UK 2012 Climate Change Risk Assessment

Agriculture

Sector Perspective

- Agriculture covers around 70% of the UK's total land area. Over half a million people are employed in UK agriculture, which contributes £7.1 billion to the UK economy. The Department for Environment, Food and Rural Affairs (Defra) is responsible for agricultural policy at UK Government level, but this responsibility is devolved to appropriate departments in Scotland, Wales and Northern Ireland.

- Many of the challenges facing the UK agriculture sector can be linked to socio-economic, environmental and technological trends and issues – with climate change being an exacerbating factor, rather than necessarily the driving force of change. Key challenges include food security (the ability to ensure all citizens have access to affordable, nutritious food), rising demand for food due to population growth, changing consumer preferences and compliance with regulations. Increasing energy prices may also present a significant challenge, together with international pressures and market competition.

- UK agriculture could be significantly affected by climate change. Rising temperatures and changing rainfall patterns, changes in sunshine levels and in concentrations of atmospheric carbon dioxide (CO_2), and increasing frequency of weather events currently considered extreme would all have an impact on operations, productivity and the range of products offered by the sector. Climate change could also affect global food production and have knock-on effects for UK agriculture and the food industry.

- Climate change may already be affecting crop yields in the UK. In future, producing food sustainably in a changing and uncertain climate may potentially become a major challenge. Other pressures facing the sector may be either exacerbated (e.g. water stress) or reduced (e.g. production potential) due to climate change.

- Accommodating change and uncertainty is a familiar feature of running an agricultural business. However, the potential impacts of climate change on UK agriculture may be intensified due to the strong interdependencies with other sectors. In particular, key issues facing the water sector (e.g. water availability, demand and quality issues) are also of primary importance to UK agriculture.

Agriculture

Climate change is projected to result in changes in temperature, rainfall patterns and sea levels, as detailed in the UK Climate Projections (UKCP09) analysis. Although most of the impacts on the agriculture sector may be negative, potentially valuable new opportunities may also arise that can benefit existing agricultural activities and encourage farm diversification.

The Climate Change Risk Assessment (CCRA) has completed an assessment of a range of impacts for which this sector may need to prepare. Some of the key points from this assessment are summarised here.

The results presented here do not take account of changes in society (e.g. population growth, economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans).

Focus on… Crops

Warmer temperatures and higher concentrations of CO_2 in the atmosphere would lead to higher yields of many crops currently grown in the UK. These benefits will not happen, however, if rising temperatures and lower summer rainfall result in increased heat stress to crops and significant decreases in soil moisture. In some cases, faster growth rates may reduce crop quality.

Overall, yields of crops such as wheat and sugar beet are projected to rise. Grass yields may also increase, although in some parts of England and Wales dry conditions may limit this. In Scotland and Northern Ireland, where water stress may be less of a problem, there is the potential for more significant increases in grass yields, which may prove beneficial for livestock and dairy producers.

