



Improving biodiversity & socioeconomic returns in the Cotswolds

Sapperton Wilder Agroforestry Report

Autumn 2024

Background

Sapperton Wilder's mission is to be an experimental site to test improving biodiversity alongside food production, while creating social and economic benefit. One of the strategies to achieve this goal is through transitioning to regenerative agricultural principles. The five principles are to minimise soil disturbance, keep the soil covered, maintain living root year-round, integrate livestock, and increase crop diversity. One way to diversify crop and income is through agroforestry. While there are many types of agroforestry, at Sapperton Wilder we are focusing on two forms: silvoarable and silvopasture. They are the combination of silviculture (the growing of trees) with arable (crop) and pasture (livestock). In essence, the practice of integrating trees into the farming cycle.



Experimental Plot, Spring 2024. Photo: Charlie Nash



Why did we plant trees?

Realising the full potential of integrating commercially managed trees into farming systems is a long way off (The Agroforestry Handbook, 2019). As an experimental project, there is potential to provide evidence behind this integration. Starting with an experimental plot, the project aims to understand optimal planting, mulching and deer protection regimes required to grow a range of target trees in Cotswold brash soils, without the need for inputs.

With a strong evidence base provided by ecological surveys, expert knowledge, citizen science, and student research, we can take what we've learned with a view to expand agroforestry across another 50 hectares of the project. The aim is to also share these findings with other landowners.

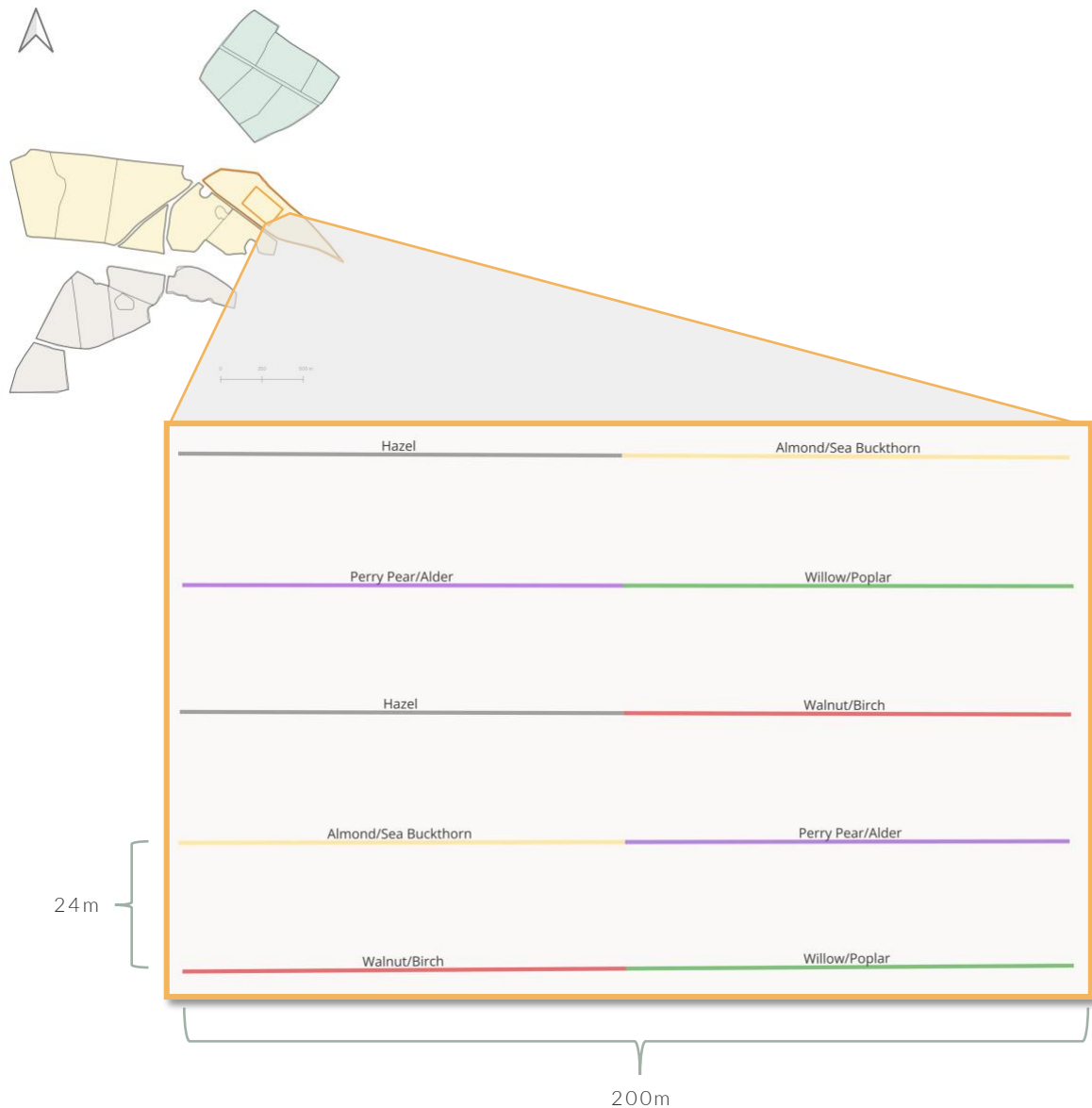
There are many drivers behind implementing agroforestry. Sapperton Wilder's purpose behind planting trees is a combination of harvest and amenity, as well as helping with soil erosion, wildlife habitat, shade/shelter, and pollinators. The planting design aims to provide reasonable but practical statistical confidence levels within a simple ANOVA experiment. The Soil Association's Agroforestry team and the Woodland Trust helped us to develop the plans for an experimental plot. We joined the Woodland Trusts' "Trees on Your Farm" scheme (funded by Sainsbury's), which provided guidance and support, supplying two-thirds of the trees. The Gloucestershire County Council provided the remaining third of the total trees.

