# Trees and woodland in the farmed landscape
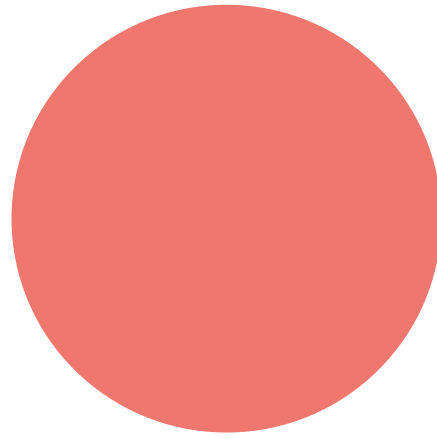
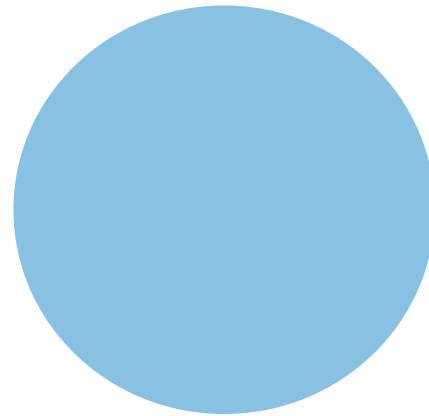**Modelling an agroforestry & farm woodland economy**

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# The context

Beyond the public policy case – what is the macroeconomic case?

Building on the principles of whole system and integration in our Regenerative forestry report – where we scope in the integration of trees and woodlands into farming systems as regenerative forestry systems

**Regenerative forestry**

Forestry and forests for the future

soil

# Main report and country summaries



Woodland and trees in the farmed landscape:
Towards a diverse, resilient and vibrant farm woodland and agroforestry economy for the UK

Report for

Soil Association

April 2022

DRAFT

Cumulus

Trees and woodland in the farmed landscape:

A farmer led approach towards a diverse, resilient and vibrant agroforestry and farm woodland economy for England

Trees and woodland in the farmed landscape:

A farmer-led approach towards a diverse, resilient and vibrant agroforestry and farm woodland economy for Scotland

Wales next...

# The case for an agroforestry and integrated farm woodland economy – Stage 1

Co-benefits -
climate -
nature -
health

Opportunities -
Performance,
diversification
& resilience

Barriers – evidence, knowledge, cultural

Viability & achievability

# The model – Stage 2 – core components

- The Evidence base

- Land use change assumptions

- Financial data

- Agroforestry & farm woodland systems

- Optional parameters

# The Evidence base

Current performance for the 6 farm types used in the model from the various Agricultural Surveys and Farm Business Surveys that are undertaken across England, Scotland, Wales, and Northern Ireland.

- Poultry (free range)
- Horticulture
- Cereals
- Dairy
- Lowland grazing
- LFA grazing

The performance impact of AFW on agricultural performance included in the model is based on peer reviewed literature.

*Where possible, data was extracted from studies that took place within the UK and focused on a specific farm type. Where this was not possible, studies from areas with similar climatic conditions were used and the performance impacts were applied to the UK context.*

# Land use change assumptions

- Land use change in the model relates to a change in area of any type of AFW rather than a change in canopy cover or number of trees.

- This is so that we can make direct comparisons between the land use changes.

- This means that actual tree numbers for each scenario will differ. e.g. coniferous farm woodland comprises the highest density tree planting, whilst silvopastoral planting has a far lower density.

# Financial Data

- Income & expenditure budgets are included for each system with a 25 year timeframe.

- Fixed costs were excluded from these budgets and therefore the model. This is because these costs remain largely unchanged for each system and farm type.

- Capital expenditure required to establish each of the AFW systems was included in the budgets. It was divided over the 25-year period that was modelled. Including this cost helps to predict the investment necessary to transition to increased AFW planting across the farm types.

- Income from production (timber etc.) was based on standard rotations and then divided over the 25-year period

- Basic Payment Scheme and agri-environment scheme payments (incl. income foregone) have been excluded from the baseline scenario.

