

Opportunities for silvopastoral systems in Ireland

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SUMMARY

Following recent changes in EU agricultural support policy, the impending imposition of controls on fertilizer use, concerns over eutrophication, pollution and loss of biodiversity and the introduction of the Single Farm Payment (SFP), grassland farmers in Ireland are seeking alternative, diversified options for land use. It is proposed that silvopastoral systems, where widely spaced, protected trees are grown in grazed pasture in a regular or varied pattern is a sustainable, economically viable land use option. Although there are few examples of silvopastoral practice on the island of Ireland, experiments and trial plantations established since 1989 have given encouraging results. In Northern Ireland, protected Ash (*Fraxinus excelsior*) planted at 5 m x 5 m (400/ha) spacing in intensive sheep grazed pasture have created landscape, environmental, production, economic, social, animal welfare and sustainability benefits. Trees have been successfully managed along with the stock (sheep until year 11 then cattle), no reduction in livestock output was found until year 10 and enhanced biodiversity and animal welfare was measured. At year 15, hurley quality ash butts (126/ha) were sold for €1048/ha plus firewood. Grass production increased following removal of the trees. There are several demonstration sites of on-farm practice. In Ireland, a silvopastoral experiment was established in 2002 in ryegrass-dominated pasture grazed by beef cattle using *Quercus robur* in an alley design at Teagasc Johnstown Research Centre in Co. Wexford. The system has been successfully established and a unique silvopastoral resource is now available for

future research at a time of increasing interest in silvopastoral systems in the EU.

From a policy perspective, in N. Ireland silvopasture will be considered as forage area and eligible for SFP as long as agriculture remains the predominant land use. This, along with its suitability for alignment with the current generation of and proposed future agri-environment schemes, make silvopasture a sustainable, viable land use option for a range of diversified scenarios incorporating trees onto stock farms in both Northern and Southern Ireland.

INTRODUCTION

Over the past 50 years production of livestock from grassland in Ireland has intensified substantially (Connolly et al. 2002, Feehan 2003, Moss 1997) creating serious environmental problems such as reduced biodiversity and nutrient leakage into water courses. It is EU policy to reduce levels of output from grassland systems and to promote sustainable farming practices which attempt to address some of the damage caused by previous agricultural practices (Finn 2003). Such a policy is to be implemented through decreased levels of livestock output, tightened nutrient management on farms, increased tree cover to contribute to habitat heterogeneity, stabilisation of rural communities and enhancement of biodiversity through a more sustainable and lower input agriculture.

Tree cover in Northern Ireland (6%) is the lowest in Europe (mean 31%) (Cooper and McCann 2002) and in Ireland is approximately 10% (Bulfin 1999, Short et al. 2005).

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In Northern Ireland 78% of the area is in agriculture (1.1 x 10⁶ ha) and 70% of the farmed area is classified as Less Favoured Area (LFA). Agriculture is based on livestock production from grassland and approximately 2.7 x 10⁶ sheep and 1.7 x 10⁶ cattle graze 78% of the land area. Of this area 54% is improved grassland, 36% is improved and semi natural grassland and 5.5% is in arable production (Cooper and McCann 2002). There are approximately 30,000 farms, mean farm size is 35.5 ha and 92% of farms are either owned or owned and rented (DARD 2003). In the Republic of Ireland, there are 144,000 farms in a total farmed area of 4.4 x 10⁶ ha (63% of the area), mean farm size is 29.3 ha, most farms are cattle or sheep based and the proportion of LFA is 67%.

It is proposed that silvopastoral systems, where wide spaced, protected trees are planted onto grassland and managed as a multi-functional system to realise significant ecological, social and economic benefits, represents one option to introduce trees to the farmed landscape. The background to the evolution of practice and thinking and the current research on silvopastoral systems in Ireland will be reviewed to demonstrate the validity of this proposal.

SILVOPASTORAL SYSTEMS

Agroforestry is a collective name for land use practices where trees are combined with crops and/or animals on the same unit of land and where there are significant ecological or economic interactions between the tree and the agricultural components. Within this general concept, silvopastoral systems are seen as those where trees are grown in grazed pastures in a regular or varied pattern. Mosquera-Losada et al. (2005) and Hislop and Claridge (2000) have summarised the benefits of silvopasture in a European context. Sibbald (1999) and McAdam et al. (1999) have shown them to be a sustainable form of land management in the British Isles.

