



## Research and Development Protocol for Agroforestry for Ruminants in Northern Ireland, UK

<b>Project name</b>	AGFORWARD (613520)
<b>Work-package</b>	5: Agroforestry for Livestock farmers
<b>Specific group</b>	Agroforestry for Ruminants in Northern Ireland UK
<b>Milestone</b>	Milestone 22 (5.3) Part of experimental protocol for WP5
<b>Date of report</b>	1 April 2015
<b>Authors</b>	Jim Mc Adam
<b>Contact</b>	<a href="mailto:Jim.mcadam@afbini.gov.uk">Jim.mcadam@afbini.gov.uk</a>
<b>Approved</b>	20 April 2015 John E Hermansen

### Contents

1	Context.....	2
2	Background .....	2
3	Synthesising knowledge from best practice and previous network trials.....	2
4	Acknowledgements.....	4
5	References .....	4
6	Annex A: Example reports to be synthesised .....	5



AGFORWARD (Grant Agreement N° 613520) is co-funded by the European Commission, Directorate General for Research & Innovation, within the 7th Framework Programme of RTD. The views and opinions expressed in this report are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.

## **1 Context**

The AGFORWARD research project (January 2014-December 2017), funded by the European Commission, is promoting agroforestry practices in Europe that will advance sustainable rural development. The project has four objectives:

1. to understand the context and extent of agroforestry in Europe,
2. to identify, develop and field-test innovations (through participatory research) to improve the benefits and viability of agroforestry systems in Europe,
3. to evaluate innovative agroforestry designs and practices at a field-, farm- and landscape scale, and
4. to promote the wider adoption of appropriate agroforestry systems in Europe through policy development and dissemination.

This report contributes to the second objective. It contributes to the initial research and development protocol ([Milestone MS22 \(5.3\)](#)) for the participative research and development network focused on the use of agroforestry in ruminant systems.

## **2 Background**

Integration of trees with crops and/or livestock production (agroforestry) has been identified as a sustainable way to increase the productivity of land and to provide a number of ecosystem services and environmental benefits compared to disaggregated agricultural and woodland systems (Jose, 2009). Agroforestry systems are carried out by only a small percentage of Northern Ireland farmers. Lack of uptake has been due to the need for more information, especially on the way to establish and manage a profitable agroforestry system as highlighted in an AGFORWARD stakeholders meeting for the 'Grazed Orchards in Northern Ireland' held on 4 December 2014 (McAdam, 2014).

There are about 1.9 million sheep in Northern Ireland. These are managed by about 20,000 beef and sheep farmers (no distinction is made) and the average farm size is 35.5 ha. More work is needed to find which of these might be suitable for silvopastoral systems, but there is a large potential. This report describes the planned specific areas of research, information and data collection, and demonstration activities within work-package 5, which will be developed in the coming months. They cover closing the knowledge gap; planned experiments; and other trials and demonstration activities.

## **3 Synthesising knowledge from best practice and previous network trials**

### **3.1 Objective**

The objective is to compile and analyse unpublished experimental data sets which will assist in the design and management of an agroforestry systems for ruminant production. The aim is to produce and communicate 'best practice' guidelines on integrating trees in grazing systems, e.g. with regards to tree species, tree density, animal density and design of the system.

### **3.2 Materials and methods**

Data, information and experiences will be gathered from the research projects outlined below and summarised in Table 1.

Table 1. Collection of data, information and experience

Step	Activity	Time
Data review of previous work	Synthesising knowledge from best practice and previous network trials. AFBI will review data from <ol style="list-style-type: none"> <li>1. EU FP project ALWAYS</li> <li>2. A UK National Network Silvopastoral Experiment</li> <li>3. PhD projects</li> <li>4. MSc projects</li> <li>5. NNE sites across the UK - Report</li> </ol>	Until end May 2016
Data review running experiment	AFBI to contribute unpublished historical data from its site at Loughgall and an on-farm site with emphasis on <ol style="list-style-type: none"> <li>1. Animal behaviour in silvopasture</li> <li>2. Pasture production in silvopasture and open pasture</li> <li>3. Impact of silvopasture on sheep carcass composition growth rate and wool production</li> </ol>	Until May 2016
Experiences from trial and demonstration	Tree varieties for sheep, AFBI will provide information on trials where different clones of cherry and sycamore are being compared.	Until May 2016
WP5 Skype meeting	Meeting with partners from INRA, IDELE , ORC and LBI	May 2016
WP 5 workshop	Workshop with partners from INRA, IDELE , ORC and LBI to compile collected knowledge from United Kingdom, Netherlands and France	May 2016 (General Assembly)
Publication	Producing report	August 2016

### 3.3 Overview of projects to revisit

#### 3.3.1. Synthesising knowledge – Activity 1

Knowledge will be synthesised from the following projects:

- a. The EU FP Project Always
- b. A UK National Network Silvopastoral Experiment. Many of the results were never published but they contain valuable lessons on ruminant livestock grazing in silvopasture in the UK. This will be particularly useful in preparing a knowledge transfer strategy for livestock in silvopasture.
- c. The Agroforestry Forum Newsletter, a quarterly popular journal reporting sites across the network.
- d. PhD projects were carried out in AFBI/Queens University Belfast on agroforestry in the 1990s. These were never published and there are very many valuable lessons to contribute to our knowledge on livestock in silvopasture. These were based on experimental results from the Loughgall site (Biodiversity-Lisa Whiteside); a site established at Johnstown Castle, Ireland and cattle grazed (Ian Short) ; research on grass and sheep performance in a mature wide-spaced poplar site, N Ireland (Richard Crowe).
- e. MSc projects carried out on various aspects of the Loughgall site. These have remained unpublished and their key messages remain unpublished.
- f. Visit the extant NNE sites at Bangor, N Wales and Glensaugh Hill sheep farm, Aberdeen. Assess current state and draw any conclusions relevant to current grazing systems.

The key references are listed in Annex A.

### 3.3.2 Productivity of silvopasture- Activity 4

AFBI will contribute historic data from its Loughgall site and some from an on-farm site. Particular emphasis will be placed on:

- a. studies of animal behaviour in silvopasture carried out in the 1990s.
- b. Pasture production in silvopasture and open pasture (using grazing exclusion cages)
- c. Impact of silvopasture on sheep carcass composition, growth rate and wool production.

These are listed in the references at the end.

### 3.3.3 Trial/Demonstration experiment on tree varieties for sheep - Activity 5

AFBI will provide information on its trials where different clones of cherry and sycamore are being compared.



## 4 Acknowledgements

The AGFORWARD project (Grant Agreement N° 613520) is co-funded by the European Commission, Directorate General for Research & Innovation, within the 7th Framework Programme of RTD, Theme 2 - Biotechnologies, Agriculture & Food. The views and opinions expressed in this report are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.

## 5 References

McAdam J (2014). Initial Stakeholder Meeting Report: Grazed orchards in Northern Ireland, UK. 4 December 2014. 9 pp. Available online: <http://www.agforward.eu/index.php/en/grazed-orchards-in-northern-ireland-uk.html>

## 6 Annex A: Example reports to be synthesised

- Anon, (1998). Forest entomologist group – annual meeting 1998. Personnel communication.
- Cooney, S. (1995). The prevention of grazing damage by sheep in silvopastoral agroforestry systems. Unpublished MSc Diploma thesis. The Queen’s University of Belfast.
- Crowe, S.R. (1993). The response of *Lolium perenne* and *Holcus lanatus* to shading in relation to a silvopastoral agroforestry system. Unpublished PhD thesis. The Queen’s University of Belfast.
- Crowe, S.R., McAdam J.H. (1992). Some effects of grazing management on a mixed species sward poplar-sheep agroforestry system. General Meeting of the European Grassland Federation 14<sup>th</sup> General Meeting: 655-656.
- Crowe, S.R., McAdam J.H. (1999). Silvopastoral practice on farm agroforestry in Northern Ireland. *Scottish Forestry* 53(1): 33-36.
- Cuthbertson, A.G.S., McAdam, J.H. (2005). Planting trees increases carabid beetle diversity on Northern Irish farmland. *Biodiversity News*, Issue 31 April page 18
- Cuthbertson, A. (1996). The effect of tree density and species on Carabid beetles in a range of pasture – tree agroforestry systems on a lowland site. Unpublished BSc (Hons) degree thesis. The Queen’s University of Belfast.
- Deconinck, J. (1997). Northern Ireland Agroforestry. Tree form analysis of the UK silvopastoral sites and tree maintenance: cost and manpower. Unpublished Report. Department of Agriculture Northern Ireland (DANI): Ecology and Land Use Section
- Flexen, M., McAdam, J.H., Anderson, D. (2014). A survey of attitudes of farmers in Northern Ireland to agri-environment schemes and woodland creation. DARD Report
- Gazeau, S., Pont, F. (1997). An assessment of farmer’s attitudes to agroforestry on sheep and cereal farms in Northern Ireland - Report. Department of Agriculture, Belfast
- Healy, M. (1997). The grazing and resting behaviour of sheep in relation to planting density in agroforestry systems. Unpublished MSc Diploma thesis. The Queen’s University of Belfast.
- Hoppé, G.M., McAdam, J.H. (1997). The effect of tree spacing on pasture production and botanical composition in a silvopastoral system. *Irish Journal of Agricultural and Food Research*, 36, p 133.
- Hoppé, G.M., Crowe, S.R., McAdam, J.H. (1999) Changes in pasture composition in establishing and mature silvopastoral systems. *Grasslands and Woody Plants in Europe* pp 177 - 180
- Hoppé, G.M., Sibbald, A.R., McAdam, J.H., Eason, W., Hislop, M. and Teklehaimanot, Z. (1996). The UK Silvopastoral Agroforestry Network Experiment - A co-ordinated approach. *European Society of Agronomy* Vol. 2, pp 630-631.
- Johnston, R.J. (1996). The effect of tree density and species on spiders in a range of lowland pasture – tree agroforestry systems. Unpublished BSc (Hons) thesis. The Queen’s University of Belfast.
- Lyttle, G. (2000). Root growth in agroforestry systems. Unpublished BSc (Hons) thesis. The Queen’s University of Belfast.
- Mc Alerney, P, (2000). The potential of trees to enhance the rural economy. Unpublished MSc Diploma thesis. The Queen’s University of Belfast.
- Mc Guckin, R. (2000). The response of pasture to grazing agroforestry systems. Unpublished BSc (Hons) Thesis. The Queen’s University of Belfast.
- Mc Keown, E. M. (1998). The effect of tree species on spiders in a low land grazed grassland. Unpublished BSc (Hons) Thesis. The Queen’s University of Belfast.

- Mc Murray, C., (2000). Species diversity in agroforestry. Unpublished NISTRO project report in cooperation with Department of Agriculture and Rural Development (DARD) and The Queen's University of Belfast.
- McAdam, J.H. (1991). An evaluation of tree protection methods against Scottish Blackface sheep in an upland agroforestry system. *Forest Ecology and Management* 45: 119-125.
- McAdam, J.H. (1996). Vegetation change and management in temperate agroforestry systems. *Aspects of Applied Biology* 44, Vegetation management in forestry, amenity and conservation areas: Managing for multiple objectives. 95-100.
- McAdam, J.H. (2005). The potential for agroforestry in the Falkland Islands. Pp406-407
- McAdam, J.H. (2005). Silvopastoralism as a land use option for sustainable development on grassland farms in Northern Ireland. pp 404-405
- McAdam, J.H. (2013). The Potential for Agroforestry in Ireland. Personal Communication
- McAdam, J.H. and Hoppé, G.M. (1997). Sheep production and performance from a lowland silvopastoral system. *Irish Journal of Agricultural and Food Research*, 36, p 119.
- McAdam, J.H., McEvoy, P.M. (2008). The potential for silvopastoralism to enhance biodiversity on grassland farms in Ireland. *Agroforestry in Europe: Current Status and Future Prospect*. Springer Science and |Business media B.V. 2009, 17: 343-356
- McAdam, J.H. (19\*\*). ALWAYS Project Final Report. The influence of site, sward type, tree spacing and tree species on the output of agroforestry systems.
- McAdam, J.H., Hoppe, G.M., Toal, L., Whiteside, T. (1999). The use of wide-spaced trees to enhance faunal diversity in managed grasslands. *Grassland Science in Europe - European Grassland Federation Symposium*, 4:293-296.
- McAdam, J.H., Sibbald, A.R., Teklhaimanot, Z., Eason, E.R. (2007). Developing silvopastoral systems and their effects on diversity of fauna. *Agroforestry Systems* 70: 81-89.
- McAdam, J.H., Thomas, T.H., Willis, R.W. (1999). The economics of agroforestry systems in the UK and their future prospects. *Scottish Forestry* 53(1): 37-41.
- McEvoy, P.M., McAdam, J.H. (2002). Coppice management and biodiversity enhancement. An investigation in Glenarