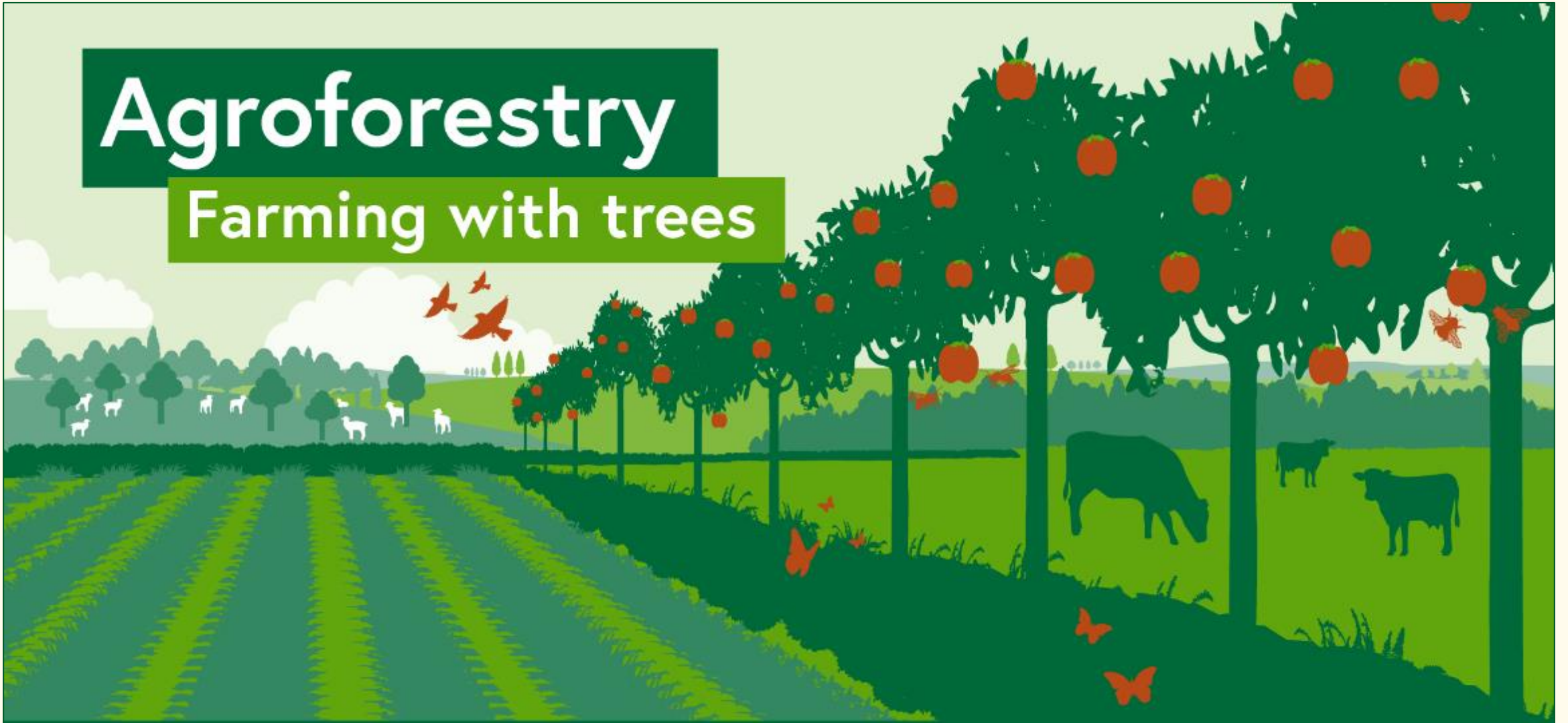


Agroforestry

Farming with trees



Forestry Commission

Forestry Commission

The Forestry Commission is a non-ministerial government department responsible for the management of publicly owned forests and the regulation of both public and private forestry in England.

Forest Research

Forest Research provides research services relevant to UK and international forestry interests, informing and supporting forestry's contribution to government policies. It provides the evidence base for UK forestry practices and supports innovation.

Forest Research is an executive agency, *sponsored* by the Forestry Commission.

James Ramskir-Gardiner

Forestry Commission's Agroforestry Adviser

'Breaking down the silos between farming and forestry'

My main role is the upskilling of both the forestry & farming sectors in England to facilitate agroforestry understanding, creation and management.

I am also working with Defra and wider partners in designing the ELMS Agroforestry offer as well as providing advice and support to FC staff, local and national organisations regarding agroforestry.

