

Focus on arable crops

In 2010 87 per cent of arable farmers said that rising input prices were changing the way they used resources, and one in four said climate change was already having an impact on their business.

Rising input costs, market volatility and demand for increased production, combined with the need to reduce greenhouse gas (GHG) emissions are already shaping the way arable farmers do business. Efficient use of resources is essential to maintaining profitability, as is the development and uptake of new technologies and plant varieties to maintain yield improvements in a changing climate.

UK farmers are well placed to increase arable production with a warming temperate climate, a Government food strategy ([Food 2030](#)) that supports an increase in sustainable food production, and a developing biofuels market. However there are other objectives: recapturing the benefits of set-aside through the Campaign for the Farmed Environment, improving the water environment in line with the Water Framework Directive, reducing nitrous oxide emissions from soils, managing rising input prices, coping with changing pest and disease pressures, and changing pesticides regulation are all issues arable farmers need to stay on top of.

Agriculture produces over seven per cent of the UK's GHGs and nitrous oxide accounts for almost half of these emissions. The gas is 298 times more potent

than carbon dioxide (CO₂) and is emitted from soils partly as a result of nitrogen fertiliser (manufactured and organic) application. A range of on-farm measures including better nutrient management and soil management can help reduce nitrous oxide emissions.

The good news is that taking measures to both reduce emissions and adapt to inevitable climatic changes have multiple financial and environmental benefits such as optimising inputs, increasing yields, reducing soil erosion and increasing profitability.

KEY OPPORTUNITIES

- Optimisation of inputs through improved nutrient management planning
- Cost savings from improved energy efficiency
- Increased demand for UK cereals production from a developing UK biofuels market and potentially declining yields in other parts of the world
- Potential increased yields from a warmer climate and rising atmospheric CO₂ concentrations
- New crops and varieties suited to the UK that maintain or improve yields e.g. durum wheat, grain maize, soybeans, sunflowers, millet, sorghum, chickpea and other oilseed and starch crops

KEY CHALLENGES

- Sustainably increasing production to meet demand from a growing population
- Better targeting of manufactured inputs, which are increasing in price
- Appropriate use of crop protection products and integrated pest management
- Coping with pest, weed and disease pressures arising from a changing climate
- Coping with more extreme weather events
- Adapting to changes in water availability and associated costs
- Managing risk from an increasingly volatile global market



RESOURCE EFFICIENCY

Targeted application and optimisation of nitrogen inputs can help to reduce GHG emissions from nitrogen fertiliser and soils as well as the indirect emissions from fertiliser manufacture. More efficient use of resources as well as improvements in plant breeding will enable arable farmers to close the gap between actual and potential yield and therefore achieve better land use efficiency.

Nutrient Management

- Nutrient management planning that includes regular soil testing will highlight areas where you can better match nutrient applications with crop requirements.
- Investigate the use of nitrogen-fixing cover crops to help improve soil structure and supplement nitrogen fertiliser inputs e.g. red clover, vetch and rye. However, they will not necessarily reduce nitrous oxide emissions (or nitrate leaching).
- Make the best use of organic fertiliser materials where appropriate, in the form of sewage sludge, compost, slurry and anaerobic digestate, which will recycle nutrients and save money.

Precision Farming

- Precision farming technology offers multiple benefits in terms of reducing costs from manufactured inputs, reducing in-field fuel use, improving soil quality and reducing environmental costs of production.
- Controlled Traffic Farming offers similar benefits by minimising soil compaction and therefore improving soil structure and increasing yields.

Transport Fuel

- Review cultivation strategies to reduce fuel costs.
- Assess transport efficiency through the supply chain (e.g. grain haulage, particularly for biofuels) and look into new low-carbon transport fuels for on-farm machinery.

Energy

- Farmers can cut costs and improve margins through investing in more energy efficient equipment. See Farming Futures fact sheet 23 or read the Carbon Trust's advice for more information.
- The Carbon Trust is offering interest-free loans (from £3-20,000) to upgrade or improve the efficiency of farming equipment (e.g. for grain drying and humidity control systems).