Sustainability

In a thorough review of the sustainability of silvopastoral systems at a European level,

Mosquera-Losada et al. (2005) edit and publish a series of papers to support the claim that silvopasture is sustainable at an environmental, economic and social level.

Environmental

Silvopasture creates habitat diversity through the spatial heterogeneity created above and below ground. The tree root systems have the potential to absorb nutrients escaping below the grass (Sinclair 1999, Lehmann et al. 1997, Short et al. 2005). This could be of particular value in a riparian situation. Gordon et al. (2005) have shown that silvopastoral systems can have a positive effect on climate change as they have the potential to sequester more carbon than grassland ecosystems.

Research on silvopastoral systems to date has concentrated on quantifying production and fewer resources have been directed towards the investigation of ecological interaction (Crowe and McAdam 1999, McAdam 2000). In 12 year old silvopastoral systems (at the Agri-Food and Biosciences Institute (AFBI) field station at Loughgall, Co Armagh, ash (*Fraxinus excelsior*) were planted at 400 stems/ha as part of a UK National Network Experiment (Sibbald et al. 2001). The impact of the system on aspects of biodiversity (carabid beetles, spiders, birds and flora) was investigated when trees had been established for up to 8 years. More spiders were collected from silvopasture than either pasture or woodland treatments and within the agroforestry, at the higher density of planting (400 stems/ha vs 100/stems ha) (Johnston 1996). Carabid beetles were more numerous and from a wider range of species in the silvopasture than open pasture (Cuthbertson and McAdam 1996; Whiteside et al. 1998). Numbers of juvenile earthworms were higher in silvopasture than grassland (Whiteside et al., 1998). Toal and McAdam (1995) found that, generally, significantly more birds were recorded on lowland and upland silvopasture in summer and winter than either open pasture or woodland. In establishing silvopasture at Loughgall, plant diversity was greater (but not significantly so) near trees than in open pasture (McAdam 1996; McAdam and Hoppé 1996) but in a mature, 35 year old poplar stand at 8m x 8m spacings, Crowe and

McAdam (1992) found that plant diversity was significantly greater than in the open sward.

Landscape

Silvopasture represents a way to introduce trees to the farmed landscape and still allow agriculture to be the primary land use. This makes systems more acceptable to farmers. Trees can be introduced at a variety of scale, species, spacing and planting years as the concept of clear felling or regular planting pattern need not apply. The visual impact of animals grazing through trees creates an attractive landscape to visitors to the countryside.

Production, economic

Silvopasture is a multifunctional system which can deliver a range of economic benefits and ecosystem services (Brann, 1988, Mosquera-Losada et al. 2005). In trials in N. Ireland (McAdam 2005) ash trees at 400 stems/ha were successfully managed with stock (sheep until year 11, then cattle) and no reduction in livestock output was found until year 10. Based on outputs from the system Thomas et al., (2000) and McAdam et al. (1999) calculated that even with no subsidy support, lowland silvopasture was more profitable (by €20 ha⁻¹) than grassland. At year 15 hurley quality ash butts (126 ha⁻¹) were sold for €1048 ha⁻¹ plus firewood. Hence systems have the potential to support cultural, rural industry. Grass production increased following removal of the trees and this allowed more stock to be introduced. Silvopastoral systems have the potential for on-farm timber production and non-timber tree based products such as fruit, nuts and foliage.

The economic value of the ecosystem services delivered by silvopasture is recognised in their acceptance as a habitat for inclusion in agri-environment schemes.

Animal welfare

In trials in Scotland and Northern Ireland (reported in Hislop and Claridge 2000) it was found that sheep spent more time in the shade and shelter of trees on hot sunny days and cold windy days than

they did in the open. This amelioration of conditions could be considered to be a positive welfare benefit.

SILVOPASTURE IN IRELAND

In Northern Ireland, silvopastoral trials commenced in 1989 at the AFBI Agroforestry Unit at Loughall, Co. Armagh. Here ash and sycamore were planted as part of a UK National Network Silvopastoral Experiment (NNE) (*Acer pseudoplatanus*) (Sibbald et al. 2001). Further mixtures of trees were planted in 1995 on the same site and a silvoarable area where wide rows of poplar were planted in spring barley was established in 1997 with a view to eventually creating a silvopastoral system. Over the 1990s four other on-farm sites were established. All of this work showed that silvopastoral systems could be successfully established and integrated with grassland farming systems and deliver the types of environmental, production, welfare and sustainability benefits mentioned above.

