Agroforestry as a tool for Net Zero in the UK

WHAT IS THE AFN NETWORK+

The AFN Network+ is a unique network of 1,000+ academics, researchers, third sector organisations, policy makers, and agri-food industry professionals from farmers to retailers. Together, we are working to identify key research gaps that may be holding the UK food system back from transitioning towards a net zero UK by 2050, while also enhancing biodiversity and healthy ecosystems, nurturing livelihoods, supporting healthy consumer habits, and minimising the environmental impacts of overseas trade. Our findings will inform the next decade of research investments in this area by UKRI (our funder and the UK research councils umbrella organisation). Alongside our core research, we run in-person and online events, produce topical resources, and give out hundreds of thousands of pounds of funding a year. AFN Network+ is coordinated by the University of East Anglia, University of the West of England, University of York, and University of Leeds, and is a £5m, 3-year project funded by four research councils; the Biotechnology and Biological Sciences Research Council, Economic and Social Research Council, Engineering and Physical Sciences Research Council, and the Natural Environment Research Council.

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Authors: Arina Machine[1], and Heiko Balzter[1,2]

[1] *University of Leicester, Institute for Environmental Futures, School of Geography, Geology and the Environment, Space Park Leicester, 92 Corporation Road, Leicester, LE4 5SP, UK*

[2] *National Centre for Earth Observation, University of Leicester, Space Park Leicester, 92 Corporation Road, Leicester, LE4 5SP, UK*

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Contents

Introduction

The Paris Climate Agreement requires a transition to net zero greenhouse gas emissions in order to avoid catastrophic climate change. In 2020, the UK became the first major economy to commit its Net Zero target into law. At the time, this was an achievement. The UK had already halved its greenhouse gas emissions compared to the 1990 baseline at that time [60, 61]. However, there is still work to be done. Current progress towards net zero is insufficient [77], especially when considering the agri-food sectors [12, 68]. The country must reduce its emissions by a further 28% compared to the 1990 baseline in the next twelve years to get back on target [18]. To achieve these targets, the UK will not only need to reduce its greenhouse gas emissions through the implementation of greener energy and more efficient infrastructure and insulation, but also by implementing nature-based solutions to carbon sequestration and storage as part of a wider programme of land use change towards multifunctional landscapes [74].

A prominent policy option for carbon sequestration is large-scale tree planting [13, 73]. The UK is falling far behind on its tree-planting commitments, though, barely planting 12% of the 30,000 hectares of trees annually it should be by 2025 [23]. With a little over a year left at the time of writing this report, it is now seemingly impossible to meet this tree-planting target. There is an urgent need in the UK to increase its tree cover. At some point, the limits of emissions reduction will be reached and the need to offset emissions will arise – a goal that will not be achieved without prior years of effective tree planting. This urgency does not even consider all the other benefits of tree planting, including those to biodiversity [59], quality of life, recreation [84], human health and wellbeing [84], air quality [29], and flood risk management [75].

When most people imagine tree planting efforts, they envision afforestation. However, the question of where to plant large numbers of trees is often complex [9, 82]. The best quality soil for tree growth is often also the most productive for agricultural uses, creating a conflict of interest between food production and sequestration. Most woodland opportunity maps discount the possibility of planting on highly productive agricultural land [5, 87]. Although this may be a reasonable consideration for afforestation, there is also scope for tree planting on agricultural land. In fact, the integration of trees on actively utilised agricultural land is a long-standing practice in many parts of the world and is known as agroforestry.

This report provides an introduction into agroforestry, its benefits for climate and food production, and its role and context in potential futures of the UK agricultural sector.

The Future of the UK Agricultural Sector

Tree planting is a long-term carbon offsetting solution. Trees sequester and store carbon for decades, meaning that tree-planting decisions need to not only consider current conditions but also potential future states. Therefore, it is important to understand what the state of the UK agricultural sector may be in the future, to understand whether tree-planting is a feasible solution for the present and future.

A recent report by the AgriFood for Net Zero (AFN) Network+ outlines alternative plausible futures for the UK agricultural sector in 2050 [3]. A summary of these scenarios is provided in Figure 1.

The scenarios are described in detail in the report by the AFN Network+, including the details of agricultural practices and economies as well as implications for social inequality and health [3]. Here, we summarise the potential implications of the scenarios on various aspects of agricultural production at the farm and field levels (Table 1).

