Autumn 2015
Newsletter

Environment Centre | Lancaster University

What's Happening in...
Environmental & Earth Science

How Environmentally Friendly are Biofuels?

Generating the large quantities of energy required to maintain our current lifestyles without damaging the natural environment presents one of the greatest scientific challenges for the coming century. Burning fossil fuels like coal and oil releases large quantities of CO_2 into the atmosphere, contributing to climate change and ocean acidification. One approach to tackling this is through the cultivation of biofuels, which are carbon-neutral: the CO_2 released when they are burnt just replaces the CO_2 removed from the atmosphere by the plants when they were growing.

But does biofuel cultivation harm the environment? Atmospheric scientists at Lancaster have been exploring this using computer models that represent the chemical, physical and biological processes that control the Earth's atmosphere and land surface. Fast-growing plants like poplar and willow, which are grown for biofuel in Europe, release volatile organic compounds (VOCs) as they grow, leading to formation of atmospheric ozone. This pollutant damages plant and crop growth, and contributes to poor air quality, harming human health. This is in addition to the pollutants released into the air when the biofuels are transported, processed or used to generate energy.

Lancaster scientists have demonstrated that planting enough biofuel crops in Europe to meet 10% of European energy needs for 2020 from this source would lead to increases in ozone that would cause almost 1400 additional deaths and 8 million tonnes of crop losses per year. The cost of this damage could be as much as US$8.6 billion per year. These effects depend on where the biofuel crops are grown, with greater damages from planting in Western Europe than in Central or Eastern Europe. This information provides important scientific evidence for air quality and energy policy makers, allowing them to make more informed decisions to design legislation that will improve our lives into the future.

Our three-and four-year environmental and earth science degree programmes are built on the strong links between our research and teaching activities. Students learn about atmospheric science, weather and climate through lectures, laboratory activities and field work at our Hazelrigg Meteorological Station. They also have the opportunity to participate in our research activities in the UK and abroad during their dissertation projects. Linking research and teaching in this way provides our students with analytical and problem solving skills that are in high demand among employers.

For more details about the reports above or about Earth Science and Environmental Science programmes on offer at Lancaster University please contact the Environmental and Earth Science Admissions Staff,

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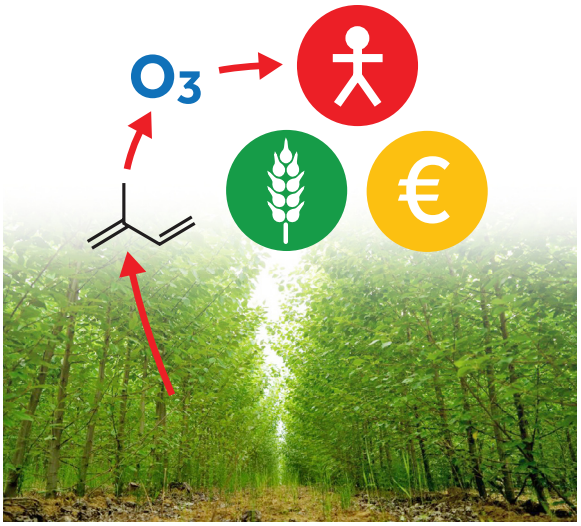
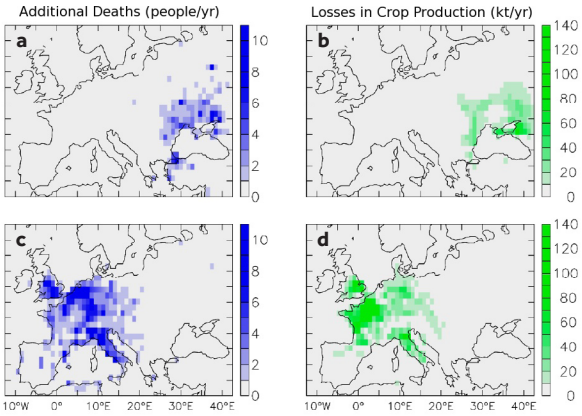
Email: **lec.ug@lancaster.ac.uk**
or see our website: **www.lancaster.ac.uk/lec**





Images. **Top:** Poplar plantations (image courtesy of Lignovis GmbH, via Wikimedia Commons (CC BY-SA 4.0)) lead to formation of atmospheric ozone (O_3) with impacts on human society and crop production. **Middle:** Modelled changes in human mortality and crop production differ greatly depending on cultivation of biofuel crops in Central/Eastern Europe (Figures a and b) versus Western Europe (Figures c and d). **Bottom:** Measuring gas exchange between plant leaves and the atmosphere in the laboratories at Lancaster.