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07815 645 676

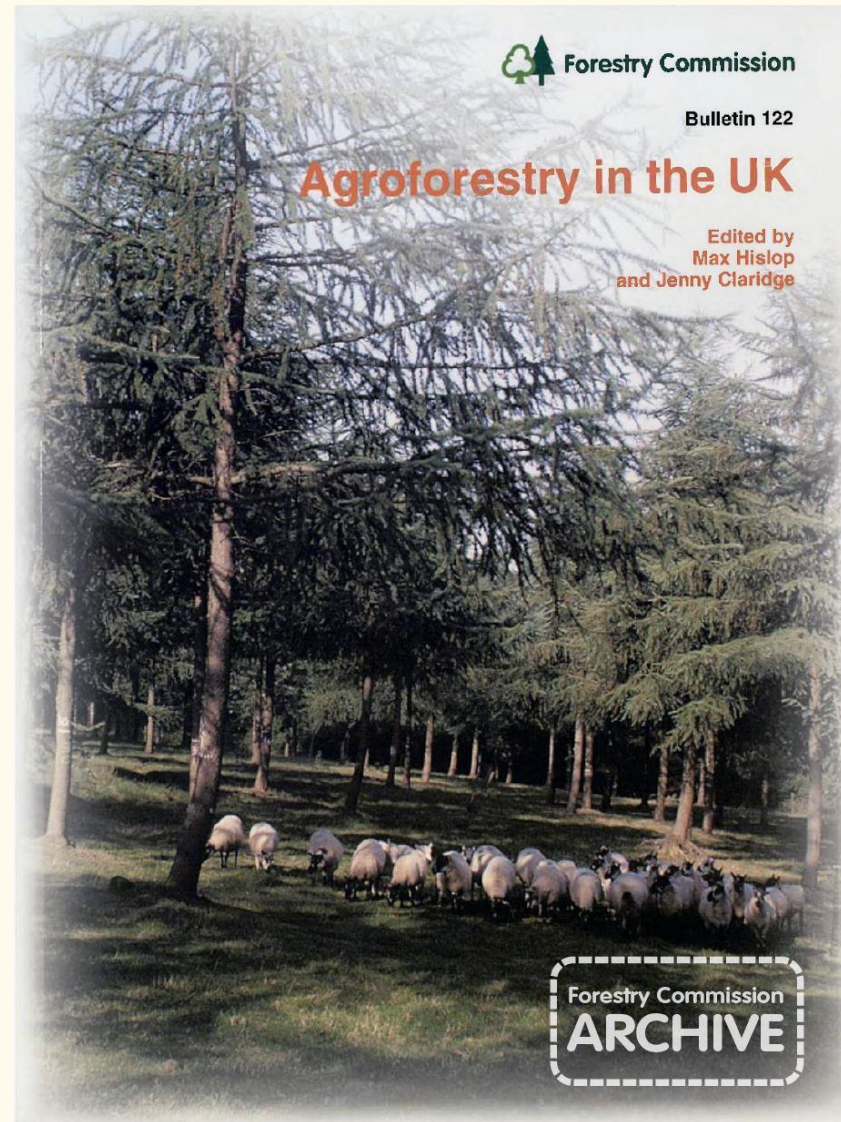


FC Bulletin 122: Agroforestry in the UK

Published: 2000

Pages: 128

<https://cdn.forestresearch.gov.uk/2000/03/fcbu122.pdf>

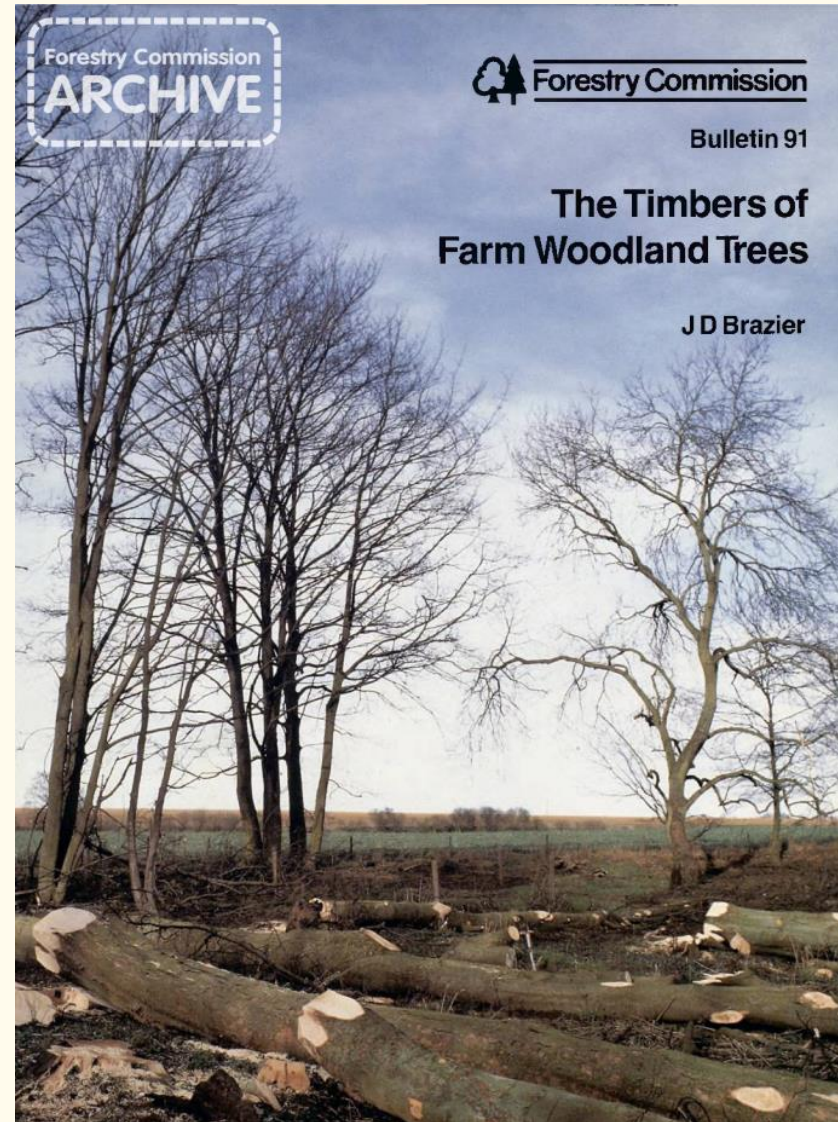


FC Bulletin 91: The Timbers of Farm Woodland Trees

Published: 1990

Pages: 22

<https://cdn.forestresearch.gov.uk/1990/03/fcbu091.pdf>



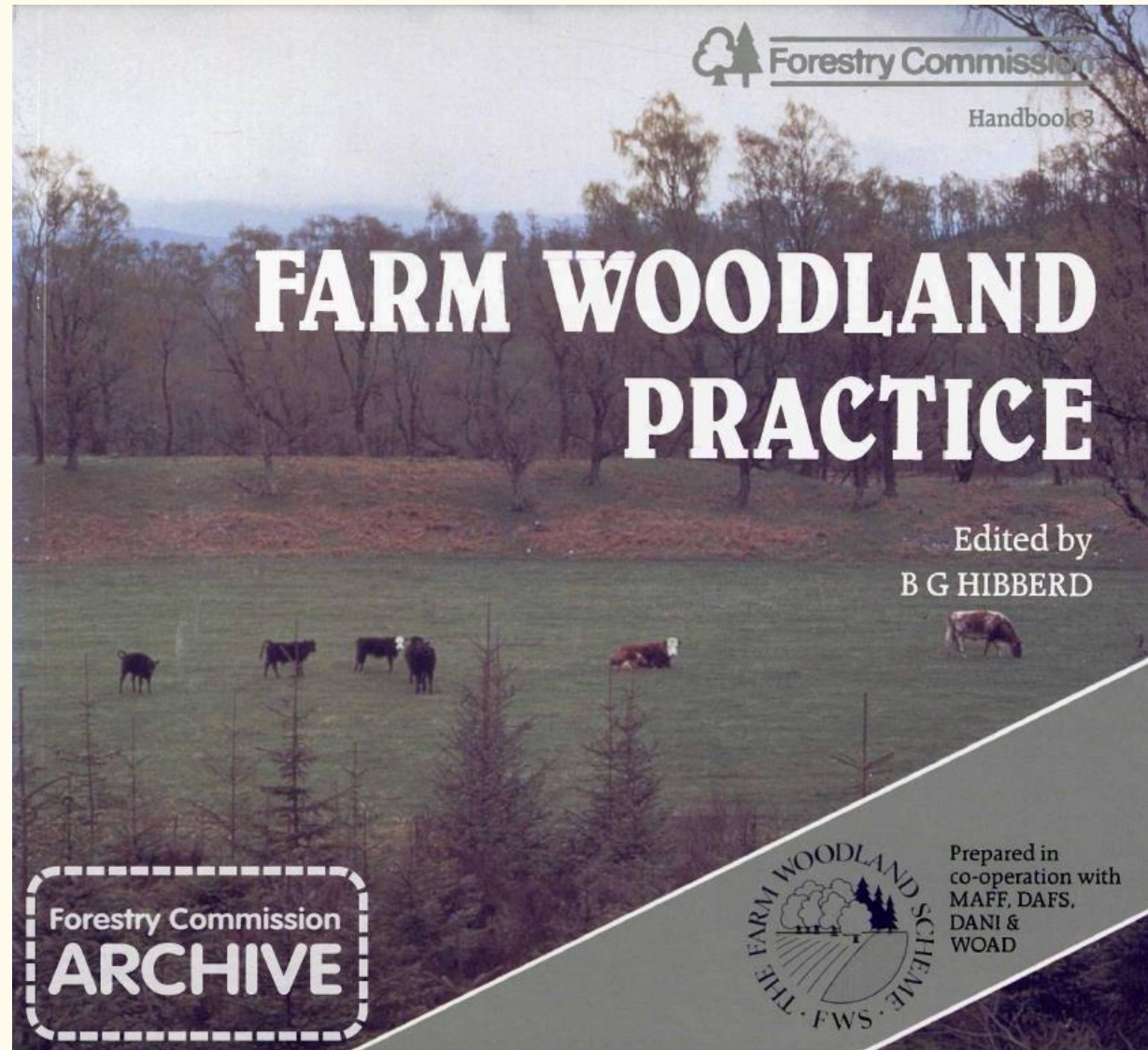
FC Handbook 3: Farm Woodland Practice

Published: 1988

Pages: 106

<https://cdn.forestresearch.gov.uk/1988/03/fchb003.pdf>

(Physical copy with me for anyone who would like to look through)



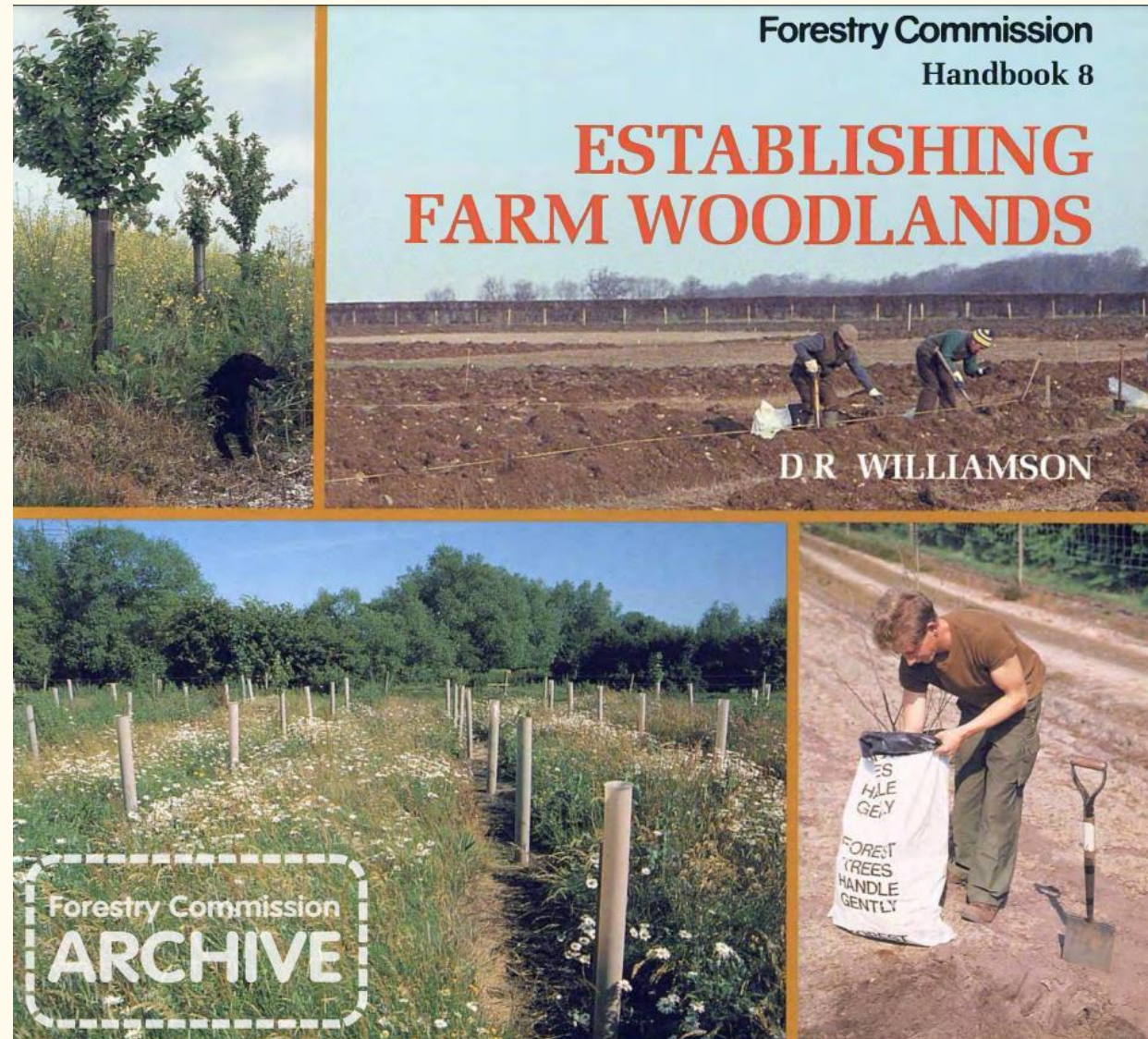
FC Handbook 8: Establishing Farm Woodlands

Published: 1992

Pages: 42

<https://cdn.forestresearch.gov.uk/1992/03/fchb008.pdf>

(Physical copy with me for anyone who would like to look through)