Figure 1: illustrative summaries of the four plausible scenarios of the UK's AgriFood sector in 2050 from the AgriFood for Net Zero Network + [3].

Table 1: Summary of select characteristics of scenarios of plausible futures for the future of UK agricultural systems [3, 88]

	Scenario A	Scenario B	Scenario C	Scenario D
Diversity of crops	Low	High	Intermediate/ Low	Intermediate
Livestock Cultivation	Low	Intermediate/ Low	Intermediate/ Low	Low
Intensification of Yields	High	Intermediate/ Low	High	High
Presence of mixed systems	Intermediate	High	High	Intermediate
Technological Innovation	High/ Intermediate	Intermediate	Low	High
Global Warming	>2.0 °C	1.5 °C	>2.0 °C	1.5 °C

A change in diets away from traditional meat consumption and intensive livestock production has a role to play in all scenarios to reduce greenhouse gas emissions. There is also a theme of increasing mixed farming systems, as evidenced by their emphasis in 'Build Back Fast Again', 'Circular Worlds' and 'Self-Sufficiency' (scenarios A, B, and C). Land use change for rewilding and carbon sequestration is included in several scenarios. Further, all of the scenarios suggest that the 1.5 °C global warming target is very likely to be exceeded, even if only by a marginal amount in 'Circular Worlds' and 'The Right to Food' (B and D), suggesting that there is likely to be volatile change to the UK agricultural sector due to more severe climate change impacts and increases in extreme weather events such as floods, droughts and heat waves [65].

This report will use these scenarios to guide the discussion of whether tree planting on actively utilised agricultural lands is feasible and its possible implications under various contexts in the UK.

What is agroforestry?

Agroforestry is a term to describe a heterogenous system of trees outside of woodlands. It indicates the simultaneous presence of agriculture and woody vegetation. Exact definitions vary between countries and organisations, but the overarching concept is the presence of trees on agricultural lands. In some instances, definitions contain additional requirements for agroforestry classification, such as that provided by the AGROFORWARD project requiring the integration of the two systems to be '*deliberate*' [1]. Whilst this particular definition is popular amongst organisations in the UK, such as DEFRA and the Woodland Trust, it complicates agroforestry classifications. Discerning whether a tree is deliberately placed on land requires understanding of the design and management of land, preventing the classification of agroforestry lands without an in-depth understanding of the fields in which they occur. For this reason, this particular report will only consider the former definition: woody vegetation on actively farmed land.

Agroforestry is a term that embraces a number of practices, many of which have historical significance in the UK such as boundary hedgerows and orchard grazing (Table 2). Agroforestry systems generally fall into the categories of silvopastoral or silvoarable, pertaining to livestock or crop systems, respectively.

Some agroforestry practices do not fall under the systems presented in Table 2, such as spatial or temporal mixtures of silvoarable and silvopastoral practices. There is a lack of consensus on what systems are classified as agroforestry, leading to some systems described in Table 2 to be discounted as agroforestry by some. As some definitions require interaction and integration of the forest and agricultural components [83], boundary systems (i.e. hedges with trees) are often not classified as agroforestry.

It is important to note that whilst agroforestry practices may be diverse, there are often legal requirements guiding the structure of agroforestry schemes. In the European Union there exists a maximum density of 100 trees per hectare [22] and in the United Kingdom over 50% of the ground must be covered by grasses, herbaceous forage, or crops to qualify for the Basic Payment Scheme [38]. Beyond this, there also exist a number of key differences in the management and makeup of trees in agroforestry systems compared to their forest counterparts. Dupraz et al. [21] outline these differences to include extent of thinning and pruning, intensity of management, species composition, intra- and inter-species competition, and tree height and breast diameter.

Table 2: Agroforestry Systems in Europe. Adapted from Dupraz et al. [21] and Mosquera-Losada et al. [51]

General Classification	Sub-Type	Definition
Silvopasture	*Wood Pasture*	Land containing livestock and trees and/or shrubs. The woody vegetation can be scattered or part of a forest system.
	Grazed Orchards	Land containing livestock and trees that produce fruit, often planted for commercial purposes.
Silvoarable	*Alley Cropping*	Rows of trees planted within cropland. The crops are planted in alleys alongside woody vegetation, which can include woody crops such as fruit or nut trees.
	Individual Trees	Cropland with significant tree cover that is not planted linearly.
	Forest Farming	Naturally occurring speciality crops harvested within forest systems.
Linear Edge Systems	*Hedgerows*	Linear system of trees and/or other woody vegetation used to define boundaries of land ownership or fields.
	Riparian Buffers	Strips of woody vegetation planted to create a barrier between agricultural land and water systems. The woody vegetation is used to protect the water system from agriculture related impacts such as nutrient leaching.
	Shelterbelts	Strips of woody vegetation planted to minimise the effects of high winds, also commonly known as windbreaks.
Urban	*Homegardens*	Woody vegetation in urban areas alongside small-scale food production. Also known at kitchen gardens.

Figure 2: images of various agroforestry systems. Images depict silvoarable, silvopastoral, and hedgerow systems (top to bottom).

History of Agroforestry in the UK

There is likely a long history of agroforestry in the UK, of which silvopastoral systems are likely the only remnants [55]. In recent years, there has been an increased interest in sustainable farming systems and agroforestry. This led to the creation of the UK Silvopastoral National Network Experiment in 1986, which included four experimental sites across the UK [67]. The experiment led to the creation of the Farm Woodland Forum, formerly the Agroforestry Research UK Discussion Forum and UK Agroforestry Research Forum, an informal consortium of researchers, farmers, and foresters with a joint interest in agroforestry research and application [34]. The Loughgall site in Northern Ireland is currently the only experimental site still active from the original network.

The most cited agroforestry extent in the United Kingdom comes from an analysis of the European Union's 2012 Land Use and Land Cover survey, which is a land cover and use classification survey of 1.1 million points with 2 km evenly spaced points in all four cardinal directions [43]. The analysis found that the UK contained 550,000 hectares of agroforestry, accounting for approximately 3.3% of all agricultural land [31]. Over 99% of this identified agroforestry in the UK was livestock agroforestry in silvopastoral systems.

More recent estimates of agroforestry from the 2018 survey suggest that approximately 390,000 hectares of the UK were under agroforestry, significantly lower than the 2012 and 2015 estimates [63]. This decline represents an agroforestry loss of 58.8% between the 2015 and 2018 surveys. This suggests that although there is an increased interest in agroforestry from the academic, governmental, and industrial sectors, its overall utilisation seems to be declining.

The agroforestry extents above only consider silvoarable, silvopastoral, and urban systems, meaning that they represent an underestimation of agroforestry in the UK. Linear edge systems, particularly hedgerows, have played an important historic role in the United Kingdom, with long histories of removal due to agricultural intensification [80]. Due to their biodiversity and historic significance, the majority of rural hedgerows are now protected under government law [15].

The most recent robust survey of UK hedgerows, excluding Northern Ireland, was conducted in 2007 under the countryside survey, which estimates a total of 477,000 km of hedgerows in Great Britain, and a total of 700,000 km of woody linear features [16]. This represents a 1.7% and 6.2% decline of woody linear features and hedges, respectively, compared to values from

1998. In Northern Ireland, there was an estimated 113,000 km of hedgerows in 2007, a loss of 4.6% compared to 1998 estimates [47]. More recent estimates of linear features provided by the Forestry Commission based on remote sensing tree canopy maps, without data for Northern Ireland, suggest that there are a total of 452,000 km of hedgerows in Great Britain, equating to approximately 165,000 hectares of hedgerow [53].

Evidenced through these estimates, agroforestry uptake in the UK is alarmingly low compared to the EU average of 8.8% [31]. Agroforestry systems are further declining in number, when both the most common silvopastoral and linear edge systems are considered. This suggests that there is a huge potential in the UK to meet its tree planting and net zero commitments through the integration of trees on active agricultural lands. However, it is also important to understand the state of the sector to understand the barriers to its uptake.

The AFN+ future scenarios highlight the potential for agroforestry to play a role in the future of the UK agricultural sector, regardless of the scenario. Mixed farming systems, food production and carbon trade-offs, and resilience are identified as key research areas that arise from the scenarios [86]. Agroforestry has the potential to provide numerous benefits, including those that tackle these key considerations. However, with agricultural intensification being a key component of three of the four scenarios, there is an important discussion surrounding benefits compared to yield and economic impacts of agroforestry.