What did we plant?

We planted a total of 1462 trees of 10 different species. They were planted in 5 rows of 200 metres, each row leaving 24 metres between to accommodate the width of the farm machinery that will be used to harvest the crop sown between the rows. Currently, herbal leys are growing between the rows, with a future vision of growing a wheat crop.

The design is based around large fruit and nut trees interplanted with a smaller species in between, either specifically chosen for its nitrogen-fixing capabilities, its potential for coppicing, or both.





Walnut: a hardy species, valuable nut crop with local market

Birch: quick establishing nurse crop, pioneering species which helps with soil nutrient cycling, to be coppiced

Willow and Poplar: fast growing, to be coppiced, used for fencing, firewood, charcoal, or biofuel

Almond: experimenting with climate resilience, marketable nut crop (if successful)

Sea Buckthorn: Nitrogen-fixing, berries can be sold (high in Vitamin C) or left for wildlife, size to be controlled by pruning.

Perry Pear: hardy species, local heritage of perry cider

Alder: Nitrogen-fixing, to be coppiced, used for biofuel or mulching of subsequent plantings

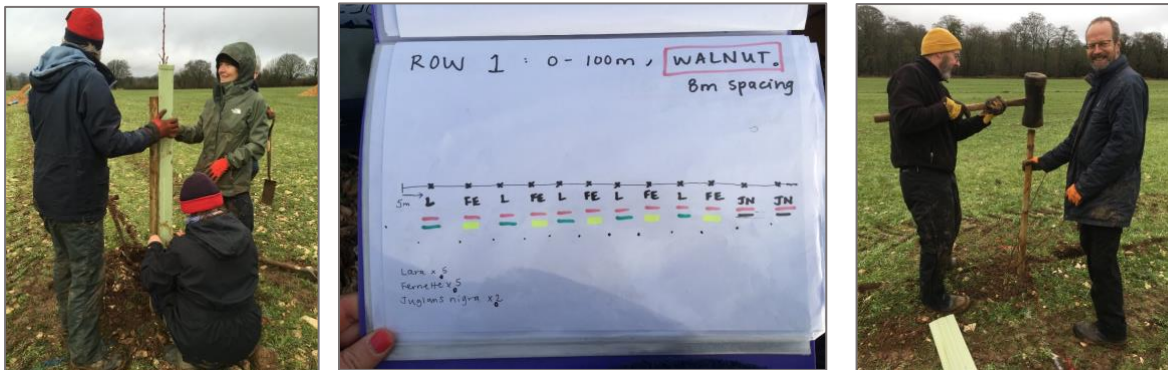
Hazel (nut & coppice): Market for both cob nuts and coppiced wood



