

Agroforestry Guidance

Note 4: Introduction to apple silvoarable systems.

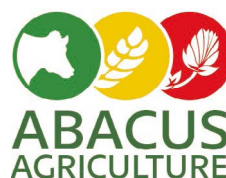
Hampshire Forest Partnership was established by Hampshire County Council in 2022 with a goal to plant one million trees by 2050. The vision for the partnership is to facilitate tree planting by working with communities, landowners, businesses, and organisations across Hampshire.

This guidance note has been produced by Abacus Agriculture and BioDiversity International Ltd. Any views expressed do not necessarily represent those of Hampshire County Council.

Any financial information presented should be checked in relation to local costs, yield potentials and sales prices.



**HAMPSHIRE
FOREST
PARTNERSHIP**



BioDiversity International Ltd



Introduction

Hampshire Forest Partnership will seek to provide opportunities for and deliver projects that meet six strategic priorities, shown below:-

1. Public benefit, amenity value, health and wellbeing
2. Climate change mitigation and resilience
3. Biodiversity and local nature recovery
4. Landscape character, cultural and heritage development
5. Learning, awareness, and educational opportunities
6. Sustainable development of the rural economy.

Hampshire Forest Partnership recognises that there are many opportunities for tree planting on farmland and to help farmers reach net zero, improve soils, and enhance biodiversity. Agroforestry has seen a recent surge in interest amongst farmers, yet there remains confusion about how best to integrate tree planting within farming systems. These guidance notes will aim to break down the barriers and improve understanding of how tree planting can be developed on farms.

Agroforestry

Agroforestry can be defined as “a collective name for land use systems and technologies where woody perennials (trees, shrubs, etc.) are deliberately used on the same land management unit as agricultural crops and/or animals, either in some form of spatial arrangement or temporal sequence.”

In agroforestry systems, there are both ecological and economic interactions between the different components. In many cases agroforestry is a profitable activity even in the absence of subsidies or grants. The major agroforestry sub-types in the UK can include:

Silvopastoral systems (livestock component linked to pasture or swards)

Silvoarable systems (arable component)

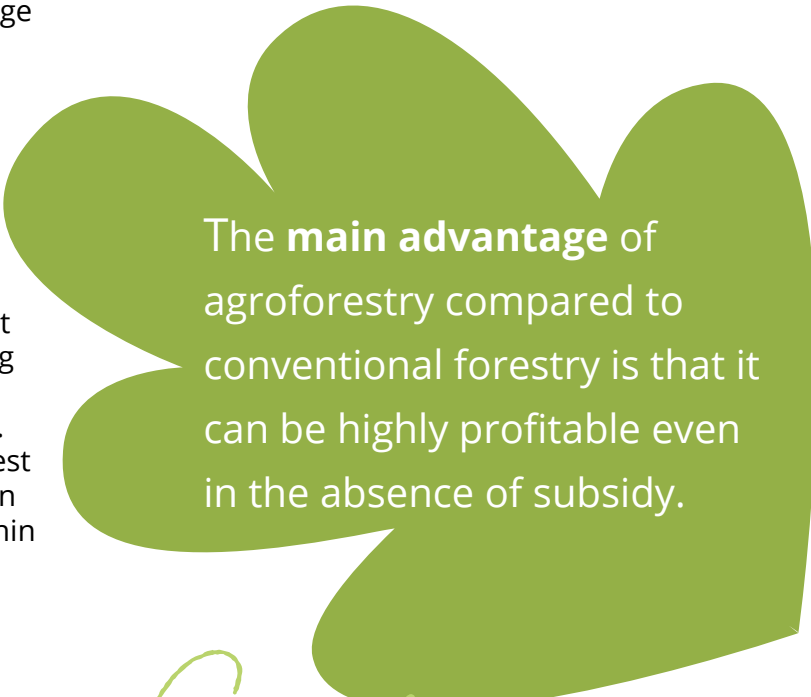
Environmental agroforestry e.g., riparian strips or buffer areas

Food forests (large garden forms for food production in the urban or peri-urban context)

Forest farming e.g. wood pasture in the New Forest

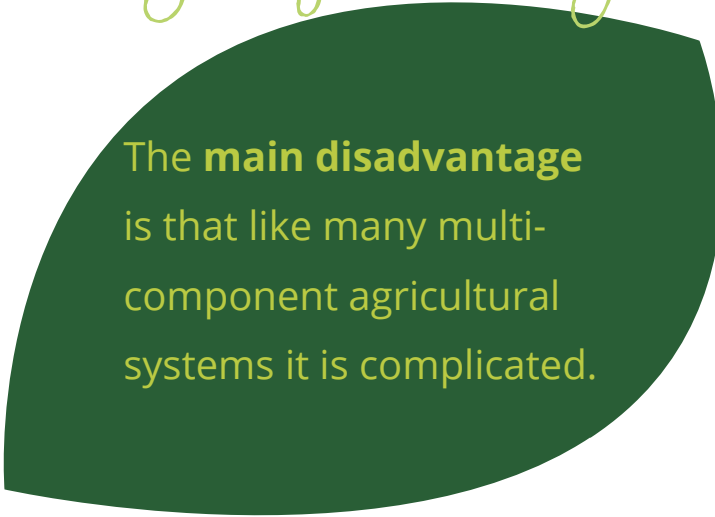
Orchard intercropping

Agroforestry is an old practice recently developed in the UK after 40 years of intensive research based on national network trials. It has only recently been recognised by agricultural and forestry policy in the UK.



The **main advantage** of agroforestry compared to conventional forestry is that it can be highly profitable even in the absence of subsidy.

Agroforestry



The **main disadvantage** is that like many multi-component agricultural systems it is complicated.

In the past there have been too few competent advisors. The situation is improving however and there is a new breed of partner advisors with key value chain knowledge/contacts and an incentive to make the system work.

Suggested Agroforestry species.

Tree species	Key management suggestion	Products and markets	Site notes/preferences
Cricket Bat Willow <i>Salix alba "Caerulea"</i>	Plant large high-quality sets	Timber for production of cricket bats for domestic use and export	Will tolerate short term flooding
Hazel <i>Corylus avellana</i>	Manage as single stem tree for mechanical harvesting	Hazel nut flour, nuts, nut milk, oil etc	Shelter is important.
Walnut <i>Juglans regia</i>	Use late flowering (spring frost avoiding) lateral bearing grafted trees.	Nuts, nut oils, walnut flour, walnut butter	Prefers deep sandy loams and shelter, but will grow in many local soil types with proper drainage
Quince <i>Cydonia oblonga</i>	Needs special processing equipment	Preserves, beverages and membrillo	Will tolerate short term flooding and is also drought tolerant
Mulberry <i>Morus nigra</i>	Use named varieties selected for flavour and precocity (early bearing) e.g., at 1-3 years old	Preserves, and beverages	Prefers shelter and deep, moisture-retentive but well-drained soil
Stone pine <i>Pinus pinea</i>	Requires specialised processing equipment.	Nut kernels	Shelter is important
Chestnut <i>Castanea sativa</i>	Use named varieties	Nuts, flour, and milks	pH less than 7
Oak <i>Quercus spp</i>	Use varieties with improved precocity as acorns are the economic product	Acorn Flour	Shelter is important
Elder <i>Sambucus spp</i>	Use a mixture of species and varieties for elderflowers and berry products	Elder flowers/berries for beverages	Shelter is important
Hawthorn <i>Crataegus spp</i>	Use species with large fruit and good juicing properties	Beverages and health products (e.g., hawthorn tincture).	Shelter is important

Setting objectives and a rule of thumb

Before establishing agroforestry there is a need to set objectives and timescales for achieving a return on investment. This will depend on land tenure and if the intention is to grow for wholesale or localised value-added markets. In general, a site of greater than 10 acres is required for a commercial agroforestry operation.

For many UK agroforestry systems trees occupy c. 10-20% of a land parcel spatially arranged in groups, rows, or as individual trees. Agroforestry is dynamic and as trees grow, management, will need to adapt.

As a rule of thumb shade levels below 50% will not have a major effect on the growth of an understorey and late leafing trees are preferred to allow an understorey to obtain some light early in the season

Management and market issues

It is important that objectives are clear. Harvesting and management of the tree crop should not interfere with arable options. Variety selection will help to make sure harvest is at a time when interference with the crop is at a minimum. Freshness and flavour are key issues when competing with imported products.

Impact of silvoarable systems

Environmental impacts include land and water decontamination, increased biodiversity, and reduced flooding. Social benefits, especially in peri-urban areas, include increased access to green space and educational benefits.

Grants for silvoarable systems

Given the low planting density, most Forestry Commission tree establishment grants would not currently be appropriate.

Hampshire Forest Partnership have several funding schemes for farmers and landowners, please the website for further information [Farmers and landowners | Hampshire County Council \(hants.gov.uk\)](#)

If your project involves the local community, Hampshire Forest Partnership have several schemes available. Visit [People and communities | Hampshire County Council \(hants.gov.uk\)](#) for further details.

The Woodland Trust is supporting agroforestry establishment and will cover most costs. This is available on first come first served basis.

Many Environmental Land Management (**ELM**) payments can be appropriate and if stacked could be attractive. Agroforestry payments will be available as part of the **Sustainable Farming Incentive (SFI)**. These may require Environmental Impact Assessments (EIA). Crop (e.g. wildflowers) strips in silvoarable systems may be eligible if part of habitat creation under the **Biodiversity Net Gain** scheme.

Hampshire Forest Partnership may also be able to provide funding support e.g. in relation to their programme "Shoots Along the Routes" [Shoots Along the Routes | Hampshire County Council \(hants.gov.uk\)](#). They can also supply **free elm trees** as part of a scheme to reintroduce disease resistant hybrids to Hampshire to benefit nature recovery (available each year on a first come first served basis).

Apple as an agroforestry tree

There are many publications on how to grow apples in a domestic and commercial orchard setting so details will not be provided here. Apples planted in silvoarable systems where there is a large distance between the tree rows will experience a very different microclimate than the ones grown in commercial orchards. There will be a far greater circulation between the tree rows, and this may reduce the incidence of fungal disease meaning that a no spray regime may be economic. In most apple silvoarable systems there will be an interest in using all the fruit and not just grade one apple. There will also be viability in selling apple products at the farm gate. Mechanical harvesting of fruit may be a possibility if appearance is not a key issue as in apple juice and cider. The lower reliance on selling apples to supermarkets and wholesalers also means that heritage varieties may be appropriate and again these may be more resilient in the absence of sprays than modern commercial varieties. Wildflower mixes sown within the tree rows and flowering intercrops such as flax may also attract predators of insect pests and consumers of fungal pathogens. The science of apple silvoarable systems is in its infancy, so many of the advantages are yet to be fully quantified and/or understood.

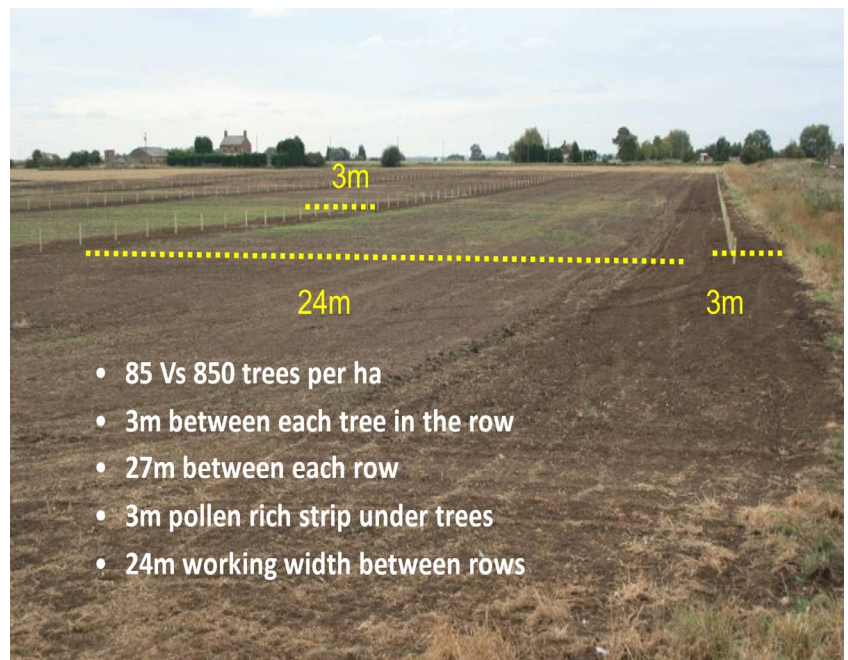
Site requirements

Apples will benefit from sheltered sunny sites with deep soils e.g., sandy loam with a pH between 6-7. Apple is insect pollinated so adding wildflower mixes to the tree strip can be advantageous.

Spacing

In modern commercial orchards, monocultures of dessert apple operate in orchard densities between 850 and 6000 stems per hectare and have an extremely high cost of establishment (e.g., £20,000 per hectare if labour is included). They also require a high intensity spray regime to manage as monocultures. 90% of the crop is sold to supermarkets.

The agroforestry option is not comparable to this approach. It is a low-cost low input approach and typically 80-123 stems per hectare is a reasonable tree planting density.



Given the importance of wild flower mixes in apple pollination, it is recommended that 3m strips are sown. For the management of organic arable crops, an ideal arable alley would be 24m wide. This gives 27m between the rows.

Varieties

There are hundreds of varieties to choose from if heritage apples are included. Heritage apples may be more resilient to pests and diseases in a no spray regime. Rootstock selection should be linked to ease of picking. The most widely available apple rootstocks are called 'M27', 'M9' and 'M26', and 'M106', producing trees of 1.5-1.8m (5-6ft), 2.4-3.6m (8-12ft) and 3.6-5.4m (12-18ft) tall respectively. Fruit yield is similar but big trees give a financial breakeven point later and can be difficult to harvest. Miniture (M27) or dwarf (M9) are not generally recommended, as the root system may be too weak to support the tree weight in later years, when it is in full production. Varieties should be selected so that harvesting time does not interfere with arable operations. It is always better to have more than one variety. Some varieties may need to be cross-pollinated with pollen from the flowers of a different apple variety to produce fruit.

Establishment and management

1.5m to 2m trees should be planted with a stake, tree protection and a mulch mat as shown in the plate below. A bamboo cane should then be inserted as a bird perch, taller than the tree, to stop birds landing on the young tree branches and snapping them off. Birds will tend to land on the highest point.



A wildflower mix is then broadcast on the 3m wide tree strip.

The pictures below show the height of the bamboo cane and the nature of the established wildflower strip.



Financial data based on targets

The gross margin data presented focusses on the tree component only. The wide spacing of the trees and the moderate beneficial shade cast means that a target of 100% intercrop yield is expected on average over the life of the system. Beneficial interactions mean that in many cases the loss of the land area under the tree strip is totally compensated for.

Variable per hectare	Apple
Tree density	85
Target average yield (tonnes)	1.7
Price per tonne	£900
Total Output	£1,530
Variable Cost (£)	
Orchard depreciation (establishment)	£60 ¹
Pruning/clearing	£50
Organic fertiliser/sprays	£81
Crop sundries e.g. tree ties	£20
Harvesting (labour)	£200 ²
Processing	£248
Storage/ bin hire	£0
Packaging e.g. boxes	£111
Transport	£90
Marketing and sales	£100
Commission/levies	£115
Total variable cost	£1,075
Tree crop gross margin	£455

1 Over 10 years based on the life of the establishment materials and not the life of the tree

2 This is the only labour that is contracted. All labour for other operations is assembled to be farm staff which is part of the fixed costs of the operation

Tree Yields - year 1-3 zero; year 4-5 50%; year 6-15 100%; year 16-25 75%

Services available from Hampshire County Council can be found at **Agroforestry | Hampshire County Council (hants.gov.uk)**.

Hampshire County Council have created a new Facebook group, **The Hampshire Agroforestry Forum**, to enable farmers, growers, and food entrepreneurs to link with each other to facilitate new markets for tree products. **Hampshire Agroforestry Forum | Facebook**. If you have products to sell or you are looking for products produced from trees, please add your details to the group.

Sources of information

Apple Best Practice Guide | NIAB

soilassociation.org/media/19141/the-agroforestry-handbook.pdf

Major nurseries sell apple trees and can give advice on varieties.

Apple trees are also suitable for silvopastoral systems and forest gardens.



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