Agroforestry Carbon Code NEIRF Project

Pilot Summary Report

Six pilots in England

Two pilots in Scotland

Fincastle Farm

Parkhill Farm

RegenFarmCo

FarmEco

Spains Hall Estate

Wood Advent Farm

Woodlands Farm

Riverford Dairy Farm

WOODLAND TRUST

Soil Association

Spains Hall Estate

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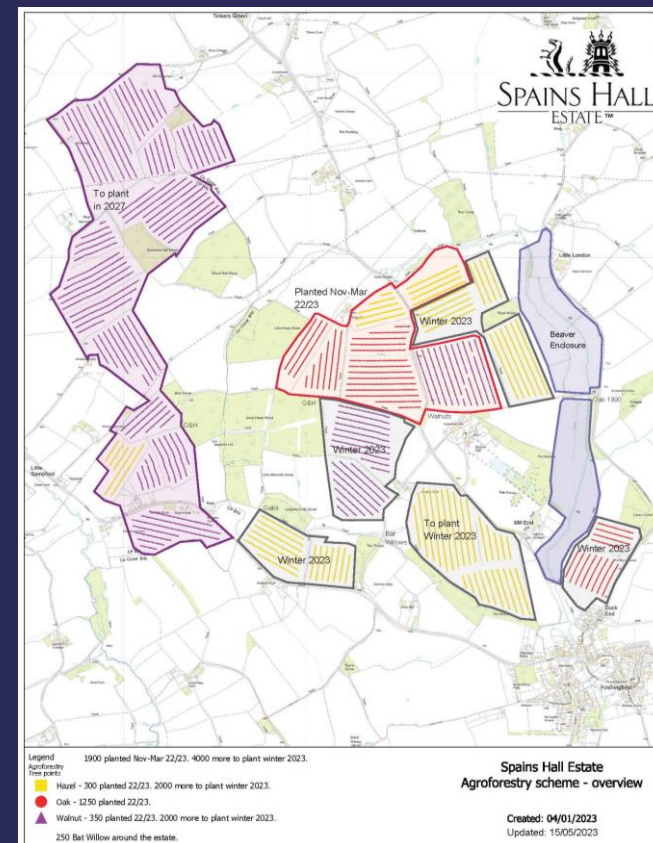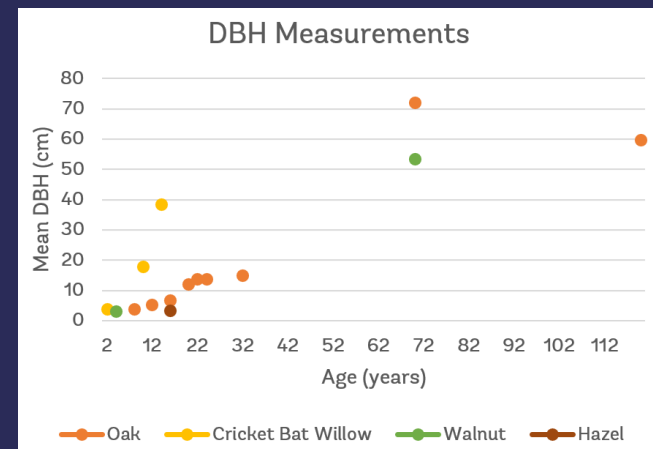
Location: Essex, England

Size: 860 ha gross

Type of Agroforestry: Single tree lines and uncropped alleys

Species: Walnut (16%), Oak (58%), Hazel (14%) and Cricket Bat Willow (12%)

Planting:

- Single tree lines and uncropped alleys - 32m row spacing total = 8m around the trees + 24m grass strip for biodiversity

- Initial planting Winter 22/23, 1900 trees over 60 ha

- Aims to plant an additional 4000 walnut and hazel by end of winter 2023/2024 over 104 ha

- Already productive cricket bat willow plantations across 9 hectares of the estate

DBH Measurements

● Oak ● Cricket Bat Willow ● Walnut ● Hazel

SPAINS HALL ESTATE™

Legend
Agroforestry Tree points
1900 planted Nov-Mar 22/23. 4000 more to plant winter 2023.
☐ Hazel - 300 planted 22/23. 2000 more to plant winter 2023.
● Oak - 1250 planted 22/23.
▲ Walnut - 350 planted 22/23. 2000 more to plant winter 2023.
250 Bat Willow around the estate.

