



Agroforestry in England

Benefits, Barriers & Opportunities



Biodiversity International Ltd



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Summary

- **Agroforestry has the potential to deliver multiple benefits for productive, resilient and environmentally integrated farm systems.**
- **Agroforestry should become a central part of the government's new farming and land management policy – clearly defined and supported in the Agriculture Bill.**
- **Government should act without delay to support the farm advice, knowledge exchange and investment required to deliver a rapid shift in farm practice.**

“ It has delivered everything we wanted. It's making us more income and delivering soil protection and biodiversity benefits. ”

Stephen Briggs
on agroforestry

1. What is agroforestry?

Agroforestry describes farming systems that combine trees or shrubs with agricultural crops or livestock. It is a land management approach with multiple benefits. It can enhance farm productivity, increase wildlife, improve soil health and animal welfare, manage water flow and contribute to climate change mitigation. Agroforestry can be designed in a way that avoids potential trade-offs between food production and other public goods that occur in many modern farming systems.

There are five distinct types of agroforestry:

- Silvopastoral: trees and livestock;
- Silvoarable: trees and crops;
- Hedgerows and buffer strips;
- Forest farming: cultivation within a forest environment;
- Home gardens: small-scale, mixed or urban settings.¹

Agroforestry includes traditional practices that are easily recognised in the English landscape, such as farm hedgerows, as well as newer innovative systems such as silvoarable cropping, a method of growing alleys of productive trees through arable land. In other countries, including France and Spain, integrating trees and agriculture through agroforestry is a normal practice, yet in England this is not the case. This briefing sets out the benefits of agroforestry, the barriers holding it back across England, and the opportunities to make it mainstream.

2. Benefits of agroforestry

Growth and innovation in agroforestry offers potential to improve farmland productivity, resilience and diversity, whilst restoring soil health, creating wildlife habitats and sequestering carbon. Though long-recognised and well established in sub-tropical climates, the benefits of agroforestry are now being realised in many temperate countries across the world. Recent research demonstrates this potential in the temperate regions of China, Australia and Canada. Despite this progress England lags behind.ⁱⁱ

Case Study

Nuffield scholar and Cambridgeshire farmer, Stephen Briggs is seeing the benefits of dual cropping. Now nine years into a silvoarable system, with apple trees in an alley-crop system with cereals, fruit yield per hectare is equal to that of the arable crop, with a gross margin of c£1,000/ha. This new scheme has simultaneously provided the business with another income-earning crop, protected and nourished the soil, attracted pollinators and encouraged local wildlife.^{iv}



a. Productivity

Growing two crops from the same land such as rows of fruit trees through arable crops, or combining livestock and timber trees, can increase total yield and on-farm productivity.ⁱⁱⁱ Farm businesses can benefit from the services that agroforestry supports such as increased habitat for pollinators and shelter for livestock and crops to support improved growth, as well as diversified agricultural products such as fruits, nuts and timber.

Productivity increases under agroforestry can be significant, in some cases up to 40%.^v Hens ranging on land with 20% tree cover have been found to have increased laying rates and higher shell density meaning higher output, fewer second eggs, and reduced losses.^{vi} Practising agroforestry can help farm businesses to be resilient, diverse and produce a combination of agricultural and wood products from the same site. A walnut timber crop on a farm can be multifunctional, offering high-value nut crops along with additional ecosystem services for a number of years before maturing to provide a harvestable timber crop.^{vii}

Diversified cropping through agroforestry can support farm businesses to operate throughout the year and avoid the peaks and troughs of seasonal demands. Well planned agroforestry using appropriate tree species can smooth out farm labour demands and provide a more diverse source of year-round income for farm businesses and staff. Furthermore, agroforestry could be a stepping-stone to get new entrants into farming as a method that enables multiple-use of a single site, such as the model pioneered at Dartington Estate, Devon.^{viii}

Case Study

At the Dartington Estate in Devon an innovative three-tiered agroforestry contract has been made between the landowner, farm tenant and local businesses growing top-fruit, elderflowers and Sichuan peppers. The tenant farmers, Jon and Lynne Perkin, were happy to integrate trees into their arable / silage rotation but, as livestock farmers, they lacked the appropriate skills, finance and market knowledge.

By teaming up with established local businesses who plant, manage, harvest and market the tree crops, the farm has gained external investment, supported new entrants to access land, increased the diversity of local crops for local markets and now receives the additional benefits of integrating trees with their arable production.



Case Study

Richard and James Thomas farm 1,000 arable hectares in Nottinghamshire. Along with farm manager Andrew Bainbridge they took decisive action after seeing their best soil washed and blown away by rain and wind.

To reduce erosion, they planted 30km of hedgerow windbreaks, converted field edges to grass to increase soil water infiltration and planted 7,550 trees in 10 metre wide shelter belts. This has improved soil health and water holding capacity of the land as well as protecting soil and crops against the impact of intense rainfall and strong winds.



b. Tackling climate change

Integrating trees into farms at a significant scale could dramatically increase the amount of carbon sequestered on farms compared to monocultures of crops or pasture.^{ix} The Committee on Climate Change highlight that conversion of 0.6% of agricultural land area to agroforestry would contribute significantly to meeting the fifth carbon budget target by 2030.^x

Agroforestry systems protect soils from erosion by wind and water, as trees with long roots hold soils firm while increasing soil organic matter by adding decomposing leaf litter.

Trees integrated into arable settings have been proven to reduce soil erosion by up to 65%.^{xi xii} The UK government has committed to the '4 per 1000 initiative' which aims to increase soil carbon stocks by 0.4% year-on-year. Agroforestry can make an important contribution to this goal and is a key way in which farming can mitigate climate change and become more resilient to extreme weather.

“It is essential to target these problematic areas by planting trees so when heavy rainfall occurs the trees will encourage infiltration and prevent the water gathering pace and causing damage.”
James Thomas,
Haywood Oaks Farm

c. Water management

Agroforestry can also be a cost-effective flood mitigation method. The role of trees on farmland has been recognised by the Environment, Food and Rural Affairs Select Committee's 'Future Flood Prevention' report, which recommended that 'Defra should put flood risk management at the centre of any new support schemes for farmers... this model must demonstrate how storage methods can be used which have a low impact on farm productivity.'^{xiii}

The careful siting of trees on farmland can improve soil infiltration and water retention, reducing the impact of flooding by increasing the capacity of the land to retain water.^{xiv} By practising agroforestry these aims can be achieved without a significant impact on farm productivity.

Trees can play a key role in reducing the impact of farming practice on watercourses. Agriculture is a significant contributor to nitrate leaching into waterways, but in a recent review of silvoarable systems in temperate climates it was found that nitrate leaching was reduced by 46% in Canada and 30% in France.^{xv} More than just mitigating agricultural pollution, agroforestry can be a key component in efficient nutrient cycling on farms, with deeper roots bringing nutrients up from lower in the soil profile increasing the availability and fertility in the top soil layers.

d. Landscape and biodiversity

Agroforestry can benefit wildlife, with the potential to increase average biodiversity more than two-fold.^{xvi} It can provide the connectivity and food sources for wildlife in farmed environments that are crucial to achieving targets under the UK's commitment to Biodiversity 2020.^{xvii} Hedgerows cover more than 725,000 km in the UK and provide a lifeline particularly for farmland wildlife. These hedgerow habitats have declined significantly in recent decades, and now 84 of the species associated with hedgerows in the UK are considered of conservation concern.^{xviii}

As well as improving habitat diversity and connectivity, trees in the farmed landscape can contribute to the aesthetic quality and meet with public perception of high quality land management. Integrated approaches to land management are popular with the public, agroforestry can harness public appeal towards 'managed rural landscapes' and offer an 'integrative strategy for landscape protection and management'.^{xix}

e. Animal welfare

Farm animal welfare and performance can be improved in agroforestry settings. Shelter from wind, rain and sun can improve quality of life with increased infant survival rates, reproductive capacity and milk production in cattle.

Sheltered environments give farmers the opportunity to keep stock on the land in all weathers, reducing the demand for investment in animal housing and providing a warmer 'maternity unit'. Agroforestry can support farmers to transition to hardier domestic livestock breeds, meaning more time on pasture for livestock that are better suited to cope with extreme weather.^{xx} The shelter provided by hedgerows and tree belts has the effect of increasing soil temperature in the early spring and late autumn, extending the growing season for grass. This is particularly important in upland livestock areas, reducing the need for supplementary feed at a critical time in young animals' development.