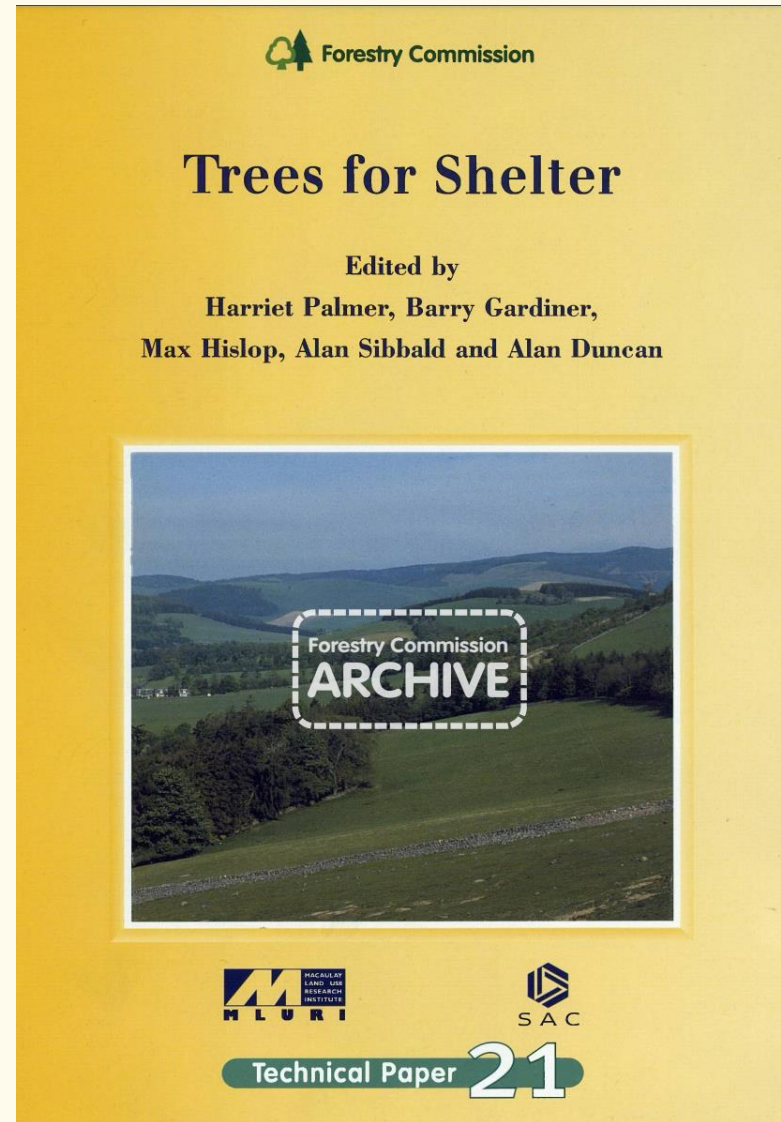


FC Technical Paper 21: Trees for Shelter

Published: 1997

Pages: 75

<https://cdn.forestresearch.gov.uk/1997/04/fctp021.pdf>

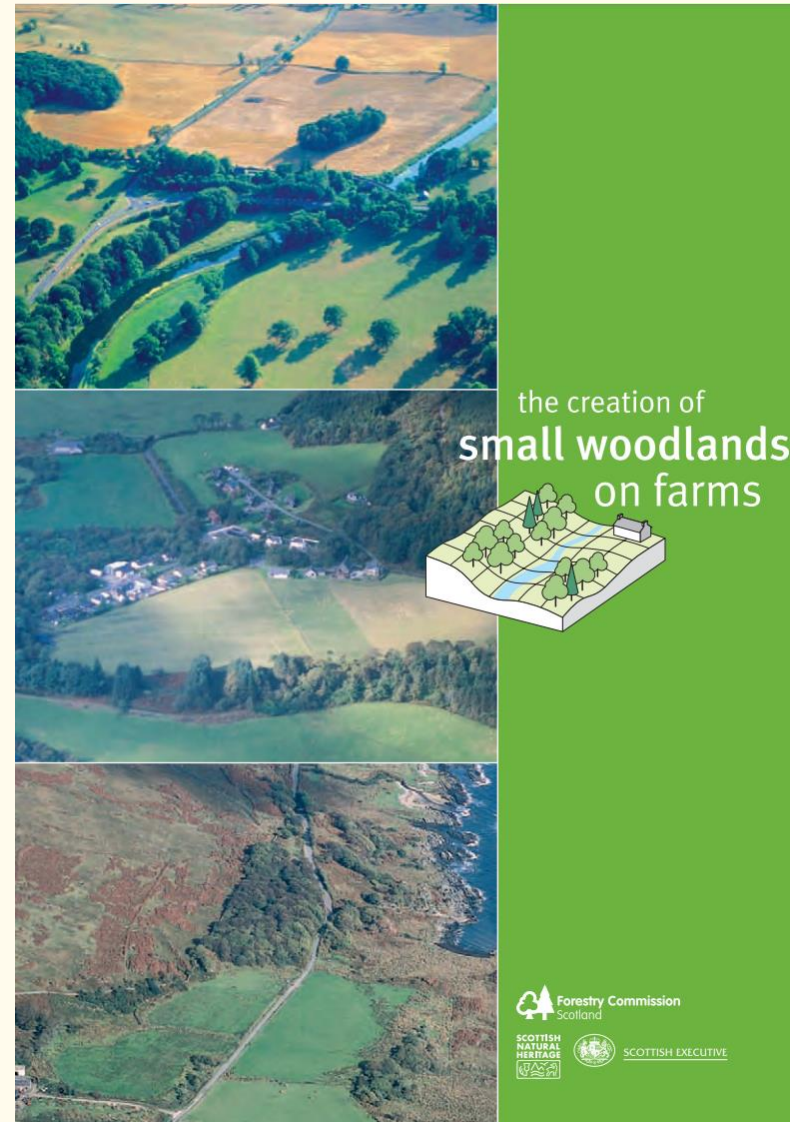


The creation of small woodlands on farms

Published: 2006

Pages: 66

<https://cdn.forestresearch.gov.uk/2006/03/fcfc150.pdf>



Forest Research

Tenanted farms and woodland creation

Published: 2023

Pages: 26

<https://cdn.forestresearch.gov.uk/2023/06/Tenanted-farms-and-woodland-creation-%E2%80%93-Evidence-review-and-interview-insights.pdf>

 Forest Research

Tenanted farms and woodland creation – Evidence review and expert interview insights

Core research programmes 2021-26
Programme 6, Work Area 1
Land Manager Engagement for Woodland Creation

Stephen McConnachie, Harry Marshall, Marios Theocharopoulos, Katy Spencer

June 2023

The Research Agency of the
Forestry Commission

 **Forestry Commission**

Forest Research

The potential for agroforestry to reduce net GHG emissions in Scotland through the Woodland Carbon Code

Published: 2022

Pages: 51

<https://www.climateexchange.org.uk/media/5388/cxc-the-potential-for-agroforestry-to-reduce-net-ghg-emissions-in-scotland-through-the-woodland-carbon-code-may-22.pdf>

climateXchange

Scotland's centre of expertise connecting climate change research and policy

The potential for agroforestry to reduce net GHG emissions in Scotland through the Woodland Carbon Code

▶ Vadim Saraev, Wen Hao Low, Kate Beauchamp and Mike Perks

Forest Research, March 2022

DOI: <http://dx.doi.org/10.7488/era/2526>

1 Executive summary

1.1 Context

Significant change is needed across all sectors – including land use – to meet the greenhouse gas (GHG) emissions reductions targets outlined in Scotland's Climate Change Plan¹ (CCPu). Woodland creation and tree planting targets are a key pillar in delivering this reduction.

Agroforestry is the combination of trees and agriculture on the same plot of land, with tree density varying dependent on agricultural land type, tree species and objective. There has been growing interest in agroforestry systems as an opportunity to integrate land management objectives and contribute to meeting tree planting targets and generate GHG reductions and removals. However, only 3.3% of the utilised agricultural area in the UK is managed for agroforestry at present (den Herder *et al.*, 2015). Carbon schemes, such as the Woodland Carbon Code (WCC) could offer a potential route to provide financial support for agroforestry and incentivise its creation.

This report examines existing evidence to assess the GHG mitigation potential of different forms of agroforestry suitable in Scotland, building on the recent Perks *et al.* (2018) report *Agroforestry in Scotland – potential benefits in a changing climate*. It also examines the economic viability of adopting such agroforestry practices.

1.2 Key findings

1.2.1 GHG reduction potential

- There is additional new evidence, predominantly drawn from studies in other parts of the UK, which provides some comparisons of the likely scale of GHG mitigation from adoption of agroforestry systems in Scotland. This new data includes evidence for hedgerows. This includes a central estimate based on studies in southern England

¹ <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/>

Grow your farm business: How trees can benefit your land, crops and livestock

Published: 2023

Pages: 27

<https://www.gov.uk/government/publications/grow-your-farm-business-how-trees-can-benefit-your-land-crops-and-livestock>

Forestry Commission Woodland Creation

Grow your farm business: How trees can benefit your land, crops, and livestock

Grow your farm business: How trees can benefit your land, crops, and livestock

A look at woodland finances

There is huge diversity in woodland and before calculating potential income you would need to consider a few factors, including the woodland type, species mix, percentage cover, yield class (an index that measures potential productivity of even-aged groups of trees), spacing, rotation, gross area, as well as your management plan and much more. Therefore, this case study won't be representative of every woodland, but it gives you an idea of what is possible.

Offset your emissions and become a net zero farm

Trees act as a natural 'carbon sink', absorbing the atmospheric CO₂ and releasing oxygen whilst locking up carbon, which means they can go a long way in helping your business to reduce its emissions. Carbon is stored throughout every part of the tree, and 70% of all forest carbon in the UK is stored within forest soils.

With the impacts of climate change becoming ever more apparent, you may already be thinking about how you can reduce your farm business carbon emissions to reach net zero targets. However, there will always be some unavoidable carbon emissions from your farm business. You can use new woodlands registered with the Woodland Carbon Code to offset these unavoidable emissions and make your business operate with a lower impact upon the environment. It's often good for business too, as the people that buy your farm produce are also looking for suppliers with a low carbon footprint and low impacts on the environment.

Trees and your crop

Alley cropping

Alley cropping is the practice of planting tree rows with a companion crop in between. When managed appropriately, alley cropping could help your farm by increasing yield, boosting income, and reducing the risks associated with monocropping. The combination of trees and companion crops planted in the alleys should be carefully considered, for example, it's important to

Grow your farm business: How trees can benefit your land, crops, and livestock

Case Study: A project to enhance the local landscape, improve biodiversity, and create a legacy for future generations

When the owner inherited their family farm in the northeast of England, they immediately began to transform it into a Green Energy hub with ground source heating, a wind turbine, and multiple solar panels. The land had been exclusively grazed by sheep and cattle for over 50 years and was home to a small sheep flock. The owner, who had a profession outside of their work on the farm, felt as though there was only a small financial gain from the farm and wanted to leave a long-lasting impact. This led them to consider alternative land use options, and as an environmentally-conscious person, the owner decided to create over 10 ha of new woodland to benefit the planet.

Long-term goal: Enhance the local landscape, improve biodiversity, and leave future generations with a better, cleaner planet.

Category	Value
Income	
Woodland Creation Planning Grant	£2,100
EWCO standard costs and maintenance payments	£112,900
EWCO additional contribution payments	£37,900
Carbon income	£63,200
Standing timber income	£2,400
Planting, establishment, and maintenance costs*	£117,600
Costs	
Woodland Carbon Code costs	£4,600
Insurance costs	£11,200

*Includes all costs associated with initial planting, shelters, fencing, rabbit netting, badger gates, vehicle deer gates, pedestrian deer gates, management, replacement (years 1-3), seedling, and fence maintenance.

Discount rates: All figures have a discount rate applied. Discount rates are used to convert future cash flows into a present value. As this case study is looking at a period spanning 50 years, future costs and income need to be converted into a present value to make everything comparable. Whilst there is no "correct" discount rate, a discount rate of 3.5% (as derived from the social time preference rate outlined in the HM Treasury Green Book 7) is used for this evaluation. For example, £100 in 50 years' time is £70.89 in present value.

Grow your farm business: How trees can benefit your land, crops, and livestock

Crop evapotranspiration

UK agriculture is facing water shortages, particularly with instances of drought, which makes preventing water loss from crops an important management strategy, as well as offering cost savings thanks to reduced water use. Using UK climate change data, a 2010 study calculated that by 2050 there would be a 20-30% increase in aridity in summer¹¹. This implies that agricultural practices will need to improve crop water efficiency to maintain production levels.

Crop evapotranspiration is a physical process where water passes from its liquid form to its gas state. It refers to two processes that occur concurrently in the natural environment, evaporation, and transpiration. This process is affected by weather factors, soil, and vegetation. Planting your crop in and amongst trees can reduce wind speeds and help to increase daytime temperatures, reducing evapotranspiration rate during periods of drought. Warmer temperatures have been shown to prolong growing seasons and trees can offer shade from intense sunlight: due to the reduced evapotranspiration rate, less water will move to its gaseous state thereby increasing the water use efficiency of the crop¹². These efficiencies will be essential in upcoming years as our climate gets hotter – allowing you to make savings now.

Trees and your livestock

Shade and shelter

It is natural for livestock to seek shade or shelter when they are facing prolonged or sudden adverse weather conditions. In warmer months, livestock can overheat or suffer from heat stress, which can lead to loss of appetite, lower yields, and reduced fertility, all of which impacts on farm productivity. For example, dairy cow milk yields can fall up to 20% when the air temperature goes above 29°C¹³. Trees on farms offer livestock natural protection from the heat and direct sunlight and can reduce solar radiation by as much as 58%, resulting in skin temperature 4°C lower than in open pastures¹⁴. When we move into the colder months, trees can act as a shelter from the elements, protecting livestock from harmful exposure to harsh winds, wet weather, and cold temperatures. Research has shown that shelter can reduce newborn lamb mortality rates, for instance¹⁵.

Trees can also encourage grass growth. In dry months, shelterbelts can substantially reduce water loss from evaporation of soil moisture, and during colder months the cover helps to maintain soil temperatures, extending the growing season. Areas protected by trees have shown an increase in pasture growth by 20% annually¹⁶. This could be vital when livestock are most in need of nutrition, resulting in higher weight gains by having access to grass for an extended period of time¹⁷.

Tree planting and woodland creation case studies

Published: 2023

21 Case studies, mixture of both print and video

<https://www.gov.uk/government/collections/tree-planting-and-woodland-creation-case-studies>



Key facts

- **Site:** Grascott Farm, Devon
- **Size:** 212 acres
- **Type:** Conifer woodland with areas of broadleaf
- **Species:** Predominantly Douglas fir, together with Sitka spruce, field maple, ash, chestnut and oak
- **Date established:** 1998-2000
- **Grants:** Forestry Commission woodland grant and South West Forest grant
- **Key objective:** Grow high-quality Douglas fir to produce timber and wood fuel, combined with delivery of multi-objective and continuous cover management principles

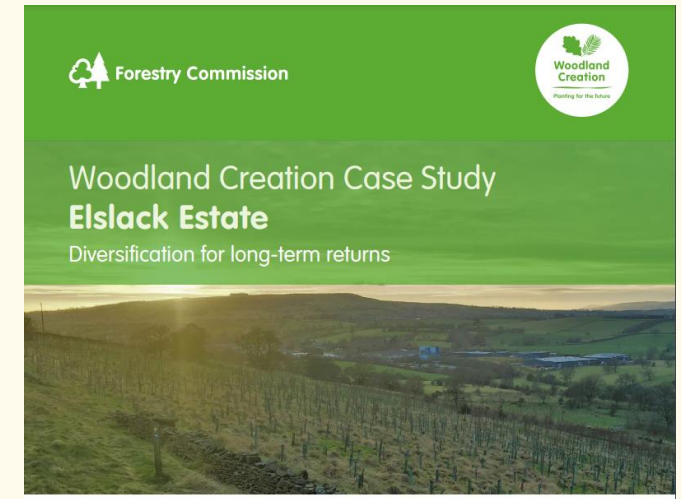
"The most important thing for forestry is continuity of management"
Sam Whatmore, Owner, Grascott Farm

Establishing a thriving forest

The Benefits Of Woodland Creation On Farmland



Luke Hemmings
Forestry Commission



The challenge

Key facts

- **Site:** Rectory Allotment, Elslack, North Yorkshire
- **Size:** 45ha, with 63,000 trees planted
- **Type:** mixed conifer and broadleaved woodland
- **Species:** Sitka spruce, Norway spruce, Douglas fir, mixed native broadleaves including oak, birch and hazel
- **Agent:** Edwin Thompson LLP, Carlisle
- **Grants:** Woodland Creation Planning Grant (WCPG), Countryside Stewardship Woodland Creation Grant (CS WCG)

Making it add up

Timber prices – Roughly **£70/ton** standing
Production – **15 ton** timber/hectare per year (YCI8)
Possible timber growth over **£1000/ha** per year

Woodland Creation: Financial case studies

Published: 2023

2 anonymised case studies,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1145187/WMB_10ha_Financial_study_Mar_23.pdf

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1145248/WMB_100ha_Financial_study_Mar_23.pdf



Woodland Creation: Financial case study, 10 hectare site



Understanding woodland financials (All figures accurate as of February 2023)

By planting the right trees in the right place, you can diversify your income and bring direct benefits to your land, your local community, and the environment. Woodland creation is a long-term commitment that provides new reliable income streams with far-reaching benefits.

When looking to understand the value woodland can bring, it's important to recognise the variables that influence income. These factors include species, growth rate, spacing, rotation length, woodland size, and the location of your woodland – all of which can vary considerably resulting in a number of possible combinations and outcomes. This real-life example of a woodland creation scheme demonstrates how the landowner created woodland to benefit the planet, while generating income. All figures in this case study are rounded to the nearest £100.



Woodland Creation: Financial case study, 100 hectare site



Understanding woodland financials (All figures accurate as of February 2023)

By planting the right trees in the right place, you can diversify your income and bring direct benefits to your land, your local community, and the environment. Woodland creation is a long-term commitment that provides new reliable income streams with far-reaching benefits.

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The Benefits of Woodland Creation Fact sheets

Published: 2022/23

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1137234/WMB_Fact_sheet_Jan_23.pdf

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1084680/FC_Fact_Sheet_Carbon_FINAL_14062022.pdf

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1136539/WAW_fact_sheet_Feb_23.pdf

Forestry Commission
Woodland Creation
Planting for the Future

The benefits of woodland creation Woods Mean Business



How woodland creation can help you generate income

Woodland creation can help you to diversify your business and generate reliable revenue streams, whilst delivering environmental benefits that support your land management goals, nature, and society.

Harvesting trees for timber enables you to use your woodland as a valuable crop. Sawlogs can be sold for construction materials or furniture, while small roundwood can be sold or processed and used for woodfuel for your own use, saving you money.

By registering newly created woodland with the Woodland Carbon Code and the Woodland Carbon Guarantee, you can sell carbon units to the government or on the private market from as early as five years after planting, and help to offset your business' carbon emissions.

Combining trees with crops or livestock can increase productivity and lead to more sustainable yields and a higher quality output – fetching a higher price.

It's not just animals or people pay to enjoy recreation and sports, glamping, and game.

With financial incentive support on hand – plot place, for the right tree and your bottom line.



Forestry Commission
Woodland Creation
Planting for the Future

The benefits of woodland creation Woods and Water

How woodland creation can help with natural flood management

Planting the right tree in the right place can help reduce the impacts of storm and flood water and alleviate the impact of drought, improve water quality, reduce soil erosion, and help keep rivers cool. Financial support and expert advice are also available to help realise the far-reaching benefits woodland can have for you, your land, the environment and future generations.

Natural flood management

A well-planned and well positioned woodland designed to comply with the UK Forestry Standard, can help to slow the flow of water and reduce flood peaks by up to 65%. Rough vegetation helps to slow the flow of water during flood events and the volume of run-off can be reduced as trees improve rainwater infiltration (that's water on the ground surface that enters the soil. Infiltration is 60 times higher under woodland compared to grass – this is because woodland soils are more open and less compact, enabling the soil to soak up and store rainwater like a sponge. Under-planting of shrubs can also increase infiltration rates across existing woodland and in a mature woodland provides continued roughness to slow the flow of water. Having woodland in a catchment increases the interception and evaporation of rainfall – further contributing towards effective natural flood management.

Up to £500/ha is available to farmers and landowners through the [England Woodland Creation Offer](#) – for creating woodland that reduces flood risk.

Forestry Commission
Woodland Creation
Planting for the Future

The benefits of woodland creation Woods and Carbon



How woodland creation can help tackle climate change

Woodland creation is a proven way to help tackle climate change – they act as a natural 'carbon sink'. Through the process of photosynthesis, in which they absorb atmospheric carbon dioxide and release oxygen, trees store carbon. Some carbon enters the woodland through the roots, trunk, branches and leaves and is stored in the long-term, while some is stored in the soil. However, woodland isn't just good for the planet – it's good for your business too.

Woodland creation could make you an income from selling carbon units, or, with increasing demand for net zero, by helping to offset your own business' carbon units, you must register and validate the potential carbon capture with the Woodland Carbon Code before you have planted it.

Trees sequester carbon at different rates

Conifer trees normally grow faster in their early life and therefore absorb more carbon dioxide earlier, when compared to native broadleaf woodlands. However, broadleaf woodland can store larger amounts of carbon in the long run. The same can be said when managing a woodland to provide continuous canopy cover – whereby the forest canopy is maintained without clear felling – resulting in larger amounts of carbon storage. Young, fast-growing trees will capture carbon dioxide at a quicker rate, while mature trees can act as carbon stores for hundreds of years. Appropriate tree species and woodland management techniques are needed to realise these carbon benefits.

Woodland Creation: Understanding Wood Pasture and Agroforestry

Recorded: 2023

1 Hour 30 Mins

<https://www.youtube.com/watch?v=j6i1F207CFE>



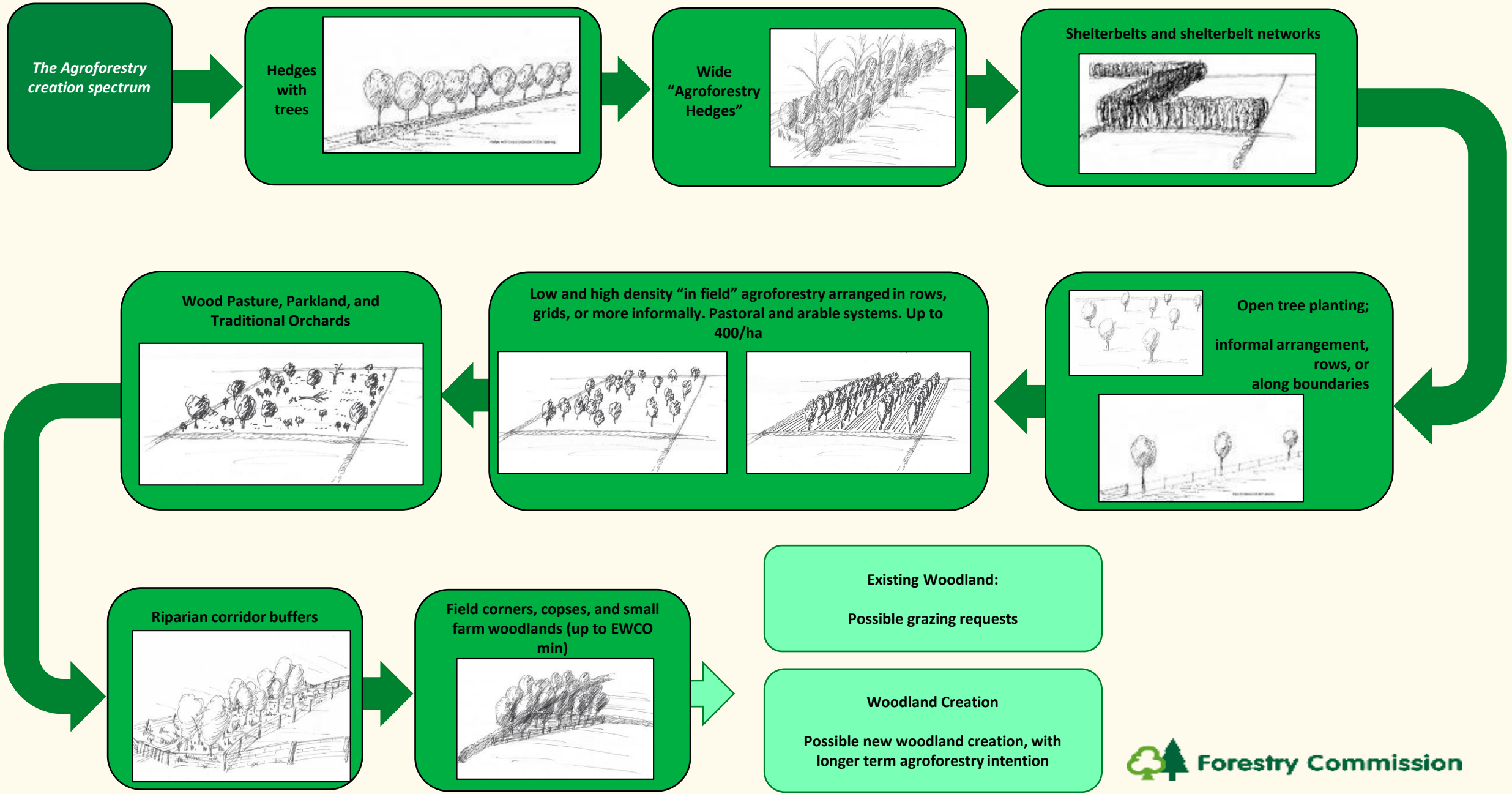
Forestry Commission Agroforestry Presentations

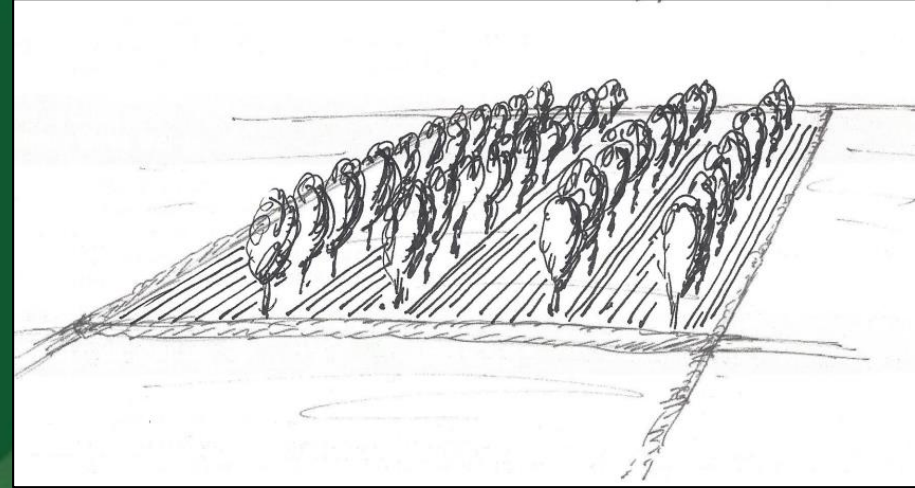
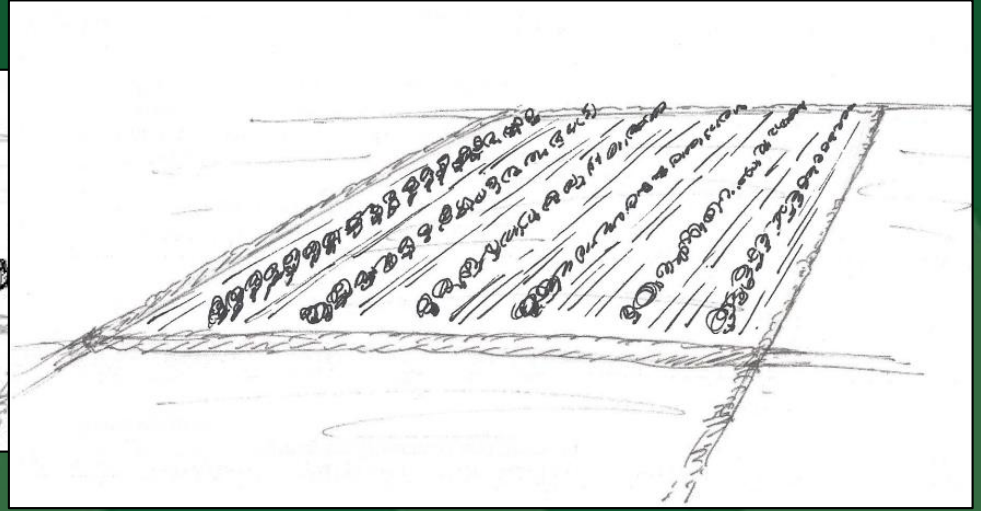
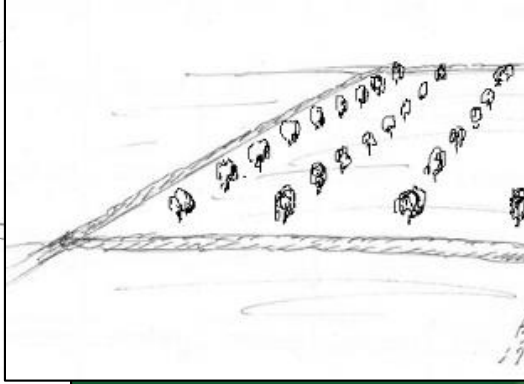
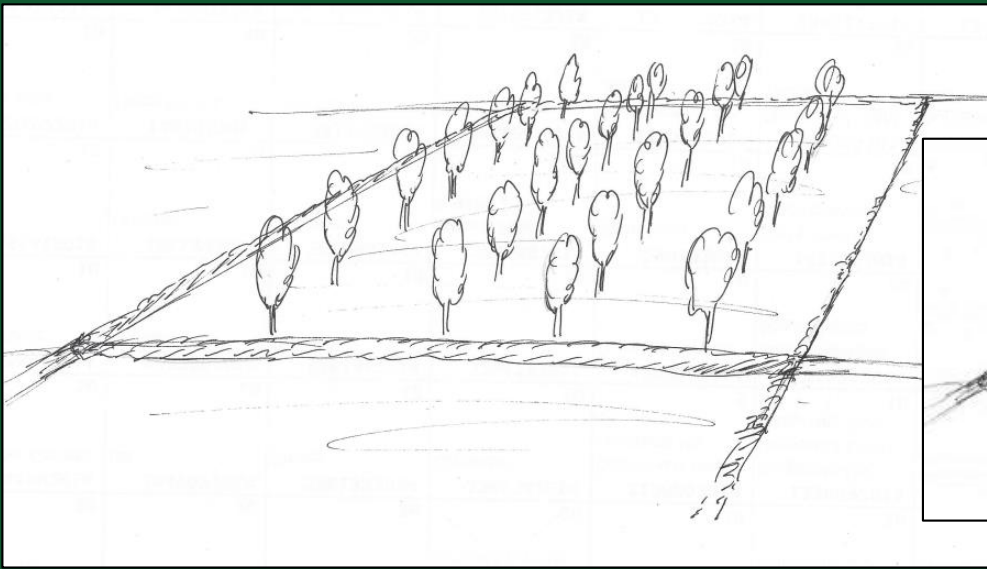
Contact James Ramskir-Gardiner for presentation access and booking for guest lecturing