How did we plant them?



Our contract farmer made the 200-metre lines in the soil, making it easy for us to plant in a straight line. He also used a soil auger to drill holes in the locations for the larger fruit and nut trees. We colour coded and bunched the tree by species, associated with the planting plan, then spray-painted the ground with the corresponding colour combination and appropriate distances. These distances were determined by Ben and Jon at the Soil Association, and their knowledge of how big the trees will get.



On the day, we had the species bunches at the start of each row. One person went ahead and laid out the stakes and tree guards down the row, while everyone else came behind and planted the trees, pounded in the stakes, and installed the tree guards. We had such an amazing turnout of volunteers from the community and through our amazing partnership with the Stroud Valleys Project. Their tree planting team leader Stuart brought his enthusiastic tree planting team.



Mulch

Using woodchip as mulch can increase soil organic matter, water holding capacity and soil nutrient levels (Organic Research Centre). Tree survival and growth is linked to minimising weed competition for water and nutrients (The Agroforestry Handbook). For more information on this, check out The Woodchip Handbook by Ben Raskin.





We sourced several tonnes of woodchip from nearby forestry work and spread it to cover the base of each tree.



Photo: Charlie Nash

Tree Protection

Over the course of 4 planting days, we got all 1462 trees in the ground and protected with tree guards. We are testing the use of traditional plastic guards with some emerging plastic-free, biodegradable options for the Woodland Trust.

Plastic	Biodegradable		
			
<p>Tubex tube</p> <ul style="list-style-type: none"> <input type="checkbox"/> Plastic tubes <input type="checkbox"/> Minimum of 5 years <input type="checkbox"/> Recyclable 	<p>BMP Treehugger</p> <ul style="list-style-type: none"> <input type="checkbox"/> Organic cotton substrate with pine resin <input type="checkbox"/> Plastic free <input type="checkbox"/> Biodegrades over time 	<p>Tubex Nature</p> <ul style="list-style-type: none"> <input type="checkbox"/> Sugarcane, corn & starch <input type="checkbox"/> Non-toxic, bio-based <input type="checkbox"/> Soil biodegradable <input type="checkbox"/> Lifespan 3-5 years 	<p>Rainbow Terra</p> <ul style="list-style-type: none"> <input type="checkbox"/> Plant resin and recycled wood residue from UK <input type="checkbox"/> Plastic free and non-toxic <input type="checkbox"/> Lifespan 5 years <input type="checkbox"/> Biodegradable



Fencing

Over the summer months, fencing was installed around the trees to eliminate deer browsing and disturbance. There is a large population of fallow and roe deer that move through the site, as well as some muntjac. Typical deer fencing is expensive, so we sought to test two more cost effective options.

Inspired by Stuart Roweth from the Stroud Valleys Project and Ed Bonn from the Farming & Wildlife Advisory Group South West (FWAG), who have both effectively used the same premise for deer fencing, each using different materials. The premise is to use a double row of fencing with a gap in between, operating on the theory that deer are reluctant to jump into small enclosures (Forestry England).

We are monitoring the fencing to assess its effectiveness in deer exclusion, as well as its cost effectiveness with scaling up in mind.