The leaves and bark of trees can provide increased nutritional diversity, improving animal health and they offer the potential to alleviate the use of antibiotics in animal agriculture.^{xxi} Creating tree belts and thick hedges can provide a suitable bio secure boundary around a farm. There is also evidence that trees in general can act as a buffer to the movement of harmful bacteria, such as E. coli through ground water.^{xxii}

Case Study

Bangor University developed innovative research with 'electric sheep'; which uses a 'robot' sheep in the farmed environment to monitor the effects of environmental exposure on livestock. Results demonstrate the benefits of sheltered environments for livestock as trees regulate air flow and temperature, stabilising animal body temperature in adverse conditions.^{xxiii}

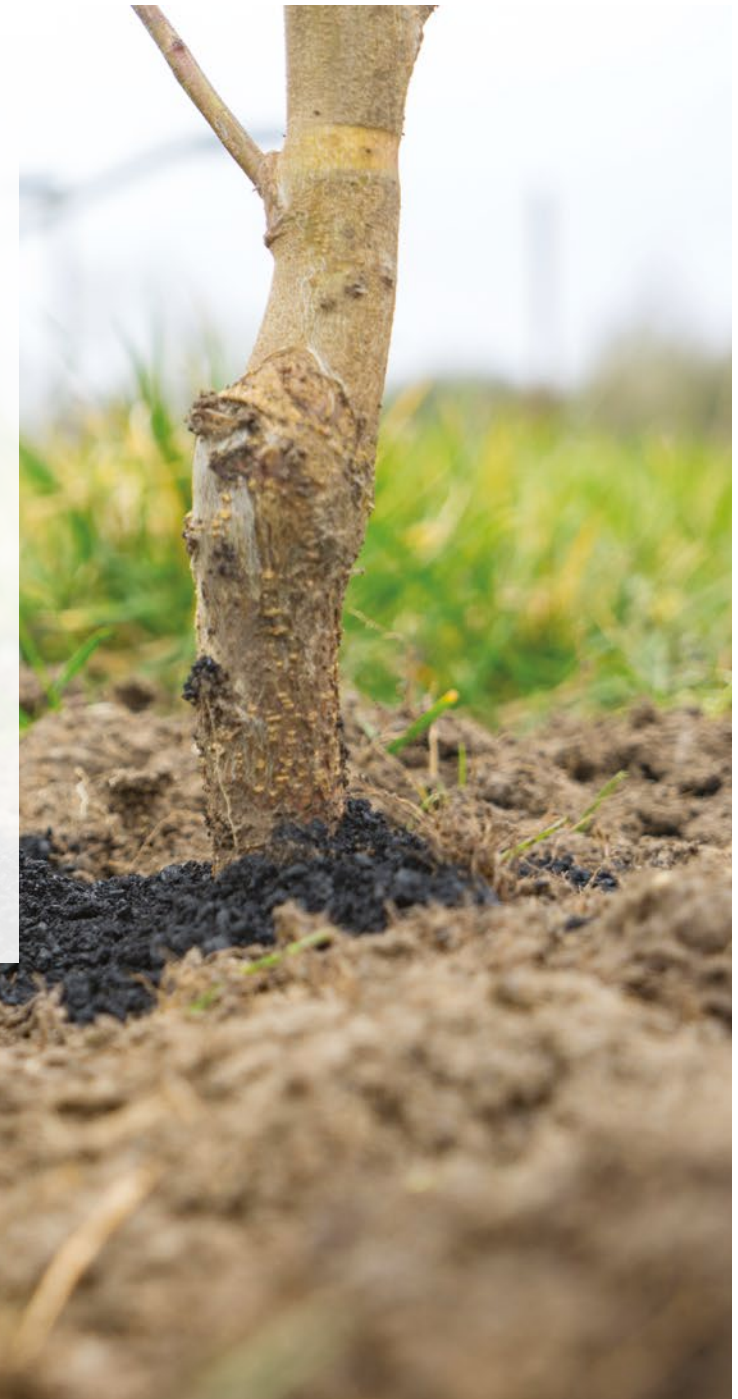


“ At first, we were planting trees simply to encourage our hens to range, having recognised their inclination towards sheltered areas. But the benefits went far beyond that original motive and, as well as the undeniable improvements to the hens' welfare, we've seen better soil water retention, more biodiversity and crucially a higher quality product. ”
David Brass,
The Lakes Free Range Egg Company

3. Barriers to uptake

Whilst most agriculture policy and rules of governance in farming have been agreed at EU level, competency in forestry and woodland has remained a member state issue. In some countries, this has led to a separation of land uses and barriers to practices such as agroforestry that cross the divide - causing confusion, contradictions and complications on the ground. Further barriers include:

- The position and definition of agroforestry is currently unclear within UK government; it sits in a policy and delivery void between forestry, environmental stewardship and agriculture.
- Agroforestry falls into a funding gap in England. Planting density in agroforestry systems is typically 75-200 trees per hectare, too low for woodland creation grants (which require a minimum of 400 trees per hectare) while it remains in a grey area for eligibility under the Basic Payment Scheme in England, with the interpretation of rules down to individual Rural Payment Agency inspectors. Such uncertainty over funding and farm payments has contributed to the weak and ineffective measures to increase on-farm afforestation in England.^{xxiv}
- There is a lack of knowledge, practical guidance and clarity on where to access advice on agroforestry within current farmer and forester advice networks.^{xxv}
- Business planning for tree planting requires long-term thinking and significant capital investment, with the return often following many years later. Many farmers on short term tenancies cannot experience the benefit of their investment, or are prevented from doing so by landlords and tenancy agreements.
- There is a lack of processing capacity in England for innovative crops that could prove highly lucrative in agroforestry systems, such as nut crops.



Recommendations

How can government unlock the opportunities of agroforestry?

Agroforestry has the potential to deliver on a wide range of policy objectives in England, yet barriers are preventing widespread adoption. Supporting agroforestry would be a win-win for productivity, environmental protection, and agricultural resilience. Government should adopt the following recommendations to make agroforestry a priority for the future of farming:

1. Provide a clear definition

The government should adopt a practical and clear definition of agroforestry in order to give clarity to land managers, practitioners, and policy makers across departments and agencies. We suggest the definition developed by the multi-country AGFORWARD project, led by Cranfield University, as ‘the practice of deliberately integrating woody vegetation (trees or shrubs) with crop and/or animal systems to benefit from the resulting ecological and economic interactions.’^{xxvi}

2. Deliver public goods

Make on-farm tree planting and management central to the UK’s new environmental land management scheme, rewarding the public goods delivered by agroforestry: carbon sequestration, flood remediation, soil organic matter improvement, biodiversity, and animal welfare. This can contribute to the UK’s afforestation targets, carbon budgets for agriculture, and ambitions for healthy soil by 2030.

3. Trial now

Establish major agroforestry trials during the EU withdrawal transition period, prior to the introduction of the new land management scheme, to test support mechanisms including advice networks and innovative funding options. This should include government support for farmer-led research and innovation networks that seek to integrate trees and agriculture.

4. Train advisors

Develop, fund and train a new generation of farm and forestry advisors that break the divide between forestry and agricultural advice and expertise. Such an advisory service will be essential for farmers and land managers to address and overcome the barriers to agroforestry in England.

5. Integrate policy-making

Integrate policies across departments and overcome the historic separation of forestry and farming. This could include integrating agroforestry into Environment Agency catchment flood management plans, and updating the Rural Payments Agency approach to allow agroforestry within the Basic Payment Scheme. This can be achieved with an over-arching agroforestry strategy to inform all departments.

6. Address tenancy

Incentivise long-term tenancy agreements to make it worthwhile for tenants to invest in establishing agroforestry and improving soil health. Government has a key advisory role to support landlords and tenants to form long-term agreements, and should seize the opportunity that agroforestry offers as a method suitable for multi-use agreements and the potential to support new entrants to farming.

7. Trees in the Agriculture Bill

Recognise the vital role of trees in the new Agriculture Bill, and support the potential of well-planned tree planting including agroforestry to achieve healthy environments, protect soils, sequester carbon from the atmosphere and support resilient farming.