



Trees, climate change and **RESILIENCE**

Ginkgos have
been trialled at
the Shropshire
Agroforestry Project

Will Simonson looks at the way climate change will impact on our farms and how we need to plan carefully for the future when choosing tree species to plant

A new National Risk Register published in the summer placed extreme weather events among the main threats facing the UK. Drought, heatwaves, storms, coastal and fluvial flooding are all included at varying degrees of likelihood and impact on

Britain's landscapes and farming. Wildfires are listed too and in the summer of last year we saw unprecedented impacts on croplands as well as heathlands and other vegetation. Climate change is no longer just a future concern.

There has been a lot of interest in

agroforestry as a 'nature-based solution' to climate change. The ability of trees on farms to store carbon in its biomass above and below ground as well as soils offers the potential to contribute to climate change mitigation and net zero targets. However, the role of trees in helping to adapt farms

and farming to climate change may be even more significant. This is sometimes referred to as building resilience, or in other words, buffering farm enterprises from some of the worst effects of climate change. Defra's England Trees Action Plan talks about agroforestry playing 'an important role in delivering more trees on farms and in our landscape, improving climate resilience and encouraging more wildlife and biodiversity in our farming systems'. Based on research by Cranfield University the Woodland Trust is recommending that in order to meet the Government's climate change and nature recovery targets, 10% of arable land should be established with silvoarable, 10% of arable land with hedgerows and shelterbelts, and 30% of pasture with silvopasture.

Trees and climate change adaptation in practice

What adaptation benefits do trees bring to the farm system? For Peter Aspin, practising silvopasture for over 20 years in Shropshire, it is all about moderating the climate on his pasturelands for the health and wellbeing of his livestock. By allowing his boundary hedges to thicken and heighten, and then planting rows of a mixture of trees across his fields, his aims include to lower maximum temperatures in summer and raise minimum temperatures in winter, control transpiration and humidity, and create shelter from the wind. The tree roots improve the rainfall infiltration and water holding capacity of the soil and since there is no compaction by animals or vehicles along the rows of trees the whole concept of land drainage is radically changed from the existing civil engineering model. Additionally, the tree and shrub browse

Almond trees fruiting in a mixed hedge at Huntstile Organic Farm in Somerset



irrigation needed. The tree roots allow water to percolate through the soil quicker, therefore soaking it up quicker after a big summer rainstorm, creating an agri-ecosystem that is able to withstand the vagaries of a more erratic climate.

Need for resilient agroforestry systems

In tropical areas where farming with trees is more commonly practised and studied, attention is turning from climate change benefits of agroforestry to the impacts of climate change on the agroforestry system itself. In other words, in order for

of opportunity for tree planting has been changing as a result, with current wisdom being that the trees should be in the ground before Christmas or otherwise as early as possible to allow them to properly establish before drought conditions arise. Improved mulching and infrastructure for irrigation can otherwise be important, though generally less practicable to install in larger-scale silvoarable systems compared to silvohorticulture.

This is just one area where the design of a resilient agroforestry system needs to be thought through. The selection of the right tree species and varieties is obviously another, with farmers starting to think about what trees will grow best in the future rather than current climate. So, at the venue of the Agroforestry Show, Eastbrook Farm, apricot and almond trees are among the mix and, though late frosts have prevented fruiting in some years, time will tell how successful these will be in the warmer climate expected in the future. At Peter Aspin's farm (Shropshire Agroforestry Project), many tree species which are novel in an English agroforestry context have been planted, for example *Araucaria* (monkey puzzles) and *Ginkgo* (maidenhairs) and his close monitoring of which trees are doing well and less well will yield invaluable lessons for the future.

Lessons may also be learned from ongoing work by the Forestry Research

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provide benefits in terms of animal health and disease resistance.

For Andy Dibben in Gloucestershire, the trees in his silvohorticultural system are also established with climate change adaptation in mind (see page 44). The trees provide the degree of shade and shelter that can be important for the vegetable crops in hotter conditions. By reducing wind speeds and their desiccating effects, evapotranspiration in the cropping area is controlled and so too the amount of

agroforestry to confer these adaptation benefits, it is important that the trees in the system do not succumb to the adverse effects of climate change. Trees are not inert infrastructure, after all, but living organisms that are exposed to warming, drying, and unpredictable and extreme weather.

One such area where this is has come into focus is the recent spring droughts causing high mortality rates in newly planted trees. Advice on the best window




Huge wild fires were seen across Europe in 2022 and 2023

climate modellers in relation to planning for more resilient woodland systems. They are providing resources that point to the wider range of species that can be considered in future woodland plantings, and also wider range of provenances, with tree stock from further south in Europe particularly in the frame. Conversely, some trees that are common in our woodland landscapes become marginal or even completely unsuitable, depending on which climate change scenario is assumed. For example, models show that under a high emissions scenario the East of England becomes marginal for beech trees by 2050 and unsuitable by 2080. The research show how it is possible to match the projected climate for any one area with a location where that climate is contemporary to understand, from these “climate analogs”, what trees may do well in the future.

Building resilience into agroforestry in the UK

Resilience is a bit of a buzzword and is applied in many contexts without a lot of thought about what it actually means and how it can be applied. The Horizon 2020 AGROMIX project is one initiative that seeks to drill down into the concept and understand how to measure the resilience benefits of agroforestry and mixed farming in Europe. Some useful work by the Stockholm Resilience Centre

on operationalising the concept has also been published and includes seven guiding principles for building resilience, whether thinking about the ecology (e.g. of trees in agroforestry) or the wider “socio-ecological systems” (the ecology interacting with human decision making and enterprise, that farms evidently are). One such principle is maintaining diversity and redundancy, and recent landscape-changing tree health crises point to the importance of tree diversity within agroforestry designs, especially with climate warming potentially leading to the spread of some tree pests and diseases, such as the emerald ash borer beetle, itself making its own appearance on the National Risk Register. The reliance on ash in the agroforestry system of North Wyke, which subsequently succumbed to ash die-back disease, is one example where a more diverse planting scheme would have served better. Two other principles are about encouraging learning and broadening participation. To this end, at the national level, events such as the Agroforestry Show and recurring Agroforestry Open Days are great opportunities to share knowledge and experience, sometimes gained the hard way, on how trees on farms can be part of our climate change adaptation effort, and how the resilience of these tree planting designs and systems can be achieved. 

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FIND OUT MORE

- ▶ National Risk Register
<https://tinyurl.com/2p8wvwwk4>
- ▶ *England Trees Action Plan 2021-2024* Defra policy paper, 2021
- ▶ *Farming for the future: how agroforestry can deliver for nature and climate* Woodland Trust Policy paper, 2022.
- ▶ *Impacts of climate change on tropical agroforestry systems: a systematic review for identifying future research priorities* Watts et al, *Frontiers in Forests and Global Change*, 2022. DOI 10.3389/fgc.2022.880621
- ▶ *Selecting tree seeds for current and future climates in order to maintain productivity* <https://tinyurl.com/2p8vcvhd>
- ▶ *Applying resilience thinking: seven principles for building resilience in social-ecological systems* Stockholm Resilience Centre 2015
- ▶ *The Promise of Agroforestry – lessons from the field* Oli Rodker, Landworkers' Alliance, 2021
- ▶ Agroforestry Open Weekend 2024
www.agroforestryopenweekend.org