Guided by this analysis of the potential plausible futures of the UK agricultural sector, this report will now focus on these key considerations on agroforestry. By doing so, we want to elucidate the role agroforestry could play in the future of the UK agricultural sector, but also highlight some of the important trade-offs. The following section will focus on considerations of:

- Carbon sequestration
- Yield trade offs
- Resilience benefits

What are the important considerations of agroforestry?

Carbon Sequestration:

Trees are a commonly cited nature-based solution to climate change due to their ability to sequestrator and store carbon for a long period of time. The overall carbon storage of agroforestry systems is often higher than their agricultural counterparts, with one global estimate suggesting that accounting for carbon stores in trees on farms quadruples carbon stock estimated of agricultural lands [85]. Carbon in agricultural lands is primarily stored in three locations: above-ground biomass, below-ground biomass, and in soil organic carbon (SOC). Table 3 summarises the carbon sequestration of various agroforestry systems, as modelled by Burgess and Graves [8].

In all four of the aforementioned scenarios afforestation of abandoned pastures plays a role in in achieving net-zero. In some cases, tree growth is not an intentional decision with the goal of sustainability, but rather a consequence of changing behaviours and economies. However, not all tree-growth may result in net positive effects. Meta-analyses suggest that planting trees on grasslands have non-significant to negative impacts on SOC [10, 20, 45]. If the underlying soil is rich in carbon, the trade-off between SOC loss and biomass gain may result in delayed carbon sequestration and potentially carbon source effects [24]. For this reason, well-planned intentional tree planting is the better alternative to carbon sequestration on abandoned pastures.

Forest systems in their early establishing stages allow for sufficient light penetration to maintain grassland suitable for livestock. With correct tree protection measures in place, silvopastoral systems may be used as a transitional land use between agricultural and forestry systems. Due to a decrease in consumption of traditional meat products, the scenario analysis outlined livelihoods of individuals in the livestock sector as a key issue [86]. Perhaps silvopastoral systems may be an answer, where the sector can be integrated into the transition towards net-zero, achieving economic and nature benefits simultaneously.

The analysis by Burgess and Graves suggests that if 20% of UK arable land is converted to agroforestry, net zero arable farming can be achieved by 2048, whilst 30% of pastures must be converted to reach net zero by 2051 [8]. These numbers assume no reduction in agricultural emissions over time but do predict a reduction in agricultural productivity to 84% and 86% for arable and livestock systems, respectively. As the model was based on existing data for UK tree growth, sequestration rates are likely to be higher under future scenarios due to increased atmospheric CO_2 concentrations [7]. Further, it is important to note that the tree species assumed for the model in Table 3 are high-yield conifer and broadleaved species that reach mature heights of 30-35 m. Not all agroforestry systems are planted with such species, particularly orchard systems where the ideal heights of trees are often no more than 5 m, which would have much lower sequestration potentials than those outlined in Table 3 due to their lower biomass.

	Change in SOC (t C per ha)	Biomass (t C per ha)	Total (t C per ha)	Years
Silvopasture	0.0	195.0	195.0	40
Silvoarable	8.7	63.0	71.7	30
Grassland Shelterbelt	0.0	68.8	68.8	40
Arable Shelterbelt	20	68.8	88.8	40
Grassland Hedgerow	0.0	66.4	66.4	40
Arable Hedgerow	20	66.4	86.4	40

Table 3: Agroforestry carbon sequestration estimates as modelled by Burgess and Graves in a report for the woodland trust [8]. Values for silvopastoral and silvoarable systems are given per unit area of agricultural system whilst values for shelterbelts and hedgerow systems are given per unit area of linear edge systems including a 6m and 2m grassland margin, respectively.

There is a general consensus that agroforestry systems sequester more carbon than their agricultural mono-system counterparts, especially once above-ground biomass is considered. However, a number of factors may affect the carbon sequestration of agroforested lands, including system in place, species and density of trees planted, management practices, prior land use, climate, and soil type. Agroforestry, particularly silvopastoral systems, may help the livestock sector adapt to potential futures where sustainability and resilience are prioritised, whether it be in a long-term or transitional manner.