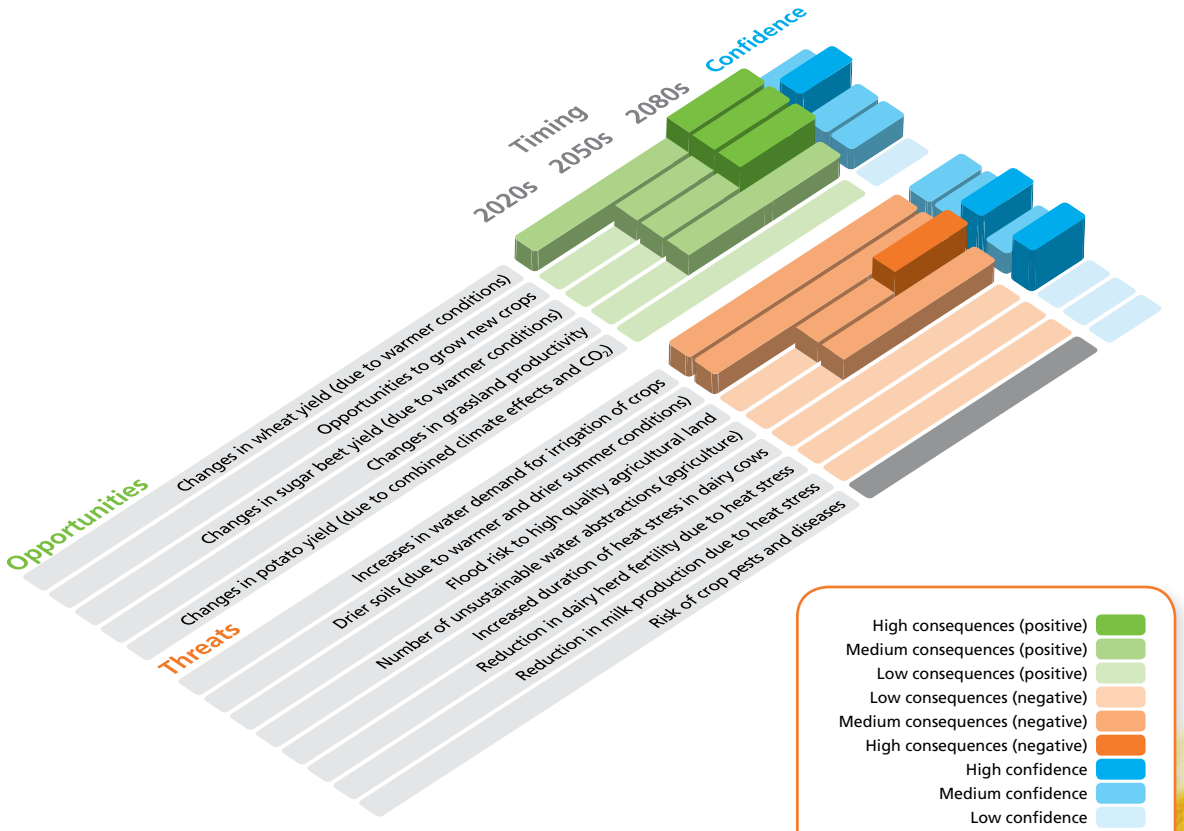
There could also be opportunities to introduce new crops or to expand existing crops that are currently only grown in small quantities, especially in the south, such as blueberries and maize, for example, as well as new industrial, energy and pharmaceutical crops. However, increases in rainfall intensity or the frequency of intense storms could increase the risk of soil erosion throughout the UK, although the implications for crop yields are unclear.

Confidence

M Increase in wheat yields: between 40% and 140% by the 2050s, assuming other factors affecting growth are not limiting (baseline: 1961-1990).

M Increase in sugar beet yields: between 20% and 70% by the 2050s, assuming other factors affecting growth are not limiting (baseline: 1961-1990)

M Increase in grass yields: between 20% and 50% by the 2050s, assuming other factors affecting growth are not limiting (baseline: 1970s-1990s)



Focus on…Flooding

Agricultural land is projected to face an increased risk of flooding from rivers and the sea. Some of this land may become unsuitable for the agricultural activities it is currently used for. Although the area of grassland and rough grazing land flooded regularly by the sea might increase substantially, some of this may still be suitable for grazing.

Confidence

H High-quality horticultural and arable land likely to be flooded at least once every 3 years: 35,000 ha by the 2020s, 75,000 ha by the 2050s and 130,000 ha by the 2080s (current figure: about 30,000 ha).

The assessment of flood risk for the CCRA has assumed that there are no changes in existing flood and coastal erosion risk management measures; the analysis takes account of current flood defences and protection against coastal erosion, but does not include any future changes as a result of adaptation policies or deterioration of existing flood defences and coastal protection measures. ***The figures here apply to river and tidal flooding in England and Wales only.***

Focus on…Water

The very dry spring in 2011 highlighted the importance of water availability at critical periods of growth in the agricultural production season and of potential vulnerability to unexpected variations. Projected changes in rainfall and evapotranspiration[1] would increase aridity[2] levels and increase demand for extra irrigation, particularly for high-value crops where quality assurance is a key market requirement.

By the 2050s, southern, eastern and central England may have water needs greater than those currently experienced anywhere in the UK. Rising agricultural water demand due to a drier climate, coupled with rising water demand from other sectors (e.g. energy and water companies), could coincide with less water being available for agriculture.

Changes in the frequency of intense rainfall events, particularly following periods of dry weather, could contribute to increased nutrient runoff from agricultural land, which may affect local water quality. As well as harming biodiversity and ecosystems, this may affect the quality of water abstracted downstream, having cost implications for water treatment and potentially affecting the health of those using private water supplies.

Confidence

M Change in agricultural (spray irrigation) water demand in England and Wales: between -10% and +80% by the 2050s and -4% and +110% by the 2080s (although baselines and projections vary significantly depending on region).

