SEEING THE WOOD FOR THE TREES

There may be many benefits for farmers who diversify into agro-forestry, as trees and arable crops work very well together. Jonathan Wheeler explored the options available.

Most farmers expanding their business go sideways and consider taking on additional acreage. Stephen Briggs suggests they might be better served exploring more vertical options, namely trees, to effectively create an extra productive area further above the soil.

Stephen took the decision to establish an agro-forestry silvo-arable system over 125 acres of Wantall Farm, Farcet, Cambridgeshire, around a decade ago. His is currently the biggest such scheme in the UK, featuring 24m-wide cropping strips interspersed with 3m-wide strips planted with trees.

Stephen, who also runs a consultancy advising new entrants to the practice, says the trees and arable crops work very well together. Trees grow much taller than the arable crops, so they provide shelter and create a local micro-climate. Their development also changes, and there's some evidence to suggest they establish deeper root systems than those in normal woodland, so they access deeper lying reservoirs of nutrients and moisture. In this way they help the arable crops by protecting them against the worst of the weather, without competing with them for resources.

PRUNING THE ROOTS

Stephen ensures this happens by root pruning the trees with a sub-soiler down either side of the tree strips each autumn to sever those shallow roots, so the trees have to rely on deeper lying ones.

As his farm is part owned and part tenanted, he had to gain approval from his landlord for the switch. The tree strips include species grown for fruit and timber, so they make both a short-and long-term contribution to the business, while the arable land supports a mixture of organic oats, wheat and vegetables.

Notably, the system requires minimal extra machinery — he says a mower to manage the under-storey of the strips is the only item. Switching to such a system does require a change of approach, but he sees clear advantages in it, chief among which is that it makes best use of the resources nature provides.

"Fundamentally, as a farmer, I am harvesting sunlight and turning it into carbon by mixing it with carbon dioxide and water. Yet just when we are gaining maximum sunlight and radiation from the sun we harvest our crops, which is effectively turning our solar panels off."
Stephen with a section of bog oak found in a ditch on the farm – proof that there have been trees there for thousands of years.

That means we are not using the resources provided to their full potential,” he says. Planting trees, he argues, means that energy is still being harnessed. To ensure both trees and crops benefit from the sunlight, the tree strips are planted on a north/south axis as much as possible.

“That ensures both sides of the trees and the arable crops get enough sunlight. The only work on the strips is that we mow one side in the spring and the other in the autumn. The mower is the only additional piece of equipment we need,” Stephen adds. He feels farmers should consider mimicking nature in this respect, commenting: “Nature knows all about this. It never leaves the ground bare and always has a range of things growing to harvest sunlight. We need to learn lessons from that.”

COVER CROPS

While many more farmers are now using cover crops during this period, it is far from a universal practice despite the obvious logic behind it. Crops and trees tend to complement each other because they take up nutrients and moisture at different times of the year, he points out. “There are some real biodiversity benefits in having perennial refuges within what are largely monoculture systems.”

These include ground stabilisation and floodwater management: “Agriculture is still very leaky; forestry isn’t and one can help the other. Trees also reduce evaporation and wind speeds as they create a more beneficial microclimate. They can make the environment warmer at the shoulders of the season.”

Those reduced wind speeds can translate into practical benefits such as more days that are high yielding years Stephen makes individual variety juices. Lower yields in 2018 meant he chose to make a single, mixed variety juice.

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Above: The trees provide fresh fruit for the shop, but crushing apples into juice can be much more profitable.
suitable for spraying. And – on a national scale – it would not take very much land to be converted to agro-forestry for the UK to meet its emissions reduction targets. "If we increased agro-forestry to 5.8 per cent we could meet those obligations."

The system could also help protect vulnerable soils against both water and wind erosion risks. One of the keys to get landlords on board with the idea so tenants can access the benefits – and the fact that land retains agricultural status and remains eligible for CAP payments – is key benefits.

Making sure the tree strips provide an income is important, he says. "We chose fruit trees so we could get a payback within 15 years, although we are planting at 85 trees per hectare against the 850 – 1000 trees that would be planted in a commercial orchard."

They have 13 different varieties of apple, all of them being late maturing varieties so arable and fruit harvest do not clash. "We have half-commercial varieties and half heritage – the latter being very useful from the marketing perspective. Most of their fruit is sold through the farm shop. In the longer term other trees that provide timber can also be included in the strips to provide an ongoing source of income.

Stephen points out that the system effectively forces its users to practise 'controlled traffic farming' as his fen drill is nearly matched to the 24m crop strips.

**Bugs thrive**

Silvoculture systems can provide an excellent environment for a range of wildlife, including a variety of insects that can help control pests and improve pollination for farmers. So says Tom Staton, a doctoral researcher at the University of Reading, who has been studying the effects of integrating trees into arable farms.

"These strips have benefits for bird life, plants, fungi and insects. Among the last group are several beneficial predators, which prey on pest insects that threaten the arable crops."

His findings are based on studies carried out in 2018 in three silvo-arable sites. In the study he compared the population of insects in the silvo-culture system with that in adjoining conventionally managed fields. Each site studied used 24m-wide crop strips and tree strips of either three or four metres width.

The study includes two organic farms in Cambridgeshire, including Stephen Briggs' farm, where the system had been in place for eight years. His tree strips are planted with apple trees above an understorey of a nectar-rich flower mix. At the time of the study the adjoining crop was winter oats.

On the other Cambridge farm the system had been in place for three years; the tree strips included a mixture of apple, other fruit, nuts and timber, and an understorey of a clover mix and the adjoining crop winter wheat.

The unit on a conventionally managed Nottinghamshire farm had been in place for four years, the trees being mainly apple, the under-storey a nectar-rich flower mix and the cropping oilseed rape.

**Natural pest control**

Tom suggests tree strips and their understoreys can support a population of insects that could have significant benefits for farmers in that they apply a level of natural control on a range of pests and could help reduce pesticide costs.

"There is also the potential to improve the business resilience, particularly when you think about threats such as the potential for some chemicals to be restricted or banned that might be introduced in the future. By encouraging a range of beneficial wildlife on farm you could be securing yourself a level of insurance against such threats."

Tom has been studying the effect on species like spiders and beetles, and found some remarkable increases in populations. "We found a 30% to 40% increase in spider numbers, and a 250% increase in "harvestmen" spiders, which are an important predator on a range of insect pests and a huge benefit for farmers."

Levels of omnivorous ground beetles rose by around 70% while parasitoid wasp populations rose by around 30%. By contrast populations of root flies, wireworms and field wasps fell.

"These flies are all plant feeding and include a range of pest species such as..."
Above: Trees and shrubs can improve livestock health as well as growth, says Russ Carrington.

Further details of this scheme: www.woodlandtrust.org.uk/plant or phone 0330 335 5303.

But farmers thinking of installing agro-forestry should be clear what their aims are when doing it. “Agro-forestry is all about integrating trees and shrubs into farming system rather than taking land from farming into forestry. It is a land management approach with multiple benefits. Schemes can be designed so they avoid potential trade-offs between farm production and other public goods that can occur in many modern farming systems. They can include traditional features such as farm hedgerows, shelter belts and parkland, as well as innovative schemes such as silvo-arable cropping, a method of growing aliens of productive trees through the landscape.”

“Agro-forestry can help provide connectivity across the landscape, so it creates wider benefits across rather than just on the individual farm. Trees can deliver a range of services, like soil stabilisation and protection against erosion, soil water management, shade, shelter and additional forage for livestock. They also produce a range of products, including fruit, nuts, material for biomass markers and – in the longer term – timber. That enables farmers to spread their risk via growing what are effectively perennial crops.”

While some farmers might be concerned that pruning trees could reduce crop yields, she suggests the opposite could be true. “In alley cropping it is normal to plant the tree lines on a north-south axis, which reduces the impact of shading. There may be some yield reduction immediately next to the trees, but the other benefits outweigh it. The effect on overall yield – if managed correctly – will be more than if the same

Left: Pan traps being used to sample flying insects.

Below left: A typical pitfall trap sample from agroforestry being analysed in the lab, this one includes predatory beetles and spiders along with a few slugs.

A predatory violet ground beetle running through agroforestry oats.

A parasitoid wasp viewed down a microscope, this is one of the more colourful and larger ones and lays its eggs inside of caterpillars.

Silviculture key to future farm policy

Support for agro-forestry must be part of any future UK-based farm policy, says Helen Cheshire, senior adviser for the Woodland Trust. She says DEFRA missed a golden opportunity to give the sector a valuable boost when it decided not to adopt Pillar 1 and Pillar 2 agro-forestry options in the last round of CAP reforms.

At the time DEFRA claimed there was insufficient interest in the idea. And while the decision taken in 2018 to allow fields in which trees had been planted to retain BPS eligibility so long as agricultural activity could continue helped, it did little to promote the technique.

Helen says that attitude should change, and the Woodland Trust is among a network of organisations seeking to achieve that.

“Agro-forestry has to become a mainstream land use. It could help us meet a significant portion of our ‘zero emissions’ targets. It will also support a more sustainable agriculture, as well as delivering a range of public goods. Farmers should be encouraged to do it and there should be no barriers to involvement. DEFRA should also be providing relevant advice.”

She also suggests more research is needed into the operation of agro-forestry in temperate climates, and establishment of new markets for tree products. The Woodland Trust is aiming to help uptake by farmers and administrators a grant scheme funded by the Accor hotel group called ‘Trees for your farm’, which, over the past five years, has provided enough finance to plant over 100,000 trees in 70 agro-forestry schemes.

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