Yield trade-offs:

Agricultural yields are a primary concern in scenarios 'Build Back Fast Again', 'Self-Sufficiency', and 'The Right to Food' (A, C, and D). In the former two scenarios (A and C) high yields and intensification exist due to a constant industrial need for economic growth. In such futures, it is difficult to justify the uptake of agroforestry if it has significant detrimental impacts on agricultural yields. This section addresses this concern, discussing the economic impacts of agroforestry systems.

Although claims that agroforestry increases arable yields are prevalent, studies of temperate systems often conclude that long-term arable yields are decreased compared to mono-culture systems [42, 55, 57, 64]. Application of agroforestry yield model Yield-SAFE to two cases estimate crop yields to be reduced, both on a cropped and total area basis, with the level of reduction becoming more pronounced over time due to tree maturity [81]. This reduction in yields is largely a result of competition between trees and crops for nutrients, water, and sunlight. However, it is possible to mitigate impacts through careful planning and management of the systems, such as selecting trees and crops with complimentary sunlight requirements and pruning of trees. For example, one study found that increasing distance between crop and tree components and moving from summer crops to winter cereals in more mature systems were successful intervention methods to minimise negative impacts on yields [57]. These interventions suggest that, as long as planning is well-researched, effects on crop yields can be minimised even if arable systems are focussed on a limited number of commodity crops, such as in futures similar to 'Build Back Fast Again' and 'Self-Sufficiency' (A and C).

In silvopastoral systems, the impact of trees on grass yields can be either neutral to negative or positive to neutral, depending on if evergreen or deciduous tree species are planted, respectively [52]. Beyond grass yields, the presence of trees on farms has a positive effect on livestock production, including higher positive behaviour and thermal comfort [27] well as higher embryo [44] and milk [2] production. Trees on pastures have been shown significantly increase the grazing period, with one study finding a 17-week extension to the grazing period in an ash silvopasture system [46]. Although all scenarios predict a decrease in livestock cultivation, agroforestry may offer a more sustainable yet productive future for the livestock sector in a net-zero world. 'The Right to Food' (Scenario D) even directly references 'heritage meat' where livestock is sustained on pasture rather than fodder as a potential future of the livestock sector. Agroforestry has the potential to not only increase the sustainability of the agricultural sector through carbon sequestration, as already discussed, but also by limiting the need for feed inputs.

Beyond existing arable and livestock income, agroforestry has the potential to provide additional economic benefits to farmers as it diversifies income streams, offering a mix of, short-, medium-, and long-term products to supplement cash flow. If the planted trees were of high-quality timber species, the material produced during thinning, management, and maturity may be sold on for profit, especially as the AGROFORWARD project recommends planting at a higher density of up to double than the intended density at maturity [78]. Thinned trees are of use in small-scale construction projects and by products of tree management provide a form of biofuel [26]. Studies have found the products of managed hedgerows [70] and alley cropping systems [28] to have the potential for profitability under specific conditions. One of the important conditions that determine the profitability of such systems are timber prices, showing profitability potential in net-zero futures as predictions suggest the price of timber will quadruple by 2050 [50] due to its role in reducing emissions of the construction sector [35].

Trees planted may also produce products such as fruits and nuts, such as within orchard grazing systems, diversifying agricultural income and making it more resilient to fluctuation in prices and yields of a specific product. However, it is important to consider whether these products would be profitable under future scenarios. The futures of 'Build Back Fast Again' and 'Self-Sufficiency' (A and C) rely on a specific set of commodity crops, meaning that there may not be a large market for certain diversified products, as compared to 'Circular Worlds' and 'The Right to Food' (B and D).

Many studies have found that although agroforestry may reduce the yield of crops or grasses when considering the yields of both agricultural and tree-based products, agroforestry increases land productivity compared to monocultures of either type [41, 54, 66, 69]. However, profitability of agroforestry systems is highly dependent on a number of factors including choice of species, density, and management strategy, as well as fluctuations in the price of timber, wood products, crops, and livestock. Studies suggest that there is a significant period where initial costs outweigh cumulative income produced by agroforestry systems, especially if there are no government grants available for tree establishment [6, 72].