Left: Electric Fencing Row 5 (Almond & Sea Buckthorn). Right: Mesh Fencing Row 1 (Willow and Poplar). Photos: Chenie Prudhomme

Results

In July, the trees were assessed for health and survival. There was an overall a survival rate of 86% (Table 1). There was an approximate 33% mortality rate for Birch and Sea Buckthorn; which can partially be contributed to deer browsing and disturbance prior to the installation of the fencing. We expect that this will not be an issue going forward, now that the fencing is in place.



Table 1: Survival Rates of Trees, Summer 2024

Fruit & Nut	Variety	Total Planted	Survival Rate
Walnut	<i>Juglans varieties</i>	25	100%
Almond	<i>Prunus varieties</i>	33	100%
Perry Pear	<i>Pyrus varieties</i>	20	85%
Hazel (nut)	<i>Corylus varieties</i>	10	100%
Coppice/Interplant	Variety	Total Planted	Survival Rate
Birch	<i>Betula pubescens</i>	197	63%
Willow	<i>Hybrid</i>	353	99%
Poplar	<i>Hybrid</i>	346	99%
Sea Buckthorn	<i>Hippophae rhamnoides</i>	342	66%
Alder (Italian)	<i>Alnus cordata</i>	75	84%
Hazel	<i>Corylus avellana</i>	61	98%
	Total Trees	1462	86%

What are the next steps?

Monitoring & Research

The project aims to consider and provide evidence behind important productivity and profitability questions around agroforestry. Various postgraduate research will help to build the methodology for long-term monitoring of both tree growth and the effects agroforestry is having on the land. Equally, a management and harvest plan will be developed. The monitoring will also include looking at the effectiveness of the experimental deer fencing.

Replacing Dead Trees

Any dead trees will be replaced this winter.

Funding

While the trees and guards were provided through grants, there is emerging funding through the Sustainable Farming Incentive for agroforestry that the project will be exploring.

According to DEFRA, the purpose of this incentive is to reduce soil erosion and flooding, improve water and air quality, provide shelter for crops and livestock, and contribute to carbon capture and storage.

Livestock Integration – Silvopasture

The view for the farm in the coming years is to integrate livestock back into the farming system at Sapperton. This will include interaction with the agroforestry.



Acknowledgements

- ◇ Jon Haines and Ben Raskin at The Soil Association
- ◇ The Woodland Trust
- ◇ Sainsbury's for funding the "Trees on Your Farm" Scheme
- ◇ Gloucestershire County Council
- ◇ Stroud Valleys Project, in particular Stuart Roweth and the amazing tree planting team
- ◇ Stuart Roweth for the electric fencing idea and guidance
- ◇ Ed Bonn at FWAG for the plastic mesh fencing idea and guidance
- ◇ Franklin Farms, without your machinery magic we might still be out there digging holes
- ◇ Each and every person who came out to help with planting trees, mulching, tree care – we wouldn't have been able to do this without you

Resources

Woodland Trust – Trees on Your Farm
<https://www.woodlandtrust.org.uk/plant-trees/trees-for-landowners-and-farmers/>

Soil Association – Agroforestry
<https://www.soilassociation.org/causes-campaigns/agroforestry/>

Gloucestershire County Council – Trees for Gloucestershire
<https://www.gloucestershire.gov.uk/trees-for-glos/>

The Agroforestry Handbook – edited by Ben Raskin and Simone Osborn
<https://www.soilassociation.org/media/19141/the-agroforestry-handbook.pdf>

The Woodchip Handbook – by Ben Raskin
<https://www.benraskin.uk/general-8>

The Organic Research Centre
<https://www.organicresearchcentre.com/research/agroforestry/>

DEFRA – Sustainable Farming Incentive for Agroforestry
<https://www.gov.uk/find-funding-for-land-or-farms/agf2-maintain-low-density-in-field-agroforestry-on-less-sensitive-land>

Forestry England - Westonbirt Arboretum – Deer Fencing
https://www.forestryengland.uk/sites/default/files/documents/Westonbirt%20Forest%20%28Arboretum%29%20Design%20Plan%202021-2030-merged-compressed_0.pdf

