The Potential Impact of Climate Change in the Norfolk Arable Land Management Initiative (NALMI) Area over the next 30-50 Years

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This poster presents climate change scenarios up to the 2050s and related impacts for the NALMI area of Norfolk. In this work funded by the Countryside Agency we analysed the impacts of climate change upon the thirteen parishes of the NALMI Region.

The location of the thirteen parishes of the NALMI Region

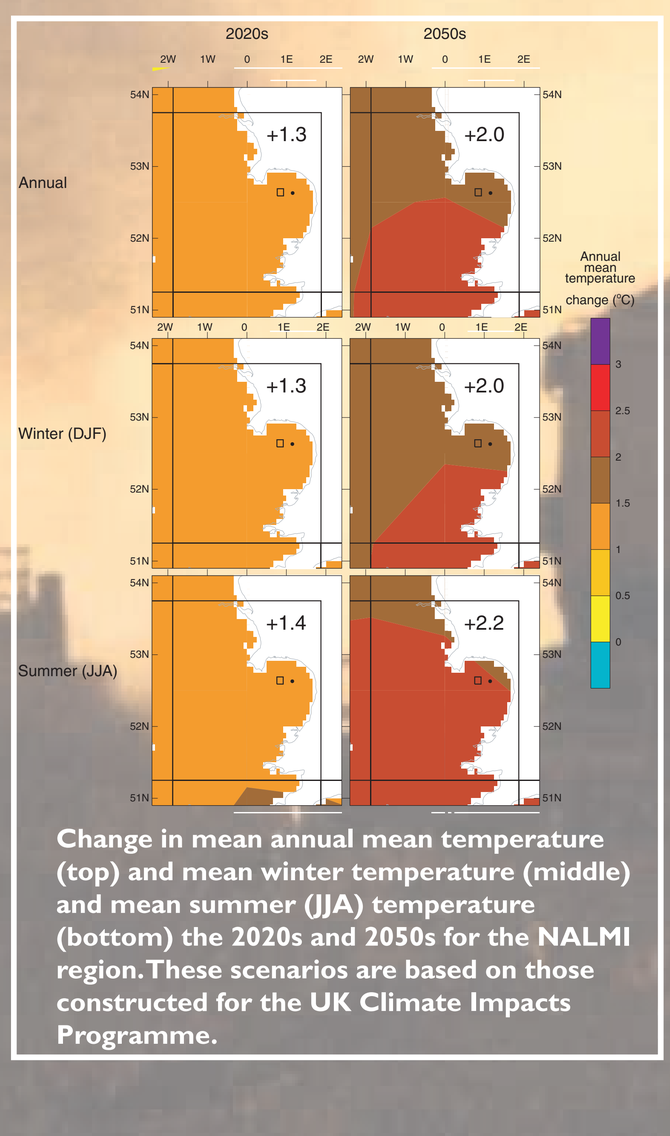
There is now an indisputable amount of evidence suggesting that the world's climate system is changing. Globally, present temperatures are now at their warmest for over a millennium. The increase over the 21st century will be between 0.2-0.3°C per decade.

The agricultural sector is relatively flexible and adaptable. Global and European studies have in fact shown that depending on which models and scenarios are used to assess the effects of climate change on agriculture, parts of the sector will be adversely affected by future climate change, whereas others may even benefit, perhaps substantially in some cases. Climate change will affect agriculture in three main ways:

- **By enhancing atmospheric CO_2 concentrations;**
- **By increasing ambient temperatures**;
- **By altering water regimes;**

The impact of these three mechanisms will be mediated by other subsidiary factors such as the state of the soil, market conditions, the presence of weeds and pests, etc. Predicting the combined effect of all these interacting factors is extremely difficult, since it will vary from crop to crop, and region to region.

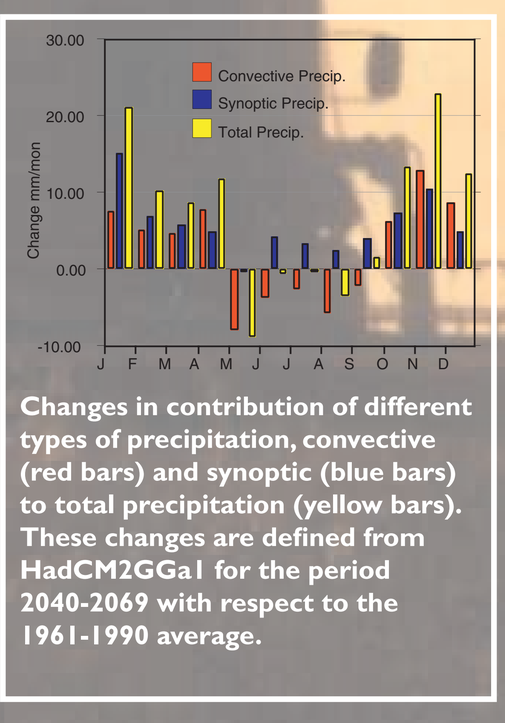
World-wide, the most affected areas will be tropical production systems where combinations of adverse weather conditions, reduced rainfall and erosion of the soils will decrease productivity. In a European context, one of the most significant impacts of climate change will be a pronounced northwards shift of crop species, agricultural practices and cultivars.