Planning

- Growth times may be altered, affecting planting and harvesting and impacting on resource planning during these labour-intensive periods.



- Reduction in number of workdays due to weather conditions. This may require additional machinery and careful management to reduce damage to soil structure during intensive periods of cultivation.
- Work with other farmers to share information and experiences, and set up networks for sharing resources e.g. Water Abstractor Groups.

Actions:

1. Visit www.nutrientmanagement.org for a nutrient management plan, other supporting tools and advice on optimising organic and manufactured fertiliser applications.
2. Find out the nitrogen content of manure/slurry before spreading and adjust application rates appropriately.
3. Investigate the use of GPS and precision farming technology. See HGCA Be Precise web pages and Farming Futures fact sheet 24 for more information.
4. Take out a Carbon Trust loan and invest in improving the energy efficiency of your business. Call 01865 885846 or visit www.carbontrust.co.uk/loans to find out if your project qualifies.

BE PREPARED FOR CHANGES IN CLIMATE

Ensuring the long-term viability of your business makes sense both for you and for future generations. Maintaining good farm management practices will be key to ensuring your farm is prepared for the unpredictable impacts of climate change. Those farms most resilient and flexible to change will be best placed to profit.

Yields

- Potential for greater canopy cover due to increased atmospheric CO₂ and higher temperatures, but this will require more efficient use of nitrogen and soil moisture. Studies have shown some varieties of winter

wheat could increase yields by 12-28 per cent in a warmer climate and other crops such as maize and sugar beet already seem to be benefiting.

- Longer growing seasons along with earlier spring growth and ripening could enable earlier harvesting.
- Extended periods of drought (such as in 2004-2006) and temperatures over 25°C (such as in 2003) could make yields less predictable and make irrigation necessary.
- Although frosts will become less common, crops may experience more damage from rare and late spring frosts due to lack of acclimatisation.
- Lower soil moisture may reduce germination and establishment of some crops, especially autumn crops.

Crops

- Northern and western regions may become more suitable for some arable crops, but this is dependent on regional soil types and topography.
- New crops and varieties (food and non-food) may become suitable to grow.

Pests and diseases

- Pest and disease populations may survive over warmer winters with fewer frosts, increasing their prevalence and increasing risk of damaged and reduced yields. Plants already stressed by drought or heavy rain may be more susceptible to damage.
- Warmer and earlier springs may bring earlier flights of pests into crops. Pest populations could also increase; for example, an increase of 2°C could increase the number of aphid generations from 18 to 23 per year.
- Long dry spells in summer make it difficult to target pests and limit efficiency of pesticides but also reduce disease pressure.
- Regional differences in range and type of pests and disease may make control difficult.

Extreme events

- Most climate change projections show that the UK is likely to experience more extreme weather events, with direct impacts on farm businesses and crops. For example the 2007 summer floods cost the arable sector over £34 million, with an average loss of £1,293/hectare flooded.
- Extreme events in other parts of the world (e.g. drought) will also have direct implications for UK arable farmers causing market volatility and unpredictable peaks in demand, such as the spike in prices in 2008 when wheat hit £200/tonne.
- Soil erosion from extreme rainfall events and extended periods of saturation could remove

valuable topsoil and contaminate water courses. Appropriate cultivation strategies, improved drainage and growth of buffer strips will all help reduce this problem.

- Flooding has significant cost implications for a farm business. Investigate digging drainage ditches, grass buffers, ponds or wetlands to slow water flow, increase infiltration into soil and reduce flooding. Maintaining the quality and structure of soils and increasing organic matter content will encourage water retention and improve drainage. See [Farming Futures fact sheet 20](#) for more information.
- Collect excess rainwater for use in drought periods. Read the Environment Agency guide '[Rainwater as a resource](#)'.
- Read [Farming Futures fact sheet 18](#) on water management or visit the [UK Irrigation Association](#) website for more information.

Changes in seasonality

- Be prepared to change traditional cultivation and harvesting timelines if necessary.
- Speak to supply chains about possible changes to timings and if appropriate agree an action plan for these changes.
- Consider how best to take advantage of longer growing seasons.

