

Woodland: The Untapped Agricultural Asset

Report by Jane Michell, Organic Studies Centre

On March 10th North Wyke Research hosted an event funded by the Rural Business School's Vocational Training Scheme. The event attracted an audience of 50 farmers and foresters and was organised and chaired by VTS Organic Training Co-ordinator Lois Philipps. The aim of the day was to understand the different types of agro forestry systems and what benefits they can deliver. Lois introduced trees as an untapped agricultural asset which, contributing to a multi functional landscape, will become increasingly important in the future.

Jo Smith from the Organic Research Centre, Elm Farm described how agro forestry is an interaction between ecology and the economy. In the past, trees had been part of land based systems in the form of orchards, pannage, and hedgerows. Remnants of traditional woodland and farming combinations are can be found in the New Forest and in parklands and commons throughout the country. However in the last fifty years agriculture, forestry and nature have separated and monocultures on large farms have become normal. The modern concepts of agroforestry are Silvo arable systems which combine trees and crops and Silvo pastoral systems where trees provide resources for animals.

Most modern systems are laid out in alleys – the width of which are determined by the machinery to be used. Crops benefit from the presence of trees – shading reduces evapotranspiration; tree roots access nutrients from below depth of crop roots and re-deposit them on the surface through leaf fall to increase soil organic matter. Horticultural crops grown in the shelter of wind breaks benefit from moderation of temperature extremes, warmer soil and air temperatures, and improved soil water conditions, all of which contribute to increasing total marketable yields and individual fruit weight. The effects of wind reduction by tree shelter can increase the minimum temperature by 2 or 3°C. Sheltered conditions also increase flowering periods and bee activity, leading to increased fruit set and earlier maturity.

In a Silvo pastoral system, trees provide shelter from rain and wind, shade from the sun, cover from predators, as well as a diversity of foraging which includes fodder from the trees. Evaporative cooling is the primary mechanism by which cattle reduce their temperature. By providing shade, trees can reduce the energy needed for regulating body temperatures, this results in higher feed conversion and weight gain. Reduced evapotranspiration is particularly important in countries like the Mediterranean. Research in the US found cattle with shade reached a target weight 20 days earlier and in New Zealand *Pinus radiata* trees planted at 400, 200 and 100 stems/ha⁻¹ reduced wind run in open pasture by 78%, 45% and 44% respectively.

During cooler months, windbreaks and shelterbelts provide valuable protection from the wind for livestock, particularly for new-born lambs and freshly shorn sheep.

The productivity of these systems depends on how the positive interactions of the tree/crop interface are managed. Design considerations include type and

density of canopy, the root system, nitrogen fixing capabilities and the effect roots have on crops, (for instance Walnut roots inhibits other plant growth in its area). It also depends on how the trees are managed, thinning, pruning, weed control and type of livestock used.

Wider environmental benefits are improved air quality, reduced wind speed, reduced greenhouse gas emissions, ammonia capture, odour control from intensive production, better water quality as tree roots mop up excess nutrients, and better soil quality as agro forestry helps prevent erosion. The biodiversity benefits are also higher in agro forestry systems because they provide a harbour for natural predators. Trials have found lower populations of cereal aphids and bean weevils but more slugs. Hazel coppice at Wakelin's Agro Forestry Research Centre demonstrated the potential of trees to reduce disease burdens, for instance, the much slower passage of blight through its potato crop. The Wakelyns agro forestry centre produced 6 tons/ha of wheat in the 15 year rotation of pasture and cereals.

Stella Cubison from Garden Organic talked about using fruit trees in an agro forestry system. Grazed orchards should have standard trees. (When it comes to grazing underneath fruit trees, alpacas, goats, and deer are too damaging). It is best to establish them on new ground which has not been used for fruit before, for instance a (SW or W facing) grass clover ley on a frost free site or above the frost line. Shelter is important especially for plums and cherries. Asked if you can mix taller trees like willow in amongst the fruit trees for windbreaks she replied that it was possible but more information is needed as not all trees grow well together. Damsons for example do not like shade but soft fruit like gooseberries grow well under plums. Other good combinations are potatoes, hazel, Norway spruce (Christmas trees), mistletoe, pear orchards. Another combination is pears with guinea fowl and poultry.

Choose trees which have the same flowering period. Ideally one other pollinator is needed even if the trees are self fertilising. Bees pollinate different varieties but there are other practical issues to mixing varieties and it is best to put them in groups or rows starting with earliest first so harvesters can work their way through the field. Pollination depends on many factors not least the weather. Every third tree in every third row should be a pollinator species. Usual numbers for hives are 2.5 hives/ha but could be more for wide spacing of trees.

At Garden Organic they planted 2 year old trees which were mulched with green waste compost, straw or woven matt. Good fruits for windbreaks are blackthorn (sloe) damsons and crab apples. These would be planted in advance of the rest 3.5 – 4.5 m apart in staggered rows with 9m gaps between rows. There are points to be gained from the environmental stewardship scheme if using native species.

Stephen Briggs, organic farmer and Abacus consultant talked from the farmer's perspective describing his new silvo arable system on his rented farm in Suffolk. The soil consists of reclaimed deep peat very close to the sea level. Soil erosion is a big issue, which can be mitigated by agro forestry. As a

tenant, negotiation for a longer lease was the first step and being organic, a derogation was required to plant vigorous MM106 commercial rootstock. He aimed to create a low input, easy care system and decided to use apples in order to keep it simple. Two thirds of these are juicers and one third eaters. Many of the varieties are pest and disease resistant as well as being drought and scab tolerant.

Half the farm went into organic conversion in 2007 with the remainder starting conversion in 2009. The new Single Farm Payment scheme contributed to the cost of maiden trees which were planted the same year having been ordered one year in advance. In total 4500 trees were planted at 85trees/ha into a 3m pollen rich species strip in rows 27m apart, leaving a 24m working width between rows suitable for his arable equipment. (He is hoping for fruiting in year 2 and selling in year 3 with full production in year 5.)

He used a John Deere tractor with a GPS system to mark out the field. The lines were then set out by hand. There are 13 varieties - some of which are heritage - interspaced with modern varieties to help pollination. All the rows have been placed so that the SW wind goes up and down the lines. Although he is filling gaps in his hedges (with trees) he does not want a lot of wind breaks because wind helps pest and disease reduction.

It took 6.5 weeks to plant, stake, tie, guard and plastic mulch. Local school children helped to plant (which included a maths lesson) and will return to help at harvest time. Following winter wheat spring wheat was drilled between the tree rows in February. 12% of the land area has been lost to trees but he expects cereal yields in the remaining area to be the same as before.

Future challenges include disease, the possibility of low yields, how to irrigate crops, pruning to reduce crop competition, security – the farm is on the urban fringe - and market developments.

Beekeepers in small numbers are already engaged and he is hoping to attract more. They are keen to bring their bees once they discover that he has botanically diverse, organic, apple orchards.

Richard Irvine from the Wembworthy Centre presented the successes and potential of Forest Schools where woodlands are used as an excellent educational resource. **Martin Nesbitt from DEFRA** explained that DEFRA has a policy for forestry and a policy for agriculture but not a policy on agro forestry although acknowledging the need to develop a policy to incorporate carbon sequestration benefits. **Adrian Morley** discussed economic opportunities from woodlands and **Sarah Bourne from the Sylvanus Trust** talked of the funding opportunities via the RDPE. Participants spent the afternoon visiting the agro forestry trials set up at North Wyke in the 1980s.

Photos available.