

## Climate Change Research

by Prof. Chris Stoate, Allerton Project Head of Research

It is 13°C in the shade according to my thermometer, but less than a week to Christmas according to my children. It has been a warm year, the warmest on record, consistent with an alarming trend in recent years. We have also experienced yet another winter of heavy rain and flooding across much of the country.

At Loddington, along with much of the country, we have experienced exceptional waterlogging of soils in recent years, with effects on crop yields that have taken two years to recover. Wildlife species such as Little Egret, Nuthatch, Roesel's Bush-cricket and Lesser Marsh Grasshopper, all of which have expanded their range northwestwards, also continue to remind us of climate change.



Flooded fields beside the river Welland

In a paper\* published recently in Environmental Management, I joined other researchers from across Europe to explore the implications of climate change for water related issues. The paper was one outcome from an EU funded project, 'ClimateWater' in which we summarised the latest water-related climate change research for European policy makers.

Human demand for water is expected to increase substantially in the coming years because of an increasing population and pressure associated with climate change. Land use associated with food production is a major part of this process, and land management is increasingly recognised as being integrated with water related issues such as flood management and drinking water quality and supply.

This month's Paris climate change agreement has come none too soon. In fact the science tells us that it has come too late to avoid some devastating consequences for our species, and of course for countless others. Some aspects such as the important and increasing emissions associated with aviation and shipping have not been addressed at all.

That said, the agreement represents an enormous achievement on the part of those involved and marks a watershed in global climate change policy. It is hard to think of any research that is more important to our future than that on climate change issues. Finally that research is being translated into policy. The success of the agreement will depend not just on whether individual governments accept it as being legally binding, but on whether it serves as a real foundation for accelerating genuine climate change mitigation, and strategies for adaptation.

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The Alqueva Dam, Portugal, where tensions between food production and water are exacerbated by climate change

So what is our contribution to this effort at Loddington? Renewable energy is a core theme for our buildings, taking the form of wood fuel heating (using wood chip from our own woods) and photovoltaic panels for electricity generation, all of which were installed before the recent government cuts in support for renewable energy.

Straw bale and sheeps' wool insulation ensure that even wood fuel use is kept to a minimum. Teleconferences and home-working reduce greenhouse gas emissions associated with travel. Rainwater is also collected from the roof for flushing toilets and washing, thereby reducing pressure on treated drinking water supply.

Farmers locally are increasingly concerned about the health of their soils. Management that increases organic matter and improves soil structure increases the workability of the soil by cultivation equipment (reducing diesel use), enhances the capacity of the soil to retain moisture in summer and during winter rains, and helps to lock up carbon.

We anticipate that reducing the frequency and intensity of cultivations, as we are doing at Loddington, by introducing grass leys into the rotation and adopting a no-till approach where and when possible, is a particularly effective approach for achieving all of these objectives. We are gathering the relevant data at and around Loddington, and I will report on our research here over the coming year.

A particular focus for us this year is cover crops that are designed to reduce soil erosion during heavy rainfall, and contribute organic matter to the soil. We are testing cover crop mixtures grown as Ecological Focus Area under Common Agricultural Policy Greening requirements against other options for a range of criteria, including those associated with climate change adaptation and mitigation.

In our landscape scale Water Friendly Farming project, we continue to monitor water quality, and work closely with farmers to improve this by adopting methods that are compatible with, and wherever possible beneficial to their businesses. In the coming year, we also plan to explore the benefits of this approach to managing flood risk in urban areas downstream.

The long-awaited translation of climate change research into meaningful policy and action through the Paris climate change agreement provides additional impetus to strengthen our own research, and the practical application of our results.

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\*Garnier, M., Harper, D., Blaskovicova, L., Hancz, G., Janauer, G., Jolánkai, Z., Lanz, E., Lo Porto, A., Mándoki, M., Pataki, B., Rahuel, J-L., Robinson, V., Stoate, C., Tóth, E. & Jolánkai, G. 2015. Climate Change and European Water Bodies, a Review of Existing Gaps and Future Research Needs: Findings of the Climate Water Project. *Environmental Management* 56 (2): 271-285.

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