# Agroforestry & Farm woodland systems

The systems that have been modelled have been defined based on the reviewed literature and case studies for the UK context. Although well validated, they are generalised depictions of how the various forms of AFW would be integrated into UK farm types.

1. Silvopasture/Silvoarable orchards (fruit)

2. Silvopasture /Silvoarable (timber)

3. Silvopasture (shelter/shade only)

4. Shelterbelts

5. Farm woodland

   - Conifer

   - Broadleaved

   - Mixed

# Optional model parameters

- Existing policy payments – if selected the model will draw from the best attempt to include the current public payment for the different systems - in the different administrations

- Income foregone – this option can be selected

- Private payments - carbon – yield models are used to provide an indicate figure for tonnes $CO_2$ sequestered. A carbon payment/tonne can be included as a variable.

*Also the yield models are used to provide indicative figures for biomass for SA/SP timber and farm woodland systems .*

# The Model – High-level dashboard

# The Model – Options 1



Select the country that you wish to model: Scotland

Creating the Custom scenario

| | Select the type of AFW you wish to apply to each farm type | of this farm type that you wish to apply it to | Change in net income per ha with policy payments |
|---|---|---|---|
| Cereals: | SA SP timber production | 0% | -£257 |
| | SA SP Orchards | 1% | -£99 |
| Horticultural: | | | |
| Dairy: | SA SP timber production | 10% | £49 |
| LFA grazing: | Silvopastoral | 20% | -£125 |
| Lowland grazing: | SA SP timber production | 10% | -£35 |
| | | 4% | -£138 |
| Poultry: | Silvopastoral | | |

# The Model – Options 2

Select the level of payment for public goods and performance impact of AFW

| | SA SP Orchard | SA SP timber production | Silvopastoral | Shelterbelts | Farm woodland |
|---|---|---|---|---|---|
| Agri-env. payment | No support | No support | No support | No support | No support |
| Carbon price £/tCO2 | £0 | £0 | £0 | £0 | £0 |
| Impact of agroforestry and farm woodland on agricultural performance | Moderate | Moderate | Moderate | Moderate | Moderate |

# The Model – Outputs

| Scenario | Net income | Additional biomass produced (cu m) | Additional carbon sequestered by trees (tCO2) |
|---|---|---|---|
| Baseline | £596,752,326 | | |
| SA SP Orchards | £548,428,660 | | 425,200 |
| SA SP timber production | £555,501,470 | 2,357,309 | 760,258 |
| Silvopastoral | £542,611,100 | 21,685 | 265,750 |
| Shelterbelts | £590,945,865 | | 370,455.50 |
| Farm woodland (conifer) | £432,492,914 | 7,972,500 | 9,503,220 |
| Farm woodland (broadleaf) | £330,843,539 | 3,189,000 | 5,315,000 |
| Custom | £513,133,247 | 608,858 | 507,170 |

High level table presenting findings here

# A mixed agroforestry and farm woodland scenario for England

| Farm Type | Total Farm type area (ha.) in England | Area of agroforestry or farm woodland based on %age allocation by farm type | | | | | Total farm type allocation (ha.) | Total change in farm type net annual income (£) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Orchards | Silvoarable/ Silvopasture | Silvopasture (shelter only) | Shelterbelts | Mixed Farm Woodland | | |
| Poultry – free range | 11,314 | | | @ 50% = 5657ha. | | | 5,657ha. | +£16,971 |
| Cereals | 2,629,637 | @1% = 26,296ha. | @1% = 26,296ha. | | @1% = 26,296ha. | | 78,888ha. | -£9,782,112 |
| Dairy | 983,542 | | @5% = 49,177ha. | @10% =98,354ha. | @1% = 9,835ha. | | 157,366ha. | +£16,434,905 |
| LFA grazing | 1,190,402 | | | @5%= 59,520ha. | @1%= 11,904ha. | @10%= 119,040ha. | 190,464ha. | -£53,139,456 |
| Lowland grazing | 1,208,771 | | @5%= 60,438ha. | @5%= 60,438ha. | @1%= 12,087ha. | 5%= 60,438ha. | 193,401ha. | -£43,853,805 |
| Total | 6,023,666 ha. | | | | | | 625,776 ha. | -£90,323,497 |
| Overall woodland and canopy cover area | | Total in-field agroforestry canopy area[2] = 115,851ha. | | | Total farm woodland area[3] = 239,600ha. | | | |

## A modelled scenario for England

1. Implementation across following farm types: poultry, cereals, dairy, LFA and lowland grazing.

2. Modest allocation of agroforestry and farm woodland systems over next 30 years – mostly 1-5% with 50% silvopasture for free range poultry and 10% mixed woodland for LFA grazing and 10% silvopasture for dairy.

3. In-field agroforestry systems at 30% canopy cover would total 115,000ha. by 2050.

4. Shelterbelts and mixed farm woodland would total 240,000ha. by 2050.

5. The reduction in net farm income from this scale of delivery is modelled at £90 million per annum (capital costs included)

# A mixed agroforestry and farm woodland scenario for Scotland

| Farm Type | Total Farm type area (ha.) in Scotland | Area of agroforestry or farm woodland based on %age allocation by farm type | | | | Total farm type footprint (ha.) | Total net cost/farm type (£) |
|---|---|---|---|---|---|---|---|
| | | Silvoarable/ Silvopasture | Silvopasture (shelter only) | Shelterbelts | Mixed Farm Woodland | | |
| Cereals | 469,100 | @1% = 4,691ha. | | @1% = 4,691ha. | | 9,382ha. | |
| | | @ -£1,346,317 | | @+£126,657 | | | -£1,219,660 |
| Dairy | 104,722 | | @5% =5,236ha. | @1% = 1,047ha. | | 6,283ha. | |
| | | | @+£591,668 | @+£113,076 | | | +£704,744 |
| LFA grazing | 3,192,072 | | @5%= 159,603ha. | @1%= 31,920ha. | @5%= 159,603ha. | 351,126ha. | |
| | | | @-£1,995,045 | @-£1,372,560 | @-£50,913,357 | | -£54,280,962 |
| Lowland grazing | 1,209,375 | @1%= 12,093ha. | @5%= 60,468ha. | @1%= 12,093ha. | 5%= 60,468ha. | 145,122ha. | |
| | | @-£423,255 | @-£3,567,612 | @+£36,279 | @-£41,481,048 | | -£45,435,636 |
| Overall woodland and canopy cover area | | @30% = 5,035ha. | @30% = 67,592ha. | @100% = 49,751ha. | @100% = 220,071ha. | | Total net cost = - £100,023,151 |
| | | Total in-field agroforestry canopy area = 72,627ha. | | Total farm woodland area³ = 269,822ha. | | | |

## A modelled scenario for Scotland

1. Implementation across following farm types: cereals, dairy, LFA and lowland grazing.

2. Modest allocation of agroforestry and farm woodland systems over next 30 years – just 1% for cereals and 1% or 5% for different systems applied to dairy, lowland grazing and LFA grazing.

3. In-field agroforestry systems at 30% canopy cover would total 72,000ha. by 2050.

4. Shelterbelts and mixed farm woodland would total 270,000ha. by 2050.

5. The change in net farm income from this scale of delivery is modelled at £100 million per annum.

# Report recommendations - What else needs to change?

- An integrated approach to farm support and regulation

- Confidence building for farmers

- Innovation that helps to make farm forestry viable

# In summary - Key benefits of agroforestry & integrated farm woodland

Benefit 1:      Possibilities for maintained and enhanced food production

Benefit 2:      Increased farm enterprise resilience and diversification opportunities, including natural capital control

Benefit 3:      Co-benefits for climate, nature and people

Benefit 4:      Achievable tree planting in crowded, contested landscapes

# Thank you for listening

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