Spains Hall Estate
Agroforestry scheme - overview

Created: 04/01/2023
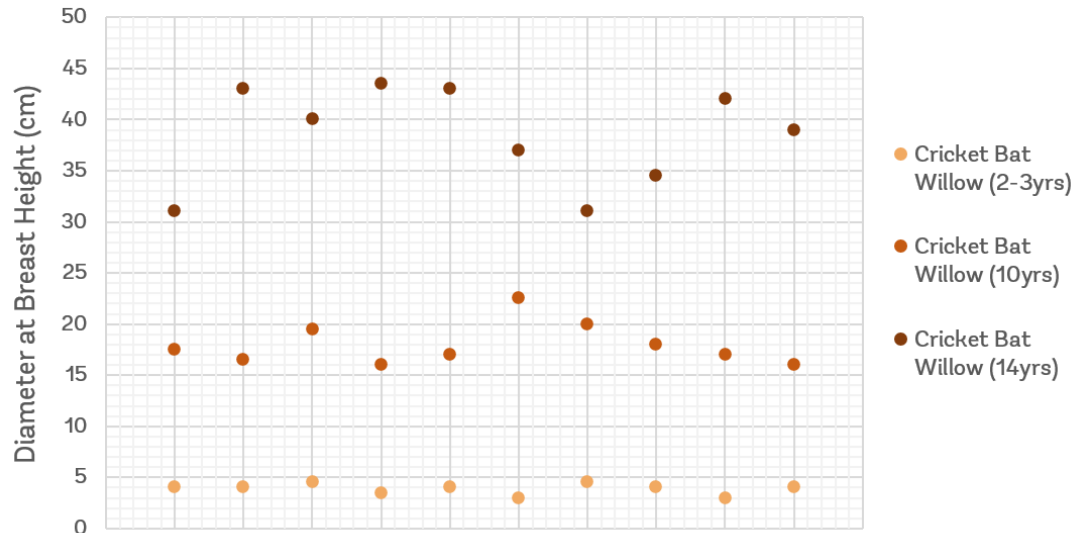Updated: 15/05/2023

Spains Hall Estate

Objectives:
- To create and pioneer productive and commercially viable nut enterprise
- To de-intensify the land that was previously arable
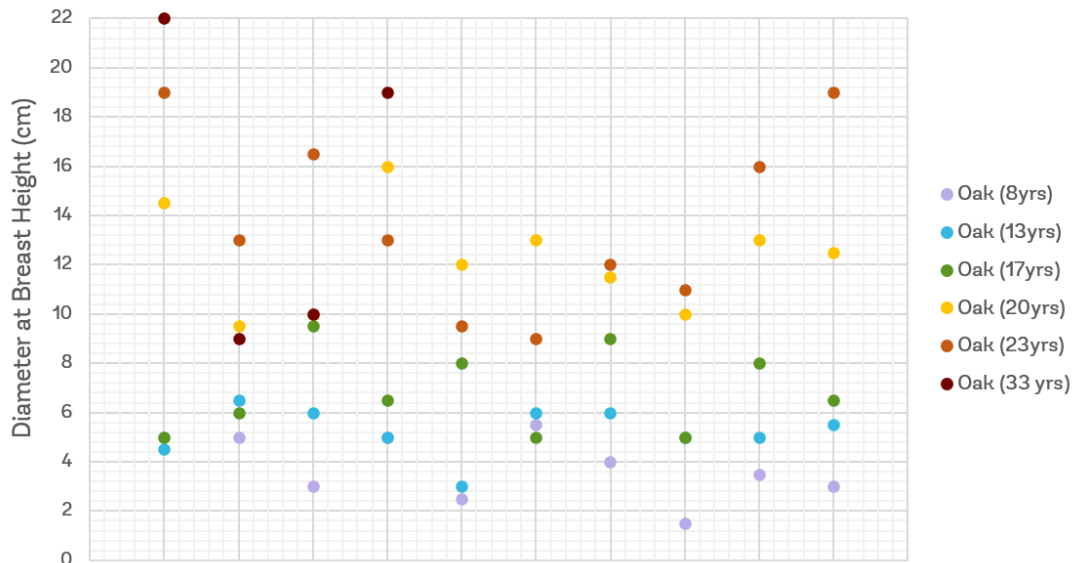- To improve biodiversity
- Target 300 ha in total by 2027

Agroforestry Barriers:
- Lack of knowledge and existing insights for modelling a productive system
- No existing yield tables or selling records
- Funding – few grants available for agroforestry. Costs approximately £30 per tree

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Cricket Bat Willow DBH Measurements

Legend:
- Cricket Bat Willow (2-3yrs)
- Cricket Bat Willow (10yrs)
- Cricket Bat Willow (14yrs)

Oak DBH Measurements

Legend:
- Oak (8yrs)
- Oak (13yrs)
- Oak (17yrs)
- Oak (20yrs)
- Oak (23yrs)
- Oak (33 yrs)

Spains Hall Estate

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Views on Carbon with Agroforestry:

Level of Commitment:

- If successful the site may be permanent, but trees would be replaced through rotation.
- Can only guarantee carbon is in the system for the shortest rotation length (hazel, 25 years).
- Could potentially commit to a longer duration with other species.
- Commercial viability is priority. Landowner cannot commit to retaining trees that are not producing.
- Could commit specific trees – no PIUs, only get paid for trees retained at verification.

Carbon Barriers:

- Self-monitoring is not an issue, it would happen anyway.
- Carbon is not the priority; a commercially viable farm is the main focus.
- Verification fees - only willing to pay if it was worthwhile with the price of the units.

Selling Credits:

- Buyer market limited- agroforestry does not maximise space usage.
- Pragmatic - willing to talk to any interested buyer.
- Price depends on access to the projects story.

Results

What's included
Timber and nut system (59.1 ha) with 1250 Oaks, 360 Walnuts and 300 Hazelnuts.

The model estimated a carbon sequestration figure for the timber and nut system of **60.28** tCO2e/yr.

Additional elements to consider
Established and new hedgerow – 59.3 km
Established woodland – 97 ha

Total Carbon figure for this pilot
When the additional elements are included in the calculation, we estimated the agroforestry and woods on the estate are sequestering 438.63 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

Wood Advent Farm

Location: Exmoor Somerset, England
Size: 169 ha gross
Type of Agroforestry: Silvopasture
Current Species: Walnut (81%), Sweet Chestnut (4%) and Hazel (15%)

Planting:
- Mix of nuts planted in 2022 using cactus guards on permanent pasture and arable fields
- Trees and protection funded by Riverford 'plant a tree' scheme covered by a ten-year agreement
- Measured Cow Field: 4.3 ha, chestnuts @ 32m rows, 5m alley and tree spacing width, 1m understory, 64 trees in total
- Years 12-15 thin walnuts from 5m to 10m spacing

Wood Advent Farm

Objectives:
Holistic farm plan and management approach:
1. Improving Soil Health
2. Fighting climate change
3. Boosting biodiversity
4. Producing the best, nutrient dense food possible

Agroforestry Barriers:
- Drought and lack of relevant information on irrigation
- Deer and vole predation in year 1
- Financial outlay without Riverford funded trees and guards
- General fear of it going wrong

Wood Advent Farm

Views on Carbon with Agroforestry:

Level of Commitment:

- Willing to commit 50 years (agroforestry life span), carbon to remain forever.
- Willing to sign a contract for this length of time.
- Happy to self-monitor, reporting annually.
- Excited by biodiversity credits too as it can't be imitated by machine as carbon capture can.

Carbon Barriers:

- Not many barriers as already doing other long-term schemes on the farm under the Woodland Carbon Code.
- Verification fees not a barrier but would be interested in combining them with existing verifications on the farm.

Selling Credits:

- Strong opinion on buyers.
- Will not sell to anyone that hasn't reduced footprint by at least 50%, but ideally 90%.

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Results

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What's included
64 Sweet chestnut trees in 4.3 hectare field. The model estimated a biomass carbon sequestration figure of **3.40** tCO2e/yr.

Unfortunately, we were unable to calculate the walnut and hazel trees as they were not yet tall enough (not meeting minimum requirement Diameter at Breast Height or 1.3 m tall).

