

## Did you know?

- UK woodlands currently remove about 15 million tonnes of CO<sub>2</sub> (MtCO<sub>2</sub>) from the atmosphere, annually – equivalent to the CO<sub>2</sub> emissions associated with supplying 2.5 million households with energy.
- Approximately 150 million tonnes of carbon (equivalent to 550 MtCO<sub>2</sub>) is stored in UK woodland biomass.
- The planting of 10,000 hectares of woodland per year for the next 15 years could remove up to 50 MtCO<sub>2</sub> by 2050.
- Managing woodland will result in some short-term loss of carbon to the atmosphere through disturbance of the soil and end use of the biomass, but this will be replaced by subsequent tree growth if the woodland is kept in continuous sustainable management.

## Looking to the future

Limitations on land availability may create conflicts between nature conservation, renewable energy production, and food production. These issues should be viewed in an integrated way, with the conservation of biodiversity being seen as an essential element of supporting resilient agricultural systems and the provision of 'ecosystem services'.

Perhaps the greatest challenge facing foresters and land managers will be in dealing with the uncertainty of how trees and woodlands will respond to future climate change. The impacts of climate change on UK woodland ecosystems are still far from clear. What you can do is to create and manage woodland in such a way that it protects their special features (particularly ancient woodland), reduces environmental impacts (e.g. diffuse water and air pollution) and assists ecosystem functioning (e.g. habitat connectivity across the landscape). This will give woodlands and their wildlife the best possible potential for coping with change.

There is as yet no reward system for farmers taking measures to store carbon in their land, as carbon markets at this sort of scale have yet to become viable. However, incentives such as grants available through the Rural Development Programme for England, from the Forestry Commission (the English Woodland Grant Scheme), Natural England (Environmental Stewardship) and the Catchment Sensitive Farming Initiative all encourage land managers to start taking action now. Feed-In Tariffs and the Renewable Heat Incentive will provide support for biomass energy

## Find out more

- Visit the [Forestry Commission's Climate Change web pages](#)
- Visit the [Forest Research Agency's web pages](#)
- Read the UK the Forestry Commissions Report '[Combating Climate Change: a Role for UK Forests](#)'
- Learn about what other farmers are already doing on the [Farm Woodland Forum](#)
- Visit the [CLA forestry and woodland web pages](#) to get advice on a range of woodland management issues
- Find out about funding and support for woodland management through the [English Woodland Grant Scheme](#)
- Find out about potential funding and support through the [Catchment Sensitive Farming Delivery Initiative](#)
- Contact your regional [Rural Development Programme for England team](#) to find out about support available
- Visit the [Biomass Energy Centre's](#) web pages to learn more about opportunities for woodfuel.
- Visit [Farming Futures](#) for other factsheets like this, including [biomass for renewable energy and water management](#).

# FARMING FUTURES

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

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## Climate change: be part of the solution Focus on forestry and woodland

*Fifty per cent of farmers say climate change is having an impact on their business now.*

Woodland creation is a very cost-effective way of helping to combat climate change in the long term. Over 70 per cent of UK land is in agricultural use, but only twelve per cent of that is woodland. The agricultural, forestry and land management (AFLM) sector can benefit (as well as wider society) from this low input productive land cover. Woodland has a key role to play in both adapting to and mitigating climate change, but due to the long time scales involved in forestry and tree growth, land managers need to start planning and responding now.

### KEY OPPORTUNITIES

- Diversification of farm income through biomass energy generation
- Reduced on-farm energy costs
- Potential future income from 'carbon finance'
- Measures to improve water quality, reduce soil erosion and alleviate flooding
- Providing shade for animal welfare

### KEY CHALLENGES

- Water availability
- Extreme weather events
- Pests and diseases

- The Renewable Heat Incentive (due in April 2011) will incentivise small to medium scale biomass heat generation, so demand for and the price of woodfuel is likely to increase.
- Woodfuel reduces carbon emissions by displacing fossil fuels. This can reduce energy costs associated with the rising price of fossil fuels, and if a well functioning carbon market is established, further financial benefits could be available to producers.
- Timber can replace other materials such as concrete and steel, which have high embedded carbon from the fossil fuels used in their production. Wood used in construction can store significant quantities of carbon during a building's lifetime.

### OPPORTUNITIES FROM FORESTRY AND WOODLAND

#### Markets

- Woodfuel is a renewable, low carbon fuel that can be specifically grown for this purpose or as a co-product of timber production. The UK Government's Renewable Energy Strategy points to the importance of woodfuel as a way of producing heat and reducing emissions.
- Woodfuel developments that focus on small to medium scale projects minimise the GHG emissions from transport and support local farm enterprises. Small to medium-scale heat is the most efficient use of biomass.



- Increased impacts of climate change in other countries, combined with carbon dioxide (CO<sub>2</sub>) emissions associated with transport, could give British wood products a competitive advantage.

## Shade and Shelter

- Rising summer temperatures and greater solar radiation will increase heat stress on livestock. Trees provide direct shade, reducing stress and improving animal welfare and productivity.
- Windbreaks can improve the heat budgets of houses and farm buildings by 10-40 per cent, reducing heating costs and carbon emissions.
- Windbreaks can reduce physical damage to crops, encourage pollination and help improve the food efficiency of outdoor livestock through a reduction in the wind-chill factor.
- Carefully located windbreaks can help reduce soil erosion and the siltation of watercourses.

