Bioenergy: an Essential Resource in Future Energy Portfolios

A recent review of bioenergy highlights the role of energy produced from wood, crops and biomass residues in contributing to future reductions in greenhouse gas emissions. Results suggest that bioenergy could make significant contributions to world energy consumption in 2050, with an increasing share of bioenergy coming from energy crops. Energy use from biomass could also fill up to 20% of the gap between projected greenhouse gas emissions and those required for a stabilization of atmospheric CO₂ concentrations at a targeted 550 parts per million, the threshold above which global warming may have serious consequences.

There is increasing concern about global warming and its potential impact on society, the economy and the environment. In this context, new and renewable energies have an important role to play in reducing greenhouse gas emissions. Currently, nearly 50% of the world's oil reserves have already been consumed and one alternative to oil and coal is the use of bioenergy, produced from resources such as wood, crops and biomass residues.

A recent global analysis carried out in Scotland analyses the current worldwide use of bioenergy and projected future trends. This review also explores scientific results concerning the advantages and disadvantages of the production of energy crops such as maize and sugar beet, including their potential contribution to future greenhouse gas emission reduction targets. Finally, the authors provide indications for how energy cropping might be integrated with sustainable agriculture in the future.

Bioenergy currently contributes up to 13.4% of world energy use and several countries have established targets for the use of fuels produced from biomass. For example, the European Directive of 2003 on biofuels requires a voluntary market share of 5.75% for biofuels in each member state by 2010. The researchers predict that in 2050 the demand for bioenergy would be 5 to 10 times higher than current demand. This demand for bioenergy corresponds to around 25-30% of projected world energy demand in 2050.

Dedicated energy crops contribute relatively little to the overall energy supply from biomass energy but researchers expect their share to increase. The main problems that are expected to arise from the future widespread use of energy crops are a high demand for water and chemicals and a competition for land, especially in areas where there is a shortage of food.

On the other hand, the authors argue that energy crops could also provide environmental, social and economic benefits. For example, energy crop production could reduce the pressure on finite natural resources, provide support for rural communities and reduce dependency on imported oil.

The authors highlight that an important benefit of energy crop use is its role in reducing greenhouse gas emissions. According to scientists, this resource could contribute 0.5-20% of the necessary reductions in greenhouse gas emissions to close the gap between projected greenhouse gas emissions and those necessary to reach an atmospheric CO₂ stabilization target of 550 parts per million (ppm) by 2025, depending on the land dedicated to energy crop production. The CO₂ stabilization target of 550 ppm is believed to be the limit above which the most dramatic consequences of climate change could not be avoided.

Nevertheless, the experts argue that for energy crops to integrate with sustainable agriculture, their production has to be optimised rather than maximised. This will include the selection of more efficient species and varieties, the choice of perennial crops to reduce establishment costs, and the potential use of biotechnology to identify traits that can improve non-genetically modified energy crops.

The authors conclude that even though the use of energy crops alone cannot meet projected emission reduction targets, this energy resource will be an important component in any portfolio of measures to tackle climate change. Moreover, including bioenergy in the options for future energy production will decrease dependency on imported energy resources and improve the safety of the energy supply.

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Theme(s): Climate change and energy, agriculture
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To cite this article/service: "Science for Environment policy". European Commission DG Environment News Alert Service, edited by BIO Intelligence Service.