Additional elements to consider
Old growth Hedgerow - 14.4 Km
Newly planted hedgerow – 1000m

Interestingly establishment and management emissions were the lowest across the pilots at just **0.03** tCO2e/yr.

Total Carbon figure for this pilot
When the additional elements (old growth hedge and new hedge line) are included in the calculation we estimate the agroforestry generates 120.77 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

Woodlands Farm

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Location: Devon, England
Size: 76 ha
Type of Agroforestry: Shelter Belt and Green Barn
Species: Oak, Birch, Thorn, Norway Spruce (Christmas tree crop)

Planting:

- Block A. Green barn Oak and Silver birch planted at 1650 trees/ha density. Oak trees thinned for firewood and birch for charcoal production
- Block B. A 25m wide planting consisting of Oak, Birch and Hawthorn all intercropped with Norway spruce harvested for Christmas trees
- Shelter Belt C, a 25m wide shelter belt consisting of Oak, Birch, hawthorn. Pruned for timber, used for shade and shelter for cattle
- Very little agroforestry practiced amongst traditional farmers

Woodlands Farm

Objectives:
- Produce a range of quality timber products on farm (Additional farm income)
- Provide shelter for livestock
- Link two existing woodland habitats

Agroforestry Barriers:
- Deer predation and squirrel damage
  - The farm joins large woodland where deer and squirrel aren't actively controlled
- Poor quality fence posts

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Woodlands Farm

Views on Carbon with Agroforestry:

Level of Commitment:

- Would be happy to commit to a 30-to-40-year commitment to carbon
- Would be prepared to sign contract to protect carbon for that timeframe, but only if it made sense financially.

Carbon Barriers:

- Dislikes consultants so would prefer to learn how to measure and self-report every 5 years.
- Previous experience of selling carbon credits from woodland through the Woodland Carbon Code.

Selling Credits:

- Would sell credits to highest bidder.

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Results

What's included
Two productive shelterbelts with Oak, Silver birch, Blackthorn and Hazel

The model estimated a carbon sequestration figure for the two productive shelterbelts of **3.29** tCO2e/yr

Additional elements to consider
Old growth Hedgerow – 38.6 km

Total Carbon figure for this pilot
When the additional elements are included in the calculation, we estimated the shelterbelts and hedgerow generate 49.23 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

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Riverford Organic Dairy

Location: Devon, England

Size: 432 ha gross

Type of Agroforestry: Silvohorticultural and orchard systems

Measured: Alder (19%), Hazel (59%), Walnut (6%), and Apple (16%)

Planting:

- Organic dairy farm experimenting with Alder rows in 2008, mature apple orchards for cider and nuts in 2019/20 as an early commercial nut trial
- Agroforestry rich area

Alder:

- A 15 year old trial with two lines of alder densely spaced
- 7 year rotation with two year horticulture and five year herbal lay
- Oaks where points are in adjoining map
- To be thinned