## Environment

Warmer, drier summers and wetter winters are anticipated by most climate change projections. Trees can help limit the worst effects of water logging and drought on soils.

- Diffuse pollution – Trees located near livestock units can help capture ammonia emissions through dry deposition on leaves and bark.
- Flood alleviation – Using trees and land management to manage water and flooding is cheaper and more sustainable than hard-engineered flood defences. Strategically sited floodplain woodland can delay flood flows and increase flood storage (sponge effect), reducing rapid surface water flooding and peak river flows. It could also be argued that woodland is more aesthetically appealing.

- Soil erosion – Woodland provides valuable protection to soils during extreme weather events, reducing loss of topsoil and damage to soil fertility. Location along watercourses can reduce sedimentation and run-off of fertiliser and manure, improving water quality. This can be an important measure for farmers located in Nitrogen Vulnerable Zones (NVZs) and on rivers with poor water quality status.

- Agri-Environment schemes – Trees can contribute to measures under agri-environment schemes that reward farmers for taking certain actions on their land.

## Biodiversity

- Forests and woodlands provide resilient habitats for wildlife; their role in the wider landscape will become increasingly important and allow mobile species to move through the landscape as the climate changes.
- There has been a decline in some woodland species as a result of less-intensive management. Sustainable woodland management – possibly made economically viable once again if woodfuel and other timber markets develop – could increase the variety of woodland habitats supporting a wider range of species.

## CHALLENGES FOR FORESTRY AND WOODLANDS

### Pests and diseases

- Climate change is leading to changes in pests and diseases, including the emergence of new ones. For example, milder winters will give pathogens a chance to survive and breed over winter, increasing their prevalence in UK woodland.
- Global trade may compound these effects. Farmers and foresters can take action to increase biosecurity



for UK woodland by maintaining vigilance and reporting unusual pest and disease outbreaks. It will also be important to maintain import controls.

- Seasonal water logging and an increase in summer drought stress could make trees more vulnerable and exacerbate damage from pests and diseases.

### Extreme events

- Projected increases in temperature and potential soil moisture deficit (PSMD) in the South and South East may result in increased losses among newly planted trees and put additional stress on existing woodland.
- Flooding and water logging over winter could kill roots and reduce effective root depth, making species more vulnerable to summer drought.
- More frequent and severe windstorms could increase physical damage.

### Tree Species and woodland management

- Towards the end of the century, many of our current timber species may no longer be considered economically productive, due to shifts in climatic zone and thermal growing seasons.
- Consideration may need to be given to introducing non-native species that are better adapted to the changing climate. However, care must be taken to ensure that such introduced species do not compromise existing ecosystems.

### Productivity and health

Initially, tree growth across the whole of England is likely to increase as a result of a number of factors including rising CO<sub>2</sub> levels and longer growing seasons. However, this is only likely to mean small increases in biomass available for sale. In the longer term a lack of summer rainfall, particularly in the South East, and increased water logging over winter may lead to reduced productivity and affect tree health.

## WHAT CAN YOU DO?

### Adapting to the impacts of climate change

Woodland managers should consider future climate change projections in decisions over species choice both for new woodlands and at restocking. Most adaptation actions simply involve good management practice, which reduce the potential impacts of climate change on trees and enable wider societal adaptation to climate impacts (e.g. flooding).

- Select species suited to your land and environment, under both current and future climatic conditions. Use Forest Research's Ecological Site Classification Decision Support System for guidance.

- Make your business more resilient by developing contingency plans for windstorms, fire and outbreaks of pests and diseases.
- When creating new woodland, plant a mixture of provenances of native tree species, including both local and more southerly (up to three degrees) provenances if available.
- Plant a range of species to spread the risk of severe pest and disease outbreaks. Diversity of species will also provide insurance against the uncertainty in both projections of climate change and the response of individual species to it.
- When planting new woodland, consider what wider benefits could be achieved, such as flood alleviation, reducing soil erosion and improving water quality.
- Try to establish larger connected areas of woodland to support more robust populations of plants and animals resilient to change, across varied soil types and moisture gradients. This will allow established wildlife to cope with changes in conditions as they occur over decades. Larger areas of woodland are also more cost effective to manage.

### Reducing future climate change

Trees store carbon as they grow and woodland biomass is a renewable resource that can be used to generate energy. The ability of trees to remove CO<sub>2</sub> from the atmosphere and displace the use of fossil fuels for energy generation can help reduce future climate change.

- Use the CLA CALM Calculator to estimate how much carbon you are locking up.
- Use timber as a renewable and sustainable source of construction material, which could reduce emissions by replacing energy-intensive materials like steel and concrete. Maximising wood and wood products can reduce the embodied greenhouse gas emissions of a typical house by up to 75 per cent.
- Use woodland biomass to generate renewable energy. Use of woodfuel as a direct source of heat can avoid up to 2000kg of CO<sub>2</sub> per tonne of woodchip and could save money on fuel bills.
- Develop your business to supply construction materials and energy products e.g. wood chips and industrial biomass fuels, alongside more traditional agricultural products.