Change in mean annual mean temperature (top) and mean winter temperature (middle) and mean summer (JJA) temperature (bottom) the 2020s and 2050s for the NALMI region. These scenarios are based on those constructed for the UK Climate Impacts Programme.

For the NALMI area:

- Identifying the precise impacts in the NALMI area is complicated by the number of variables (both climate and non-climate) involved, and the uncertainties surrounding potential spill-over impacts from cognate sectors.
- Pressures on water supplies will be a growing problem in the region irrespective of climate change. At the moment the number of households in the region is predicted to rise steeply but the planning system is still to find a mechanisms to allocate the available water between and within different sectors. Climate change is likely to exacerbate these tensions.
- Climate change impacts will be both favourable and detrimental to the area. In dry years certain crops (e.g. cereals) can still fare well depending on water availability at the right time during crop growth.
- Animals are affected directly by extreme events such as heat stress etc. Summer droughts have a negative effect on forage, reducing livestock weights, disrupting milk production, reducing fertility. Warmer weather may also exacerbate some of the issues faced by farmers.
- The cropping of seed crops will probably expand northwards as the climate alters One response might be to sow crops (e.g. winter oilseed rape) earlier to avoid summer droughts. Sunflowers or more drought tolerant crops could be grown in the spring season.
- Root crops such as sugar beet are expected to thrive in high temperatures and CO_2 concentrations although this may be offset if summers are hot and very dry. Stresses such as water shortage during the main part of the growing season are currently a threat to the quality (skin finish and shape) of the crop.
- Parts of the NALMI area have soils which are susceptible to water erosion. However wider adoption of more erosion-prone crops (either current crops such as fodder maize, sugar beet or potatoes crops which might be attractive under a warmer climate, e.g. grain maize would greatly increase future water erosion on susceptible soils in the NALMI area. This would create severe off-farm water quality problems.

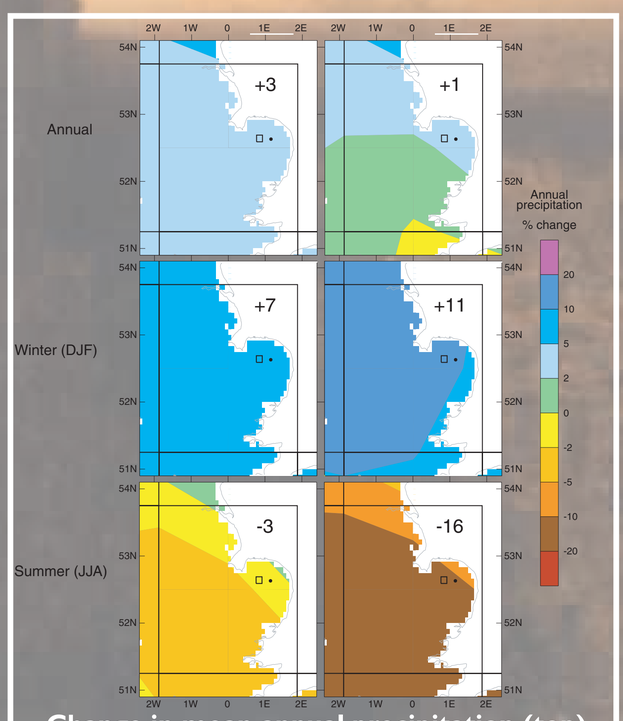


Changes in contribution of different types of precipitation, convective (red bars) and synoptic (blue bars) to total precipitation (yellow bars). These changes are defined from HadCM2GGa1 for the period 2040-2069 with respect to the 1961-1990 average.

There are large uncertainties in the future but there are means which can aid individuals and organisations in thinking about possible changes and options they may face in the future; as mentioned in the report. A scenarios approach as recommended by this study is one way of addressing this problem.

Conclusions

With a mixture of foresight and careful planning, the agricultural and farming sector is capable of adapting successfully to maximise the benefits of climate change and minimise the costs. Any initiatives undertaken in the NALMI area need to consider short and long term changes. This means acknowledging that climate change will be felt in the near future, which will require certain adaptation strategies, whilst in the longer term emphasising the need for mitigation strategies in addition to adaptation.



Change in mean annual precipitation (top) and mean winter precipitation (middle) and mean summer (JJA) precipitation (bottom) the 2020s and 2050s for the NALMI region.

Further reading:

Hulme M. and Jenkins G. **1998** *Climate Change Scenarios for the UK: Scientific Report*, UKCIP Technical Report No. 1, Climatic Research Unit, Norwich, 80pp.

Jordan, A., Lorenzoni, I., Hulme, M., O'Riordan, T. and Turner, R.K. **2000** *A Co-Evolutionary Approach to Climate Change Impact Assessment: A Scenario-Based Study in the UK*. CSERGE Working Paper. CSERGE, UEA: Norwich (in press).

Viner D., Jordan A., Lorenzoni I and Favis-Mortlock D. **2000** *The Potential Impact of Climate Change in the Norfolk Arable Land Management Initiative (NALMI) Area over the next 30-50 Years*. Report Prepared for the Countryside Agency. Publ. Climatic Research Unit, UEA, Norwich. UK.

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