

The potential for

Agroforestry, the integration of trees, crops and/or livestock on the same area of land, has been identified as a "win-win" multifunction land-use approach that balances the production of commodities (food, feed, fuel, fibre etc) with non-commodity outputs such as environmental protection and cultural and landscape amenities.

In Ireland there are several types of agroforestry practice which may have an application:-

1. SILVOARABLE AGROFORESTRY

Widely spaced trees intercropped with annual or perennial crops.

2. RIPARIAN BUFFER STRIPS

Strips of perennial vegetation (tree/shrub/grass) natural or planted between croplands/pastures and water sources such as streams, lakes, wetlands and ponds to protect water quality.

3. MULTIPURPOSE TREES

Fruit and other trees randomly or systematically planted in cropland or pasture for the purpose of providing fruit, fuelwood, fodder and timber, amongst other services, on farms.

4. SILVOPASTURE

Combining trees with forage and animal production. It comprises forest or woodland grazing and open forest trees.

Given the dominance of pastoral agriculture in Ireland it is obvious that silvopastoral systems will attract most interest. Research in Northern Ireland (carried out since 1989) has shown that wide-spaced protected hardwood trees such as ash, oak or sycamore can be established in permanent pasture and grazed with sheep initially (for about 7yrs) and subsequently cattle.

BENEFITS

Agroforestry systems are excellent examples of what we now call "Ecosystem Services Delivery" or more basically – "what your countryside can do for you!" agroforestry systems have both production and environmental benefits.

PRODUCTION BENEFITS

The tree component of the system can yield income depending on the tree species planted and the natural harvest or replanting cycle. For example fruit and nut trees can be grown over pasture and these will yield regularly when mature.



Young silvopastoral trial plantation with widely spaced ash, August 2012, Clonakilty Co. Cork. (photo: Jim McAdam)

AGROFORESTRY

in Ireland

by Professor Jim McAdam



Cutting grass for silage between rows of newly-planted ash, the Clonakilty trial. (photo Eugene Curran)

Wood as a fuel or for sawn timber or specialist wood production can yield a valuable return. In trials at AFBI Loughgall in Co. Armagh, 15 year old ash at 5m x 5m spacing give good yields of quality hurley butts, the wide spacing likely leading to good "basal sweep" and fast growth of "springy" wood.

The agricultural component is the main source of income in the early years of an establishing system. In the Loughgall trials referred to earlier, pasture growth was not reduced until 13 years after planting and full sheep production (when compared with open, grass fields in the same trial) was maintained. Thereafter pasture growth slowly declined but picked up when the trees were subsequently thinned for further hurley ash.

In silvoarable systems, where trees are grown in wide spaced rows to facilitate a crop (e.g. cereal production) yields of cereal are largely unaffected as the tree crop is regularly pruned and ploughing keeps the roots below the level of competition with the cereal roots. A further development being investigated in a new EU-funded Teagasc/AFBI project is planting an energy crop e.g. short rotation coppice- in between rows of selected, high-quality cherry trees.

ENVIRONMENTAL BENEFITS

Environmental benefits of agroforestry are well proven in Ireland. These include their positive impact on biodiversity, nutrient cycling, water quality and carbon sequestration.

Biodiversity is conserved and generally enhanced in agroforestry systems compared to conventional agricultural systems and in some cases, biodiversity levels are greater than in both agricultural and woodland systems. At a field scale, the presence of trees creates diversity in ecological factors such as radiation, humidity and temperature, and this creates different microhabitats for plant and animal species.

Nowadays, the destruction of some bird habitats due to the reduction of forests could be overcome to a certain extent if scattered trees were established between those smaller forests and planted at a minimal distance that allows those forests to be connected to one another. This is particularly important where there is a small forest area such as on the island of Ireland. In UK trials, agroforestry harboured greater bird diversity than forested areas and arthropod biodiversity including beetles, spiders and snails was higher in silvopastoral systems than in open grassland.