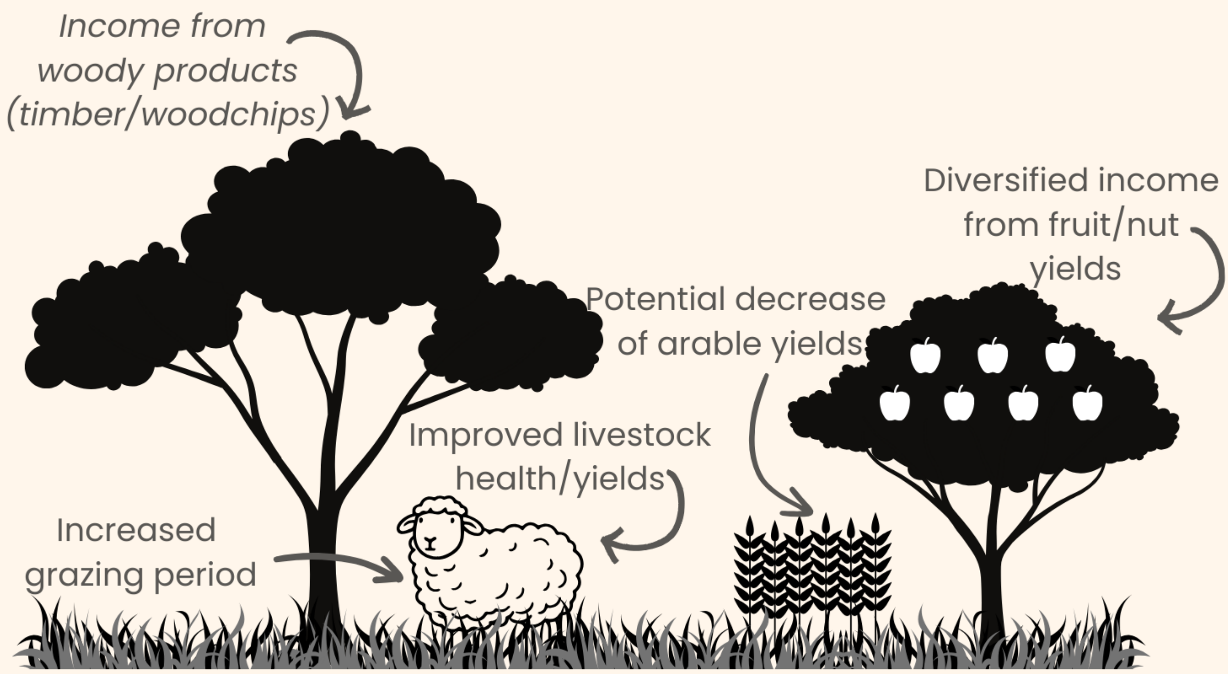

Figure 3: summary of the potential economic implications of agroforestry, focussing primarily on yield of agricultural and woody products.

Resilience:

Agroforestry may have additional economic implications to agricultural land through increase the resilience of systems to extreme weather events and increasing productivity of low-quality soils (Figure). Under all scenarios some level of warming is predicted, and even in the scenarios where the targets of the Paris Agreement are broadly achieved, the climate of the United Kingdom would undergo significant changes. The Intergovernmental Panel on Climate Change (IPCC) suggests that even warmings of 0.5°C would cause a significant increase in extreme weather events [65]. The Met Office has concluded that the UK climate in the 20th century has already been wetter, sunnier, and warmer compared to the previous century, with temperature extremes changing more rapidly than average temperatures [40]. This suggests that not only will the UK climate get warmer, but there will also be an abundance of unpredictable events such as storms, floods, and heatwaves, all of which will affect the efficiency and profitability of the agricultural sector. This report will focus on extreme weather events predicted up to and including 2050, which include high temperatures and precipitation events for all scenarios, and droughts for scenarios 'Build Back Fast Again' and 'Self-Sufficiency' (A and C) due to likely exceeding a 2.0°C warming scenarios [30, 40, 48, 65].

Although higher temperature and CO_2 levels are associated with higher crop production, due to extreme heat events the agricultural sector is overall predicted to be negatively affected by increases in temperature [14]. The losses outlined in this report focus on agricultural production and do not account for the other effects of extreme temperatures in other areas of the agricultural sector such as storage system failures. It is important to note that climate impacts will vary spatially across the UK, meaning that these summary predictions may not be accurate for all agricultural areas.

In 'The Right to Food' (scenario D) unpredictable weather events are likely to be countered through technologies in the agricultural sector, such as climate-resistant crop breeds, lab-based proteins and controlled environment farming such as greenhouses and vertical farms. However, in many of the other scenarios technological innovation is less prevalent, meaning that resilience-building must largely be achieved through other means.