Focus on…Livestock

Pigs and poultry may be particularly vulnerable to heat stress, with poultry suffering higher mortality rates and producing fewer eggs, while transportation of animals during heatwaves may pose major risks to their health and welfare. Heat stress is projected to begin affecting dairy production by the 2050s. By the 2080s, the impact may become significant for farmers operating on low margins and for regional economies reliant on exporting dairy products.

By extending the growing season in upland areas, however, warmer temperatures may result in more winter grazing and forage, assuming access is not limited due to wet conditions. Milder winters may reduce feed and bedding costs by cutting the length of time livestock need to be housed. If summers became hotter and drier, however, this may result in insufficient forage for grazing animals, particularly in the south of the UK.

Confidence

L Lost milk production due to heat stress: between 0 and 100 million kg/year (between 0 and 1% of current total UK milk production) by the 2050s.

Focus on…Pests and Diseases

The evidence that climate change will increase crop pests and diseases is weak. However, the interactions between crops, pests and pathogens[3] are complex and currently poorly understood in the context of climate change. It is also difficult to analyse the future level of risk as agricultural pests and diseases are managed and controlled in a variety of ways.

For example, although climate has also been linked to the spread of some strains of Bluetongue virus, its emergence in northern Europe is not explained entirely by climate change but by a complex combination of drivers such as an increase in international transport.

As hot dry weather is unfavourable to most sheep parasites, the numbers of roundworms, blowflies and ticks may decrease in some parts of the UK.

[1] Water loss from the soil as a result of (i) direct evaporation and (ii) moisture lost via the surface of plants.

[2] The dryness of the climate, typically measured as a combination of rainfall and evapotranspiration.

[3] Disease-causing microbes.

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The Challenge of Adaptation

Agriculture is a particularly diverse industry, incorporating international agri-businesses and family farms and ranging from outdoor crop cultivation to indoor livestock rearing. The ability to adapt to climate change varies accordingly across the sector.

Many horticultural businesses, for example, are highly innovative and can adapt quickly, while some sub-sectors are less able to adapt or may be able to adapt to some changes but not to others. It is important to ensure that businesses are aware of the range of potential risks from climate change in order to adapt.

Seizing the opportunities and minimising the risks that may result from climate change requires investment in new technologies and better management techniques, such as:

- Improved water management: (e.g. water harvesting and on-farm storage) and improved irrigation techniques to improve water efficiency during dry spells.
- Changes in grassland species composition (e.g. with deep-rooting or drought-tolerant species).
- Changes in livestock production cycles (e.g. introduction of autumn lambing and calving).
- Planting of trees to provide shade for livestock and windbreaks for crops.

Adding to the challenge of adaptation is the fact that considerable uncertainty surrounds (i) the way different climate impacts on this sector may interact with each other and (ii) the socio-economic changes that will have a major influence on the continued evolution of UK agriculture. Specific knowledge gaps identified by the CCRA include:

- The potential impact of climate change on agricultural pests and diseases.
- The effects of climate change and climate extremes on water available for new and existing crops, especially in areas affected by sea level rise and coastal flooding.
- The effects of climate change on animal health and welfare, and particularly the effects of heatwaves and droughts.
- The ability of rural communities to adapt to the effects of climate change on their lives and livelihoods.

Where to Get Further Information

For copies of the CCRA Agriculture Sector Report, the CCRA Evidence Report and Devolved Administration Reports, please visit www.defra.gov.uk/environment/climate/government/

How the CCRA was conducted

The CCRA reviewed the evidence for more than 700 potential climate impacts on the UK economy, society and environment. Over 100 of these impacts across 11 sectors were taken forward for more detailed analysis, having been selected on the basis of likelihood, potential consequences and how urgently adaptation action may be needed to address them.

A plausible range of climate change scenarios was used in the analysis. Some aspects of socio-economic change (e.g. population growth) were also taken into consideration. Adaptation policies that are planned for the future were not considered, so that the underlying level of risk could first be compared across sectors.

The results presented here are based on the UKCP09 Medium emissions scenario for the 2020s (2010-2039) and the Low, Medium and High emissions scenarios for the 2050s (2040-2069) and the 2080s (2070-2099). A range of climate projections representing lower, central and upper estimates were considered within each emissions scenario.

Risks are categorised as low, medium or high based on their economic, social and environmental consequences.

The CCRA findings are also categorised as having low, medium or high confidence. The level of confidence is the degree to which the findings are considered valid, based on the type, amount, quality and consistency of the evidence studied.

Further information on how the CCRA results should be interpreted is presented in the CCRA Evidence Report. www.defra.gov.uk/environment/climate/government/

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