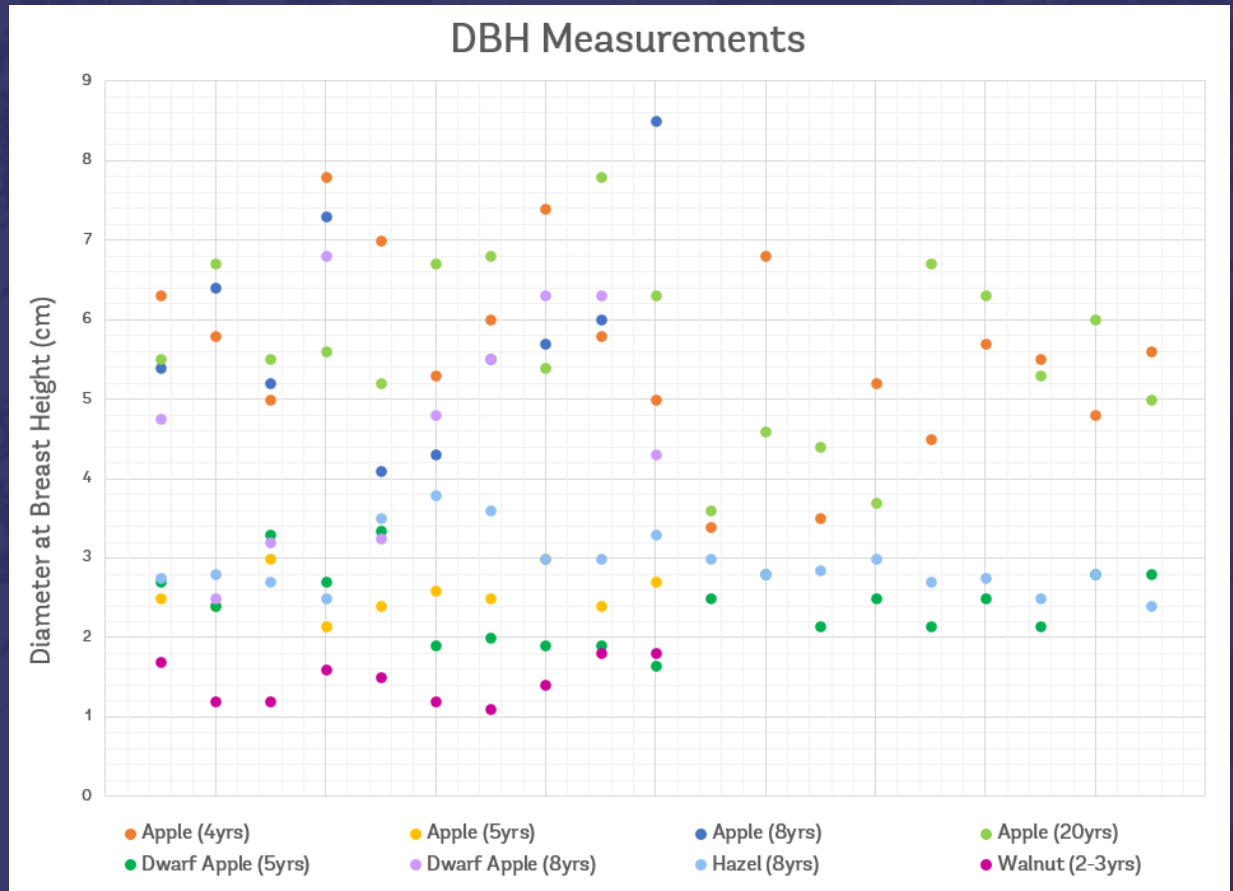# Riverford Organic Dairy

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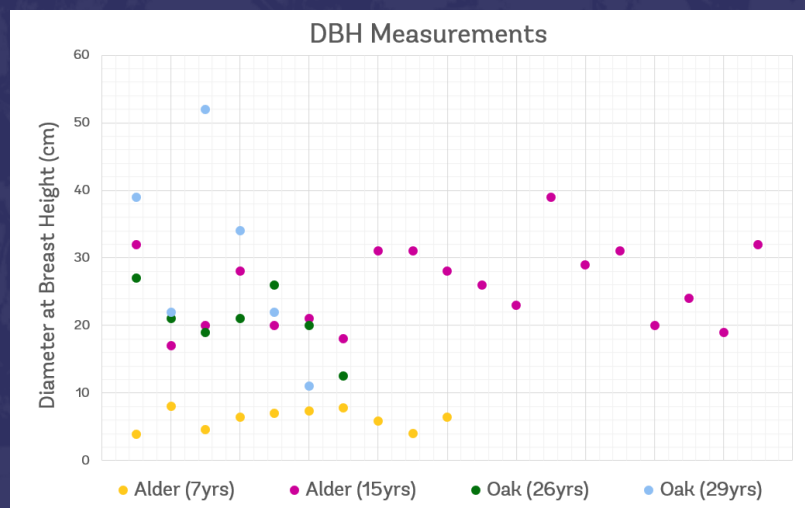
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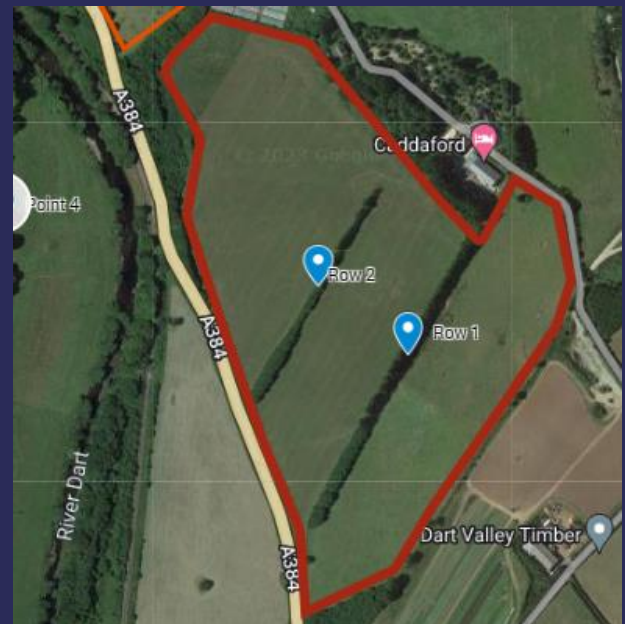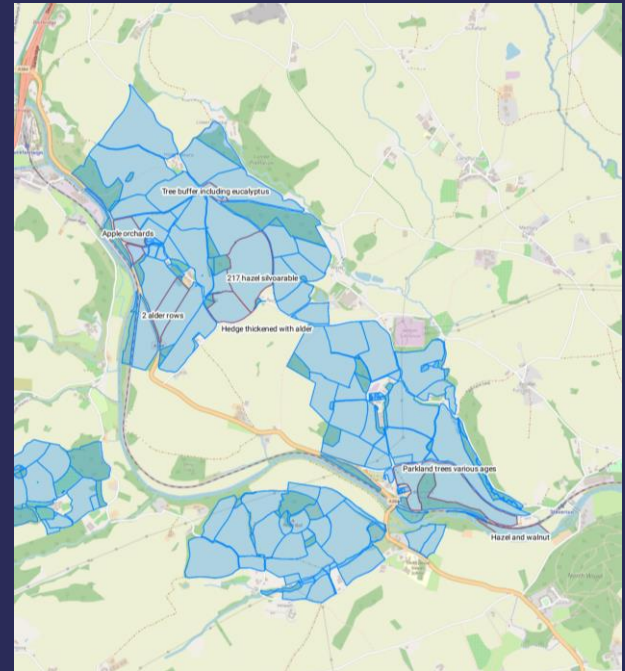
Objectives:

- To trial commercial nuts in the UK
- Opportunity for diversification for farmers about to lose BPS
- To provide public goods
- Possibly a source of biomass and carbon offsetting

Agroforestry Barriers:

- Fitting Agroforestry into vegetable and livestock rotation
- Lack of planning or information about other schemes before planting – no precedents
- Being contractually locked into environmental schemes off-putting

DBH Measurements

Diameter at Breast Height (cm)

- Apple (4yrs)
- Apple (5yrs)
- Apple (8yrs)
- Apple (20yrs)
- Dwarf Apple (5yrs)
- Dwarf Apple (8yrs)
- Hazel (8yrs)
- Walnut (2-3yrs)

Riverford Organic Dairy

DBH Measurements chart — Diameter at Breast Height (cm) plotted for: Alder (7yrs), Alder (15yrs), Oak (26yrs), Oak (29yrs)

Views on Carbon with Agroforestry:

Level of Commitment:

- Aim to have a hazel canopy in 50-80 years, though this would have been thinned from 5m to 10m spacing at approx. 10-15 years (currently no definite plans).
- Commitment length depends – for semi-standard orchards probably no more than 25 years.

Carbon Barriers:

- Being locked into the scheme with a contract is a deterrent but understandable so not a big barrier.
- Self-monitoring not an issue – planned for every 5 years.
- Costs – if verification fees too high versus reward the process is worthless.

Selling Credits:

- Initially interested in offsetting own impacts.
- If selling, would like to know a lot about the potential buyer of his credits.

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Results
Riverford Organic Dairy

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What's included
In field Alder tree rows in 16 ha field
Nut system with 85 walnuts and 243 hazelnuts
Orchard of 65 apples trees

The model estimated a biomass carbon sequestration figure of:
- In field Alder tree rows generate **117.44** tCO2e/yr

- Fruit and nut systems with **85 walnuts * and 65 apples trees** −0.08 tCO2e/yr
*(243 hazelnuts not counted as too small for DBH based model)

Interestingly establishment and management emissions for the fruit and nut trees were amongst the highest across the pilots at **0.63** tCO2e/ha/yr.

Additional elements to consider
Mixed hedgerow – 640 m
Oak/Willow Riparian woodland – 1.9 ha

Total carbon figure for this pilot
When the additional elements are included in the calculation, we estimate the agroforestry and riparian woods generate 128.97 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

FarmEco Ltd

**Location:** Nottinghamshire, England
Size: 45 acres
Type of Agroforestry: Silvoarable and Food forest
Species: Apple, Sweet Chestnut, Walnut, Birch

Planting:

- Explored many different agroforestry systems including silvoarable, fruit and nut forest, hedges and shelter belts, amenity planting
- Mixed silvoarable system planted in 2014, including tree species such as apple (21 Varieties), Sweet chestnut and Walnut
- Fruit and nut forest planted in 2018/2019, includes 70 different tree species. Rotationally grazed with sheep from planting
- Agroforestry locally rare but gradually increasing, predominantly hedgerows and shelterbelts
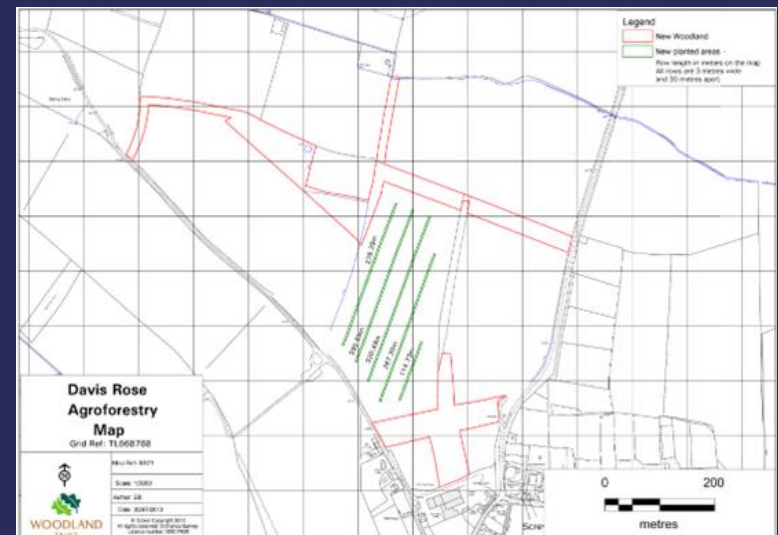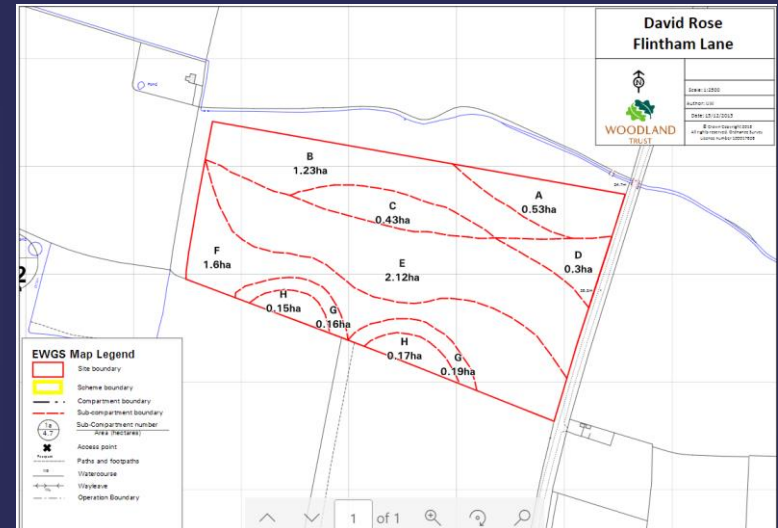
FarmEco Ltd

Objectives:

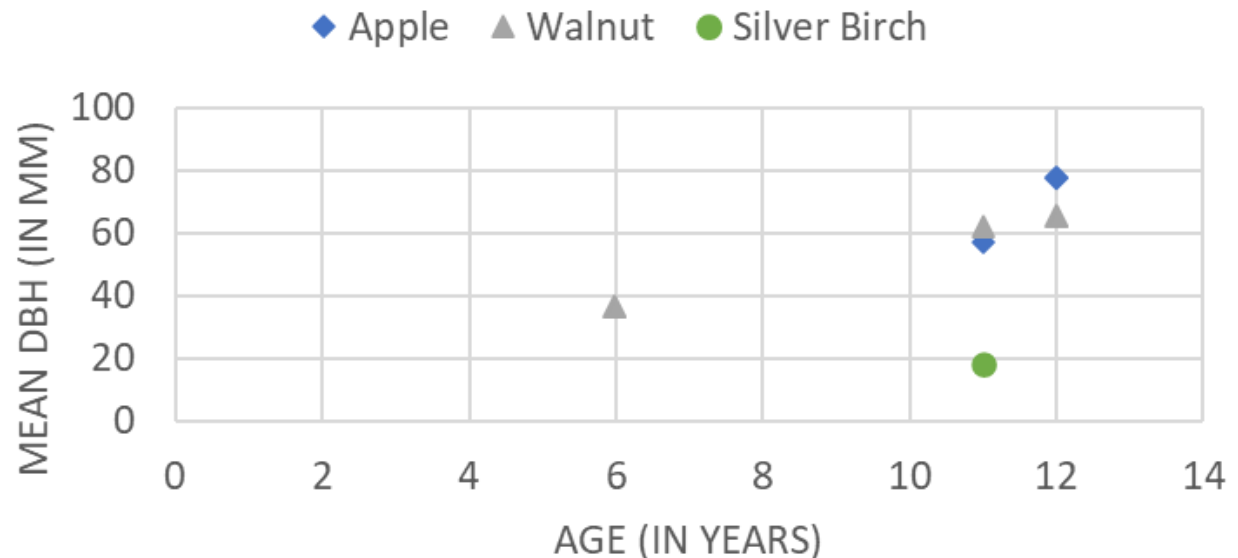Acknowledged that objectives of the agroforestry system are changing:

- Food security
- Improving the environment for the betterment of the farm and the community.