Agroforestry counters the effect of high temperatures through creating lower-temperature microclimates, increasing soil moisture by accessing deeper water sources, and reducing crop transpiration rates. We have already discussed the positive impacts of silvopasture systems on livestock health and productivity and pasture temporal efficiency in the yield impacts section of this report. In silvoarable systems crops and trees often compete for the same nutrient, water, and sunlight resources, meaning that system design and planning, such as the selection of tree species with hydraulic lift capabilities is vital to the creation of resilient fields [52]. One model of alley cropping found that agroforestry minimised the negative effects of high temperatures on grain filling but was only predicted to have positive impacts on crop photosynthetic capabilities after 20 years of planting [62]. Agroforestry has been shown to have large positive impacts on crop yields under drought conditions caused by high temperatures [11, 49], but mitigation for these conditions is less relevant for 'Circular Worlds' and 'The Right to Food' futures (scenarios B, and D), as significant increases to droughts are only predicted in the UK for scenarios where warming has exceeded 2°C [25].

High precipitation has the potential to negatively impact agriculture through the loss of soil nutrients, limiting the gas exchange of plants due to waterlogged soils [56], increasing the risk of water-related diseases [79], and delays in the management of land [37], such as harvesting and planting. High precipitation can lead to devastating effects, such as the UK experiencing its lowest harvest in a quarter of a century in 2020, partially caused by high precipitation events across the year [32]. Most recently, storm Babet in 2023 is thought to have severely impacted yields of crops [36].

Trees are known to improve soil drainage by taking up significant quantities of water through their roots, leading to less surface runoff and better water storage. The Pontbren Project found infiltration rates of soils near shelterbelts were 60 times higher than those in nearby pastures [4]. With higher soil infiltration rates, plants are much less likely to experience waterlogged conditions and their negative impacts. Further, by reducing surface runoff, trees can help prevent the loss of soil nutrients such as nitrogen and phosphorus [76]. This is particularly important for all futures apart from 'Build Back Fast Again' (B, C, and D) where sustainability in fertiliser use is vital. Agroforestry has been shown to improve soil health overall, including its impacts on soil carbon, nutrients, and microbial dynamics [19].

The presence of trees on farms has been cited as an effective and natural method to increase field resilience. This increase in resilience can have direct positive economic impacts, with one study predicting agroforestry having higher long-term returns under conditions with high market and climate uncertainty [58]. However, the authors of the study emphasise that this was not the case for all agroforestry systems modelled, suggesting that systems must be well-designed.

Agroforestry can increase the resilience of fields, but for it to be successful the system must be designed with intention. Discussion of what planting designs and management practices yield best results for agroforestry systems is outside the scope of this report, but a thorough discussion of spatial design and management considerations exists in a number of sources [17, 33, 52, 71].

Conclusions

Agroforestry has a role to play in the future of the UK agricultural sector, as is already evident by the growing interest in it.

Agroforestry is a tool that can help the agriculture in several ways, allowing for multiple benefits. Even when considering futures with varying priorities, such as economic growth, sustainability, or system stability, agroforestry can aid each of these goals whilst potentially also achieving benefits that are not prioritised. With correct planning agroforestry can improve farm yields and reduce the need for cost-ineffective inputs, improve general sustainability of fields, and make them more resilient to agricultural product prices and extreme weather events. With agroforestry, there may not need to be a choice between economic outputs or sustainability, but rather a future for both.

However, there can be drawbacks of implementing agroforestry, such as the potential decrease of arable yields and soil organic carbon of grasslands. It is not as simple as planting any tree on any agricultural land.

The consideration of existing conditions, such as crop species, soil types, climate, as well as potential future conditions such as extreme weather events caused by climate change and future prices of timber and crops, is important in ensuring that agroforestry systems provide benefits rather than costs to landowners and managers. For this reason, scenario analysis can offer a useful tool in the planning of long-term agroforestry systems, as they can be used to test the success of designs and management practices under a number of potential futures.

Not only should we be considering how agroforestry may benefit the sector, or put us on a more climate-friendly path, but also what impacts potential futures may have on the systems that we are currently planting. This consideration can ensure that planting is occurring with "*the right tree in right place, for the right reason*" [39].

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