Geophysical Research Abstracts
Vol. 13, EGU2011-11097, 2011
EGU General Assembly 2011

Effects of simulated climate change over energy crops in Ireland

Saul Otero Labarta (1), Dru Marsh (1), Gary Lanigan (2), and Bruce Osborne (1)

(1) School of Biology and Environmental Sciences, University College Dublin, Dublin, Ireland., (2) Johnstown Castle Environmental Research Center, Teagasc, Wexford, Ireland.

Anthropogenic emissions of greenhouse gas (GHG) have increased vastly in the last century, building up their concentration in the atmosphere. This change in the atmospheric composition is affecting Earth's energy balance and forcing climate change globally. In Ireland, change will be mild compared to other European countries, but some changes are predicted consisting mainly in drier and warmer summers followed by wetter and colder winters.

In order to mitigate climate change one of the most promising approaches is to produce fuels from crops in a carbon-neutral manner. The energy produced from these crops will reduce the amount fossil fuels that is burned, curbing GHG emissions. Energy crops are one of the key elements in achieving a carbon-neutral, independent energy economy and their use is increasing throughout Europe.

For Ireland, agricultural ecosystems are the biggest single contributor to GHG emissions. As climate change continues, we must improve our understanding of the ecophysiological responses to the changing environmental conditions of these ecosystems. Bioenergy crops will be used more extensively in the future as Ireland reduces its carbon profile, however, little information has been collected about the effect of climate change on these crops.

The aim of this work is to simulate the effects of drier and warmer summers in Ireland using rain-out shelters in two different stands of newly established energy crops. We measured GHG emissions at plot level as well as some other plant and soil properties in order to understand the response of ecosystems under these conditions. Two contrasting energy crops , *Miscanthus x giganteus* and *Phalaris arundinacea*, were compared to an undisturbed plot of semi-natural grassland used as control.

Preliminary data show significant differences in the response of the three crops in response to our induced environmental changes. All crops showed some water stress, confirming that the treatments were successful in limiting the water availability. Grassland showed a significant decrease in yield, *Phalaris* showed no changes while *Miscanthus* showed a much higher growth inside the shelters, demonstrating that temperature has a significant and contrasting impact. Soil properties also showed major changes depending on the crop and the treatment. In general terms, GHG emissions are higher inside the shelters from the soils while carbon assimilation through photosynthesis, as well as other physiological properties, is species dependent.

These results suggest that climate change is going to affect significantly the physiology of these crops, leading to changes in their GHG mitigation potential. More work, however, is needed in order to fully quantify the change in the GHG budgets.