Agroforestry Barriers:

- Drought conditions
- Wind damage
- Deer predation
- Knowledge and skills of management (pruning)

DBH MEASURMENTS

◆ Apple   ▲ Walnut   ● Silver Birch

FarmEco Ltd

Views on Carbon with Agroforestry:

Level of Commitment:

- Productive timeframe of apple trees 20 years, will probably be retained after for system benefits and currently not economically productive.
- Always discussed guaranteeing carbon for 30 year time period.
- Happy to take out a covenant or contract – hadn't considered insurance.

Carbon Barriers:

- Self-monitoring not an issue, previously measured and reported tree growth every month. Volunteers enjoyed monthly task as something purposeful etc.
- Regarding paying for verification – yes, but needs to ensure carbon credits cover verification costs.

Selling Credits:

- Have discussed with wider organisation. They would very much like to know who carbon purchasers are and would look to build relationship to include biodiversity credits and volunteering opportunities to purchaser. Would also like to know the purchaser of the credits are acting environmentally responsible.

Results

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What's included
Birch Labyrinth 0.6 ha – 160 birch trees, interplanted with coppiced Lime and Hazel
Fruit and nut Silvoarable 6.1 ha – 450 apples, 125 walnuts, 125 sweet chestnut and 125 elders

The model estimated a figure for biomass carbon sequestration per year of:
- Fruit and nut trees – 1.89 tCO2e/yr
- The Birch Labyrinth – 3.27 tCO2e/yr

Additional elements to consider
Three classes of hedgerow – total length 720m
Two types of native woodland – total area 2.5ha

Total Carbon figure for this pilot
When the additional elements are included in the calculation, we estimate the agroforestry and woods generate 43.54 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

RegenFarmCo

Location: Yorkshire, England
Size: 37 ha
Type of Agroforestry: Complex Silvopastoral
Species: Apple, Pear, Quince, Mulberry, Hazel

Planting:

- Extremely complex silvopasture alley system planted in winter of 2021/2022
- Tree species include apple, pear, walnut, hazel, quince, mulberry
- Fruit bush species and soil conditioning species also incorporated in planting plan
- Very Low occurrence of agroforestry locally, planting trees can be divisive in such an upland and AONB setting

RegenFarmCo

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Objectives:

- Reverting landscape to semi natural pre-farming program
- Improving water quality
- Yorkshire farmers currently most in poverty, so opportunity to show different approach. Focus on biodiversity and Carbon markets

Agroforestry Barriers:

- AONB bird and grass land survey requirements
- Lack of appreciation for biodiversity and ecosystem function within AONB

Views on Carbon with Agroforestry:

Level of Commitment:

- Expected productive timeframe of system is 20 years
- Would guarantee carbon credits for 25/30 years
- Operates as a CIC so limited liability. If there was personal liability, then would prefer to have insurance cover for carbon credit guarantee.

Carbon Barriers:

- Would be happy to self-monitor growth of trees every year, would incorporate into volunteer workshop.
- Happy to pay for verification and currently paying for soil carbon verification work. A fan of it being independently verified so doesn't receive comeback from food companies.

Selling Credits:

- Keen to work with existing food companies, even though they have big footprint.
- Need to work with biggest polluters and largest organisations.
- Feel vulnerability to ongoing support from big corporations as project needs to be credible.

Results

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What's included

Fruit and nut Silvoarable (1.9ha) with apple, pear, medlar, mulberry and hazel

The model estimated a net carbon sequestration figure of **2.57** tCO2e/yr for the fruit and nut silvoarable with apple, pear, medlar, mulberry and hazel.

Additional elements to consider

Established hedgerows– total length 2.2km
Established and new woodland – total area 12 ha

Total Carbon figure for this pilot

When the additional elements are included in the calculation, we estimate the agroforestry and new woodland generates **96.61** tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

Parkhill Farm


Location: Fife, Scotland

Size: 217 ha gross

Type of Agroforestry: Silvoarable and Silvopasture

Current species: Apple (40%) and Native Broadleaf Woodland (60%)

Planting:

- 'Quarry office' field, 6.5 ha alley cropping in north/south lines of 38 cider apple varieties planted in 2016

- Neighbouring Lindores Abbey Distillery stocks small batch cider Aipple. More than 300 cans produced in 2022 with plans to expand

- Farm planted 10 ha of mixed broadleaves over the last 4 years, of which 5 ha planted in 2023

Parkhill Farm

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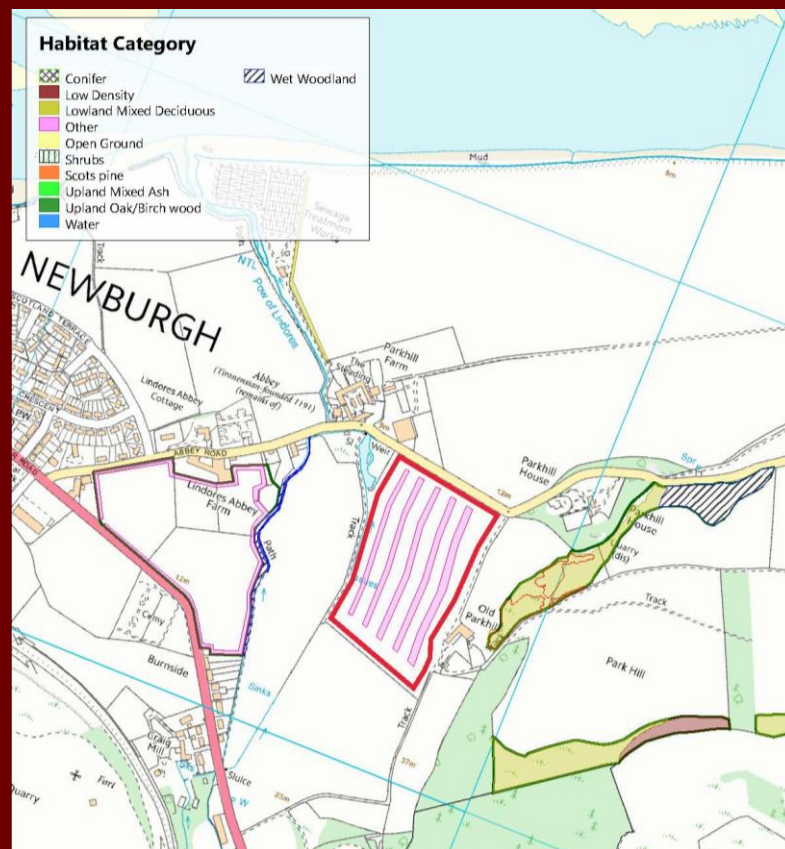
Objectives:
- Environmental benefit
- Avoid orchard and keeping farming productivity
- Connectivity to Tay
- Apple and barley heritage in Newburgh