Recent and ongoing research into the production of fast growing trees by root-pruning techniques (Hoppé et al. in prep) has implications for reducing tree protection costs in the establishment of silvopastoral systems.

In the Republic of Ireland Short (in Short et al. 2005) established a silvopastoral experiment at Johnstown Castle in County Wexford (Teagasc Research Station) in 2002 with oak (*Quercus robur*) in an alley design and grazed by cattle. Trees were successfully established and cattle managed in the system. The establishment of an alley silvopastoral system (in this case with electric fencing) into existing pasture increased ground beetle abundance relative to a plantation being introduced. The study also showed that there may be potential for silvopastoral systems to be used as a tool in the prevention of non-point source pollution from overland flow originating from pasture (Short et al. 2005).

POLICY IMPLICATIONS

Where agroforestry aligns with EU policy is poorly defined. Silvopastoral systems can contribute to

reduction of livestock grazing pressure, improve nutrient management and ameliorate of animal living conditions. If they are introduced to intensive or semi-intensive farming systems, they align closely with current EU policy for intensively managed pasturelands which will be decoupled from subsidies for production to a more area-based system of payment with strict environmental and other cross-compliance measures attached.

In a more global context, silvopastoralism can be a mechanism to create land use systems with levels of carbon sequestration which are higher than those from pastureland and which can buffer the more adverse effects of climate change (Mosquera-Losada, McAdam and Rigueiro-Rodriguez 2005). Agricultural officials in Northern Ireland are regarding silvopastoralism systems as eligible forage area for Single Farm Payment (SFP) as long as agriculture remains the primary land use. Within the current Rural Development Regulation (EC 2004) support is provided for agroforestry.

OPPORTUNITIES FOR INTEGRATION

Under the arrangements set in place following decoupling with the SFP, the agricultural industry might develop in two groups of agricultural production: a 'competitive pillar' – a relatively intensive agriculture industry competing on world markets in a strictly business-orientated method of raw material/food production; a 're-creational pillar' – conservation, amenity, recreation and environment (CARE goods) – state subsidy aimed at producing CARE goods through funding to farmers/landowners. The 'bridge' between these two pillars is rural development policy, which can provide benefits in both areas. The integration of trees onto farms and into livestock systems (silvopasture) at a range of scales and levels offers a strategic policy option to realize some of these goals.

Agriculture has come through a series of crises recently and farm incomes are currently severely depressed. In difficult times farmers generally concentrate on short-term goals and needs, longer term needs being much less attractive. This tends to severely limit the opportunity for innovative long-

term planning. The needs which can be justifiably met by planting trees tend to be longer term. However, currently farmers are, by necessity, concentrating on the short- to medium-term goals. Although this fact has always been recognized as a major drawback to farmer investment in woodland-related enterprises, it would appear that this limitation is particularly strong at present. The position of trees in silvopasture becomes even more difficult as it is viewed as an unproven technology in a range of woodland options which are already considered as limited in achieving short- to medium-term goals. Speculating on the potential for agroforestry planting in Northern Ireland, given the current state of the industry, it is likely that silvopasture should not attempt to substitute for current or proposed woodland planting (McAdam and Crowe 2002) but be targeted to those farmers and landowners included in the recreational pillar (of the CAP) category:- all farmers interested in agri-environment measures, and increasing levels of biodiversity in grassland; conservation bodies and community groups; farmers with specific nutrient management problems e.g. riverside and general bioremediation scenarios and the organic sector (McAdam 2005).

The challenge remains to develop systems which yield a short to medium term product from the woodland component without excessively compromising the agricultural component of the system. The opportunity to grow crops for energy and fibre should be considered within this scenario. The markets for non-timber products from trees such as fruit, foliage, cosmetic, medicinal may represent, high value areas for niche market business development. While these are difficult to generalise, they do offer innovative farmers the opportunity to diversify their enterprise base and create sustainable grassland-based options which may help their future economic viability.

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