Actions:

1. Diversify crops to hedge bets against unpredictable weather and climate and investigate [drought and heat resistant crop varieties](#).
2. Investigate pressures on local water availability and if necessary consider improving the efficiency of your irrigation systems, installing a rainwater harvesting system or building an on-farm reservoir.
3. Improve the drainage and structure of your soil and take steps to avoid soil erosion.
4. Sign up for flood alerts from the [Environment Agency](#) or call the Flood line on 0845 988 1188

MARKETS

- Prices may be strengthened by potential global wheat shortages due to changing weather conditions and current wheat producing regions becoming less suitable.
- Homegrown markets could increase in importance in the face of volatile global supply and growing concerns over food security. Increasing consumer interest in where food comes from, food miles and how it is produced could also offer opportunities in how you market and sell your produce.

- In the UK we need to obtain 10 per cent of road fuels from biofuel by 2020. These biofuels can take the form of bioethanol or biodiesel, although the market for bioethanol is currently looking stronger due to the development of three wheat-to-bioethanol plants by 2012. [UK bio-energy \(Biofuel and biomass\) industry development](#) is creating new jobs and a new market for arable crops while also reducing GHG emissions associated with transport fossil fuels. Arable farmers growing oilseed and cereal crops are well placed to produce the necessary feedstock to supply the emerging biofuels market and receive a competitive price for their crop as well as take advantage of more marginal land. See the [HGCA Biofuels](#) and [National Non-Food Crop Centre](#) web pages for more information. Or visit the [Energy Crops Scheme](#) and [Biomass Energy Centre](#) websites.
- Adding value to arable crops through the production of new plastics, oils and building materials that could replace fossil oil-based products.
- [Alternative crops for new markets](#) could open up new markets, help maintain business efficiency and assist business diversification.

Actions:

1. Investigate diversifying your business into the supply of energy crops and take expert advice on project feasibility (e.g. guaranteeing a buyer)
2. If you are growing crops for biofuels undertake a greenhouse gas audit using the [HGCA calculator](#).

FARMED ENVIRONMENT

- Retain and exceed the environmental benefits of set-aside through the [Campaign for the Farmed Environment \(CFE\)](#) while maintaining profitability and increasing food production.
- Create and maintain coppiced areas, hedgerows, un-cropped land and permanent grassland, which naturally absorb CO₂.

- Improve [nutrient management](#) to reduce leaching into water courses and comply with the requirements of the Nitrates Action Programme if your land is within a Nitrate Vulnerable Zone. For example, apply fertiliser on damp days to increase absorption.
- Consider spring crops compared to winter crops to reduce input costs, reduce the number of farm operations required, reduce winter soil erosion risks and potentially enhance farm biodiversity.
- Look into cover crops to improve soil structure e.g. red clover, vetch and rye.
- Conserve or enhance soil organic matter by adding compost and crop residue.
- Try to reduce the intensity and frequency of disturbance of your soils (e.g. changing cultivation techniques to min-till or no-till may be appropriate), which will help preserve carbon sinks.
- Reduce soil erosion – avoid cultivating wet/saturated soil and use buffer strips and hedges as barriers.
- Environmental Stewardship provides funding and advice for many of these recommendations, including spring cropping, cover crops, minimum till and un-cropped land. In-field options can count towards your contribution to the CFE.

Actions:

1. Sign up to the [Campaign for the Farmed Environment](#).
2. Take out or renew an [Environmental Stewardship agreement](#).
3. Speak to your local [English Catchment Sensitive Farming](#) officer.
4. Carry out a [LEAF audit](#) to take stock of your whole farm environmental and business performance
5. Use the [CLA CALM Calculator](#) to work out the carbon footprint of your farm.



For news, events, and links to stories about how other farmers are managing climate change on their farms, please visit: www.farmingfutures.org.uk

With thanks to: Forum for the Future, AHRF, AIC, CLA, Defra, FWAG, HGCA, LEAF and the NFU.