Agroforestry Barriers:
- Lack of Information, knowledge and examples
- Expense - would not have gone ahead in the absence of WT funding and advice
- Apple trees and guards subtracted from Environmental greening area (Scotland 5%)

Parkhill Farm

Apple Trees DBH Measurements

Legend:
- 2016 Thomas Jeffrey
- 2016 Ashmeads Kernel
- 2004 Worcester Pearmain
- 2016 Black Dabinett
- 2016 Michelen
- 2004 James Grieves

Views on Carbon with Agroforestry:

Level of Commitment:
- Willing to commit to 40 years – the full productive lifespan of apple trees.
- Willing to consider insurance and covenants.
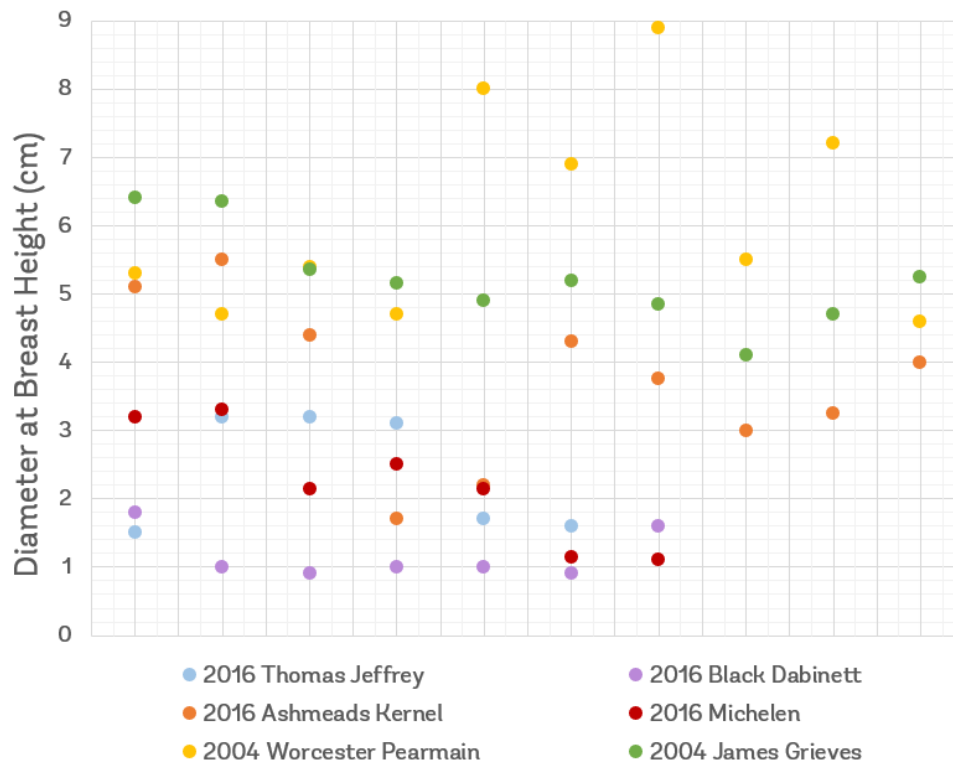- Happy to self-monitor every year.

Carbon Barriers:
- Verifications– willing but reluctant to pay for them.

Selling Credits:
- Very interested in the buyer – not willing to sell to fertiliser or oil companies.
- Price is important but so is selling to the right company.
- Interested in potential benefits in selling carbon with a story.

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What's included

Silvoarable with 709 apples

The model estimated a net carbon sequestration figure of **0.52** tCO2e/year for the silvoarable

Additional elements to consider

Three beech and mixed woodlands - total area 10 ha

Total Carbon figure for this pilot

When the additional elements are included in the calculation, we estimated the apples generate **92.85** tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

Fincastle

Location: Perthshire, Scotland

Size: 500 ha gross

Type of Agroforestry: Wood pasture on rough grazing
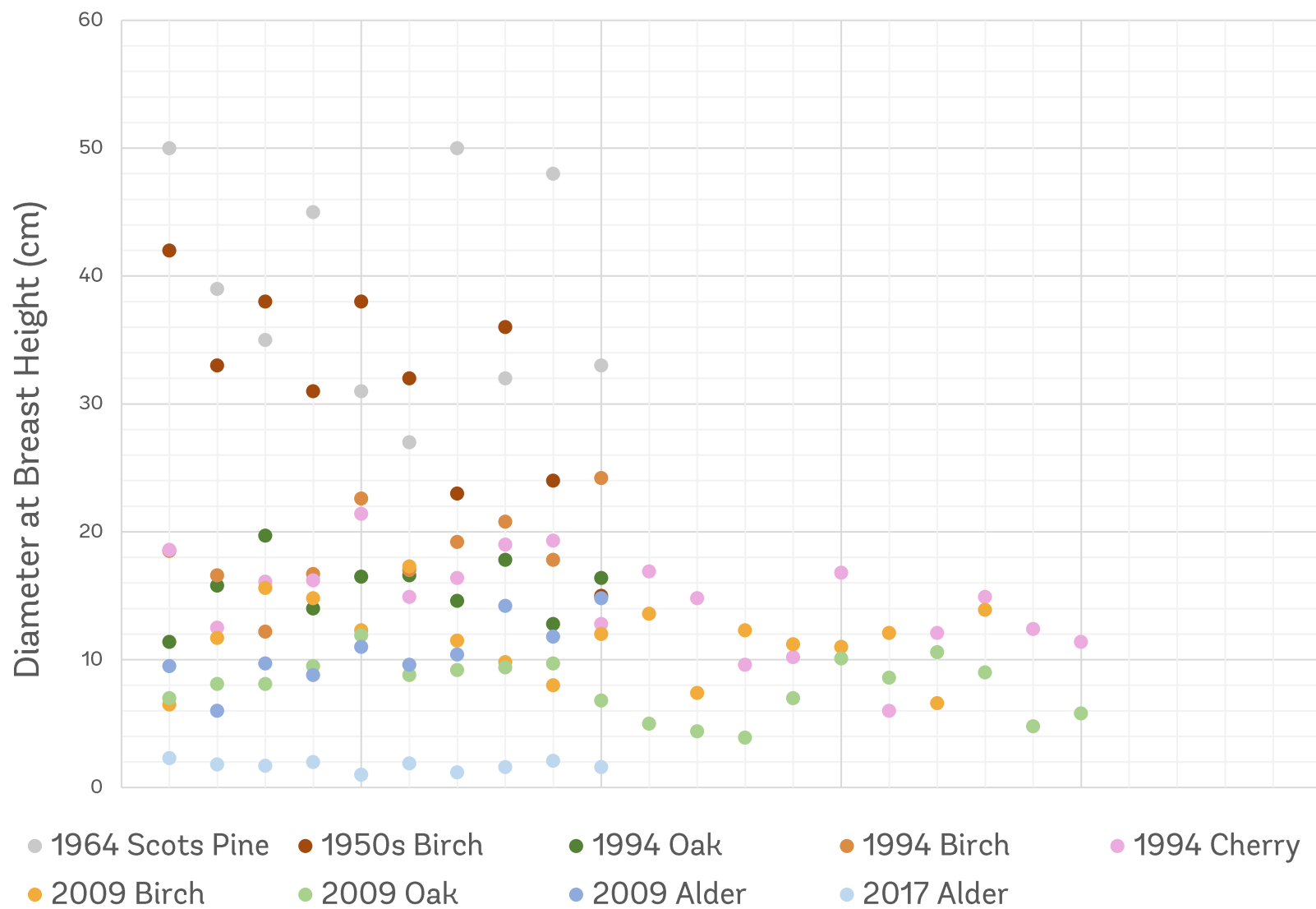
Measured: Mixed broadleaf pasture (7%)