Nutrient Cycling and Water Quality

Agroforestry generally results in greater nutrient cycling than pure agricultural crops because the leached nutrients from the crop root layer can be captured by the deeper roots of the tree once the crops are not able to take them up due to excess of inputs or lack of crop growth.

Nitrate leaching into water bodies can cause enrichment problems in rivers and seas, and it is regulated in Europe by the Nitrates Directive (Council Directive 91/676/EEC). Computer models have suggested that agroforestry (compared to agriculture) can reduce nitrate leaching in north-west Europe.

Agroforestry has also been shown to decrease soil erosion losses and the associated loss of P. In soils with low P-soil retention, silvopastoral and alley cropping practices were found to reduce phosphorus losses in sandy soils.

Carbon Sequestration

Compared to treeless systems, agroforestry is able to sequester more carbon due to the tree component which is able to store carbon in wood and reach deeper soil layers and higher aerial height than arable crops.

ELIGIBILITY FOR SINGLE FARM PAYMENT (SFP)

In Northern Ireland under the Department of Agriculture and Rural Development's **Guide to Land Eligibility (2012)**

"Woodland can be considered eligible in the following cases:-

Agroforestry is having agriculture and trees growing on the same land unit. Where land is managed for agroforestry, the tree density is in excess of 50 trees/ha but the planting has taken place in such a way that the area of the field is utilised for agricultural activity in the years of tree establishment. These areas are eligible."

FARMER ENTHUSIASM

Crosby Cleland – a prominent Co. Down sheep farmer near Saintfield – is one of an increasing number of landowners enjoying the fruits of tree planting efforts. Hundreds of trees – mostly ash – dot two acres of less productive land on his farm, with the tree canopy providing shelter, shade and grazing for a large flock of ewes.

The potential for AGROFORESTRY in Ireland

Crosby is no stranger to success. He was awarded the prestigious "UK Sheep Farmer of the year" in 2008, while a recent Ulster Grassland Society visit to his farm viewed it as an example of top class grassland management.

"I planted this area of land in 1997 with help from a DARD Agroforestry grant, which at the time covered the cost of the trees' establishment" explained Crosby. "I now run 750 ewes on a total of 76 hectares of good grassland, but this was one spot you couldn't put to the plough; it was non-productive.

"The leaf canopy is now meeting above the grass swards, and the shading doesn't appear to have any adverse effect on growth. At the same time, the sheep can benefit from the shelter."

Tree shelter can help reduce pneumonia in cattle in winter and can help increase lamb survival rates.

"I must say that my own experience of agroforestry has not only given me great satisfaction, turning otherwise less productive land into profitable grazing, but it's also given me a real appreciation of the beauty of trees and their importance to our environment," says Crosby. "I would encourage farmers to look at their least profitable land areas with a view to creating small plantations of trees" (Farming Life)

FUTURE POTENTIAL FOR AGROFORESTRY IN IRELAND

In the British Isles the most promising new agroforestry systems are those where trees have a particularly high value, for example, orchard intercropping systems, or where the presence of trees provides animal welfare and marketing benefits, for example "woodland eggs" for free range hens roaming under trees. Woodland grazing systems are also being encouraged within existing forests to increase understorey diversity and the regeneration of some tree species. Parkland systems, involving widely spaced broad leaved trees in grazed pasture are also widely valued for their landscape, biodiversity and cultural value. Other systems where the trees, and crops and animals are less closely mixed include shelterbelts to provide wind protection to animals and crops, tree belts to capture ammonia from intensive pig and poultry units and riparian planting. The widespread traditional practice of surrounding fields with hedges including trees also results in an "Agroforestry landscape". Lastly, the increased planting of perennial crops (other than just grass) in the UK (e.g. Miscanthus,



16 year old Ash with grazed ryegrass at 250 trees /ha, AFBI Loughgall. (photo-Rodrigo Olave)

short rotation coppice) also provides farmers with more opportunities than a simple divide amongst annual arable crops, grasslands and perennial woodland systems. Agroforestry lends itself to organic systems of production. The range of cropping and livestock options possible to deliver multiple outputs with no inorganic fertiliser input is high. Silvopasture is also a welfare-friendly system. Stock move under the trees for shade and shelter, eat the foliage and use the trees to scratch and rest under. Most of the early work on silvopasture has been done using ash, a tree which responds remarkably well to being grown at wide spacing and whose late leaf emergence and early leaf drop suits a grass understory (see photo above). The palatable leaves are readily eaten in autumn. The promise of a valuable hurley ash crop make the system very attractive. It remains to be seen how Ash Dieback (caused by the fungal organism *Chalara fraxinea*) will affect this and other silvopastoral situations. Given that there will always be a demand for ash in Ireland, the wide-spacing of these trees and the stock cleaning up leaf litter in autumn, silvopasture may well create conditions to best alleviate the risk of Ash Dieback!

Professor Jim McAdam

Professor Jim McAdam is Head of the Crops Grassland and Ecology Branch in the Agri-Food and Biosciences Institute (AFBI) based at AFBI HQ at Newforge Lane, Belfast and has planted and supervised silvopastoral trials at AFBI's field station in Loughgall, Co Armagh.

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Case study of agro-forestry in the Republic of Ireland

In the Republic of Ireland, the Forest Service has been set the task of trying to increase, sustainably, the amount of land under tree cover. Since the late 1980's the land available for planting has been predominantly owned by farmers and the amount of land now planted by the private sector is nearly equivalent to that planted publicly which is currently being managed by Coillte Teoranta. A farmer will only plant if it suits his or her current situation and this is one of the main challenges that we face.

Agroforestry presents a great opportunity for an active farmer to get involved in forestry in a less abrupt way, compared to conventional planting, while still retaining a connection to the land. Our experience in agroforestry systems is quite limited to date. So in 2011 myself and a couple of colleagues, visited trials that Professor Jim McAdam had set up in Loughgall. He had planted ash trees 20 years ago and these were planted at 5 meter spacing. This is roughly 400 trees per hectare all were protected initially with tree guards and now had a plastic mesh protecting the trees against grazing sheep. The result is very impressive so much so that my colleagues and I decided that we should look into setting up a demonstration plot in the South. I eventually found a suitable piece of ground near Clonakilty in West Cork. The 2 hectare site is owned by a farmer, Mr Liam Beecinor, and he

was very enthusiastic and supportive in setting up a demonstration plot on his land. (Please see photos in pages 22 & 23) The agroforestry design is pretty much a reflection of the ash plots in Loughgall. The trees were planted in 2012 at 5 meter spacing. The plants are protected by 5-6 foot tree shelters.

The advantages of agroforestry are many but as a forester there are plenty of silvicultural advantages. Trees need to be thinned in order to maintain the health and vigour of a plantation. The fact that fewer trees are planted results in less pressure to thin. When the farmer does thin at around 12-15 years the trees can produce hurley butts and firewood. Firewood has become an increasingly valuable commodity. Ash provides great firewood and can be burned almost green and has a huge calorific value and this is increasingly reflected in the price.

Another important silvicultural priority is to ensure that the timber produced has small and few knots in the timber, essentially removing as many side branches and forks as possible. Pruning is usually done in the first six years, however as the trees in agroforestry are protected in a shelter this keeps the stems much cleaner meaning less management is needed. There are increasing numbers of deer in the country and this limits where you can

plant broadleaves, however with the tree shelters this will protect them against deer also.

The demonstration plot in West Cork has already proven to be a great learning curve and in a good way. Liam put sheep into the site and grazed it in early spring, but showing great initiative and skill he was able to get 2mm cuts of silage from the plantation without damaging the planted trees. This was possible due to the wide spacing facilitating machine access. He then let his sheep in again in the autumn.

The farmer will enjoy short to medium returns on his planted land through the thinnings, silage and animal husbandry. Agroforestry has real potential in Ireland and it is only a matter of finding what systems work best for us and how we can support them under the current funding mechanisms. There is huge interest in agroforestry throughout Europe and hopefully this will result in adequate funding. These are some of the challenges that we face and I am looking forward to jumping the hurdles.

by Eugene Curran,
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