems (no ploughing) systems. No-tillage systems offer the most potential by preventing carbon release from soil. They could be used on 86 per cent of arable land in Europe, with a potential to sequester 40.4 MTCyr⁻¹ over 50-100 years.

Estimates of land available to grow bioenergy crops varied widely among the different studies. According to the European Environment Agency (EEA), by 2030 there will be approximately 19 million hectares of land available for bioenergy crops in the EU-25. Land resource demand for bioenergy crops in the EU-25 could be between 4 to 18 per cent by 2025 and between 13 to 27 per cent by 2050. Although there is much uncertainty about the carbon savings that could be made through using biofuels, with much depending on the land used to grow biofuel crops, the studies suggest they could avoid between 19 and 59 MtCyr⁻¹ of GHGs in the period 2005-2010, rising to 100-130 MtCyr⁻¹ by 2030. However, limitations to some of the studies surveyed place such figures under debate. Future research should focus on providing a more complete picture of land use change.

1. See: http://ec.europa.eu/environment/climat/climate_action.htm
2. TranSust.Scan was supported by the European Commission under the Sixth Framework Programme. www.transust.org/transust.scan.htm


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