Rapid economic growth places unique challenges on Ireland as it seeks to meet its future energy needs as well as its Kyoto emissions targets. New research suggests that using willow and miscanthus as biofuel crops could reduce Ireland’s overall carbon emissions whilst securing long-term economic benefits.

Food crops, such as corn, are often used as feedstocks for biofuels such as ethanol. Food shortages and increased food prices are two of the problems recently attributed to the diversion of food crops for biofuel production. As a result, attention has turned to using non-food crops as a source of biomass for energy production. Willow and miscanthus (a tall grass similar to bamboo) are amongst the most promising sources of such biomass. Both willow and miscanthus are fast growing and can be burned to produce heat and steam to power turbines. The CO₂ emissions that result when these crops are burned are equal to the amount of CO₂ that they absorbed from the atmosphere during growth.

The researchers quantified the greenhouse gas (GHG) and economic consequences for Ireland of using willow and miscanthus for heat and electricity production. They performed life-cycle and economic analyses to quantify all GHG and economic impacts arising from changes in fuel-chains, land-uses, and carbon-credit purchase requirements for compliance with Kyoto and future GHG emissions targets.

Using these crops as biomass fuels could lead to annual emissions savings of between 7.7 and 35.2 tonnes of CO₂ per hectare of land converted to grow the crops. These savings were calculated from reduced fossil fuel use and land use change, after accounting for emissions attributable to growing, processing and transporting the biomass. Rapid economic growth has led to substantial increases Ireland’s energy requirements and GHG emissions since 1990. Consequently, Ireland will have to buy carbon credits to meet its EU targets, or work to quickly include new sustainable energy sources within the energy mix. A nominal cost of carbon credits of Euros 10 per tonne of CO₂ was used to calculate the national economic savings attributable to biomass CO₂ reductions.

The net financial costs or benefits likely to be realised by farmers and consumers switching to miscanthus and willow biomass were also calculated. Integrating these economic impacts for a range of possible land use and fuel combinations, the authors estimated that annual national economic benefits could equal Euro -457 to Euro 1,887 per hectare cultivated. The economic benefits of biomass heating are moderately dependent on oil and gas costs (an oil price of US Dollars 58 per barrel was assumed). Meanwhile, the economic benefits of electricity-generation are highly dependent on the trading price of CO₂ under the European Emission Trading Scheme (a value of Euro 20 per tonne was assumed). At current CO₂ prices, co-firing biomass with coal to generate electricity is more expensive than using coal alone. However, co-firing miscanthus with peat to generate electricity, and using willow woodchip instead of oil, gas and electric heating, could result in both economic and GHG benefits.

The Irish government began offering grants to farmers growing willow and miscanthus in 2007. To encourage farmers to grow energy crops, the authors recommend extending current subsidy schemes, and adding modest and well-targeted financial support and regulation. Grants are also available to install wood boilers (for burning willow and other wood) in homes and commercial premises. This could be extended to include combined heat and power plants. Using miscanthus and willow could contribute to Ireland’s EU commitments to generate at least 20 percent of its electricity from renewable sources, and emit 20 percent less GHG, by 2020. The authors conclude that growing these crops would represent a more efficient land use option than current liquid biofuel (e.g. ethanol) production from food crops.


Contact: dstyles@dpc.ie

Theme(s): Climate change & energy