james.ramskir-gardiner@forestrycommission.gov.uk

- Multiple presentations given to both forestry and farming sectors
- Covering a range of topics including farm timber potential, overview of agroforestry systems, current funding and regulations managing trees in the farm landscape, designing and planning woodland/ agroforestry creation
- Guest lectures delivered to degree and college level students. (Newcastle University, Harper Adams University, Northumberland College.)
- Previous lectures tailored to course subject matter. E.g. Farm business, Stakeholder engagement and regulations.
- Practical volunteering work / site visits on local farms establishing & managing agroforestry may be possible where timings & location align.

- Example of lecture slides...





More regular “alley” designs effectively facilitate arable systems, *but can equally be used for grazing, grass management, and mixed rotation systems*

Tree element can range from low growing fruit and nut species through to large timber species like Cricket Bat Willow and Poplar, all giving different effects of shade, shelter on the land below.

Allowing the agroforestry system to be designed for geographic, climatic, and economic requirements in any given situation

Opportunity for the Forest Industry: Establishment, maintenance, good potential for medium to high quality products if managed well, although crown growth may be a limiting factor due to greater distance between stems

Agroforestry can start with hedgerows....

Providing effective windbreaks, shade, and shelter

Increasing tree numbers without giving up acreage



Hedgerows with trees and field corner planting



Regular systems

Allowing sward
management

High pruned and
thinned

For sward light
levels and timber
quality



Silvopasture

Ecosystem services

Riparian corridor buffer

Buffering watercourses
with woodland and
rough vegetation

stabilising and filtering



Poultry industry established research:

(David Brass, Lakes Free Range Egg Company, *Bright and Joret* study)

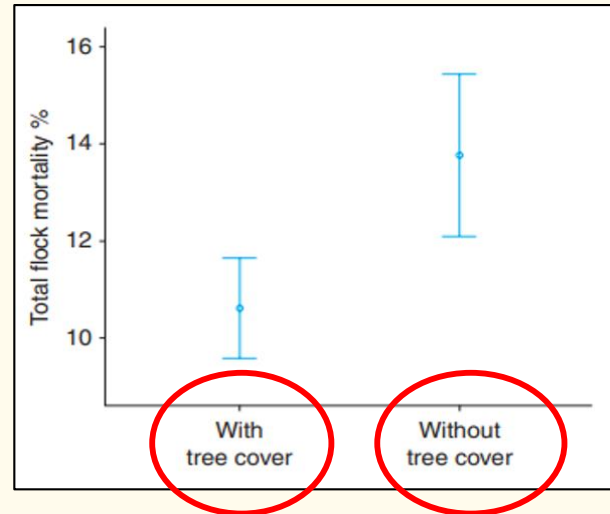
Decreased mortality

Decreased egg seconds

Combined:

total saving of £10,560
per flock

Just for having trees

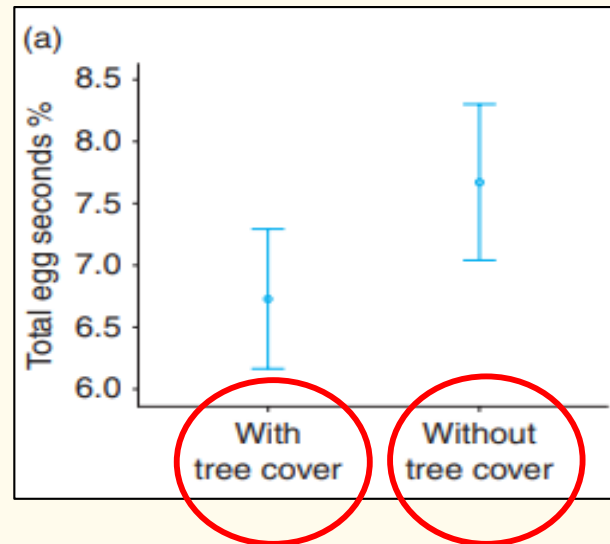


**3% decrease in
bird mortality under trees**

(e.g., flock of 10,000 birds)

Eggs@£1/dozen (2018)

£7,200 saving



**2% decrease in "egg
seconds"**

(valued at 30% of Class A eggs)

4,800 dozen eggs moving from
seconds to Class A

£3,360 saving

Future Forestry Commission Resources

- Aspirations to create a publicly available 'Forestry for Farmers' course. (Building upon an inhouse 'Forestry for Non-Foresters course)
- Exploring funding and collaborative work with the Soil Association to enhance their existing online '[An introduction to agroforestry and farm woodland benefits and opportunities](#)' course. Course currently £18.72 per access, looking to make free for all UK residents (currently free to access for Welsh residents)
- Detailed guidance on agroforestry grant schemes & regulations within England. *(these are currently being developed, with a grant release date of 1st Quarter of 2024)*
- Forest Research are carrying out an 'Expanding Agroforestry' Project, producing evidence reviews on agroforestry topics and collecting new data on agroforestry:
- **Agroforestry Species & Silviculture** *Improved information on AF tree species will be collated from decision support tools and literature.*
- **Agroforestry Ecosystem Service Benefits** *Evidence for the impacts (+/-) of agroforestry systems for the agricultural landscape*
- **Exemplar Case Studies** *Drawing from existing databases we will build a list of exemplar agroforestry case study sites in the UK*
- **Agroforestry carbon sequestration potential at different spacings.**

(Some of your institutions are already involved with this study)

Non Forestry Commission Resources

- [Soil Association Agroforestry Handbook](#) – Free PDF available. Single best resource for getting a solid understanding of Agroforestry systems and the potential for UK farming. Good [YouTube](#) channel also.
- [Land Workers Alliance 'The Cutting Edge' Report](#) – Recent accessible report published detailing 12 small to medium scale forestry businesses, covering profits/costs/ business type etc.
- [Land Workers Alliance 'The Promise of Agroforestry'](#) – 8 case studies from the UK carrying out agroforestry.
- [Agroforestry: A Primer](#) - a guide to agroforestry principles and concepts – and how to use them effectively. Created by [CIFOR-ICRAF](#) & [World Agroforestry](#)
- [Scottish Forestry Woodland Grazing Toolbox](#) - guide to developing a Woodland Grazing Plan

(There are alot more resources out there, but this is a good starting point)



The Agroforestry Show is the first of its kind aimed at bringing together farmers, foresters, tree surgeons, growers, graziers, advisors, funders, food businesses and agroforesters.

Potential bursary for up to 100 Agri & Forestry students to attend the show.

Please contact [Helen Chesshire](#) (Woodland Trust) for more information.

Final thoughts

My role is to work with and support **you** to create the material you require to be able to teach and engage with the future generation of farmers and land managers. If there is something that you need, please get in touch so we can create that resource.



james.ramskir-gardiner@forestrycommission.gov.uk