Scots pine (3%), Birch (30%), [Sitka Spruce (60%)]

Planting:

- Trialled variety of planting designs mixing forestry and agriculture due to farmers experience in both industries
- Lightbulb moment when removing fences from a Sitka plantation above the farm - livestock used for shelter immediately which reduced flystrike and improved livestock welfare
- Rotational grazing around new and young trees to avoid damage

DBH Measurements

- 1964 Scots Pine
- 1950s Birch
- 1994 Oak
- 1994 Birch
- 1994 Cherry
- 2009 Birch
- 2009 Oak
- 2009 Alder
- 2017 Alder

Fincastle

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Objectives:
- Increase woodland cover
- Produce useful product e.g. timber, bedding
- Maintain the biodiversity level on the farm (avoiding species rich grassland)
- Expand area for carbon and livestock benefits

Agroforestry Barriers:
- Tenancy barrier
- Sporting Estates
- Grant system divide between agriculture and forestry
- Cultural perception
- Lack of knowledge of the effect animals have on growing trees and vice versa

Views on Carbon with Agroforestry:

Level of Commitment:
- Willing to commit to 100-year contract (100-year rotation).
- Interested in 40-year contract clause for diseases.
- Willing to self-monitor but thinks it only needs to be done once to generate growth class.

Carbon Barriers:
- Verification fees – it depends on the money coming in.

Selling Credits:
- Would use a broker and sell to the highest bidder.
- If selling directly would not sell unethically – avoiding airlines and oil companies.
- Interested in keeping it local and selling carbon and biodiversity together.

Birch DBH Measurements

Legend: 1950s Birch, 1994 Birch, 2009 Birch
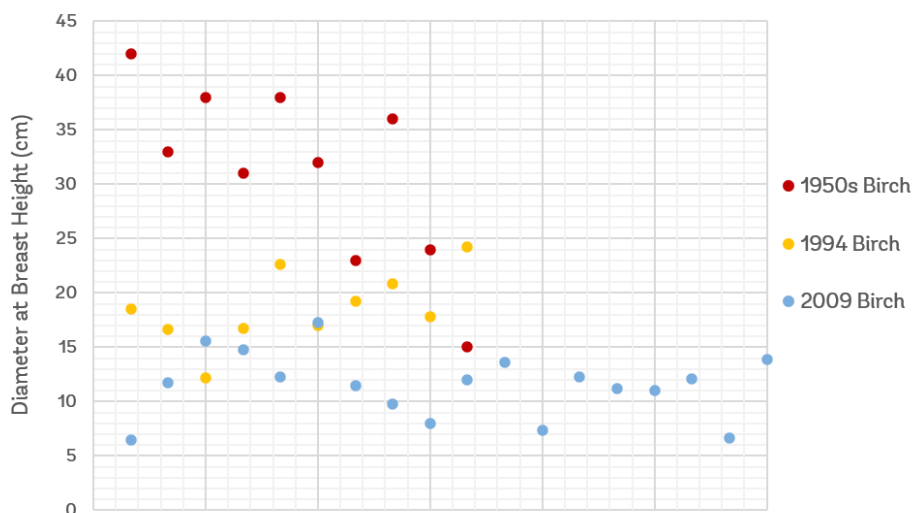
Results

Fincastle

What's included

Silvopasture mixed with oaks and other species

The model estimated a net carbon sequestration figure of **1.72** tCO2e/year.

Additional elements to consider

Scots Pine shelterbelt 2ha
Sitka Spruce Woodland 40 ha

Total Carbon figure for this pilot

When the additional elements are included in the calculation, we estimated the silvopasture generates 316.5 tCO2e/yr. This figure does not reflect the carbon performance of your agricultural operations.

Carbon Attitude Conclusions

Carbon is often not the priority –agroforestry needs to be financially viable as carbon is unlikely to provide sufficient income.

As agroforestry is often very low stems per hectare, several pilots were interested in selling units at a higher price point, through building a closer long-term relationship with buyers. This could include volunteering opportunities or by effective marketing of the carbon story and biodiversity benefits.

Commitment length would generally be dictated by the tree species and their productive lifespans (approx. 25-50 years).

Concerns over whether enough income would be generated through carbon to make the time and costs involved in monitoring and administration worthwhile. Most pilots were willing to commit to a contract, ongoing verifications and self-monitoring if it was financially workable.

Differing views and levels of concern about buyers. A consensus that ethical buyers are preferable but also an acceptance through lack of knowledge on carbon trading that ethical demands are not always possible. Shared preference to know and communicate with buyers investing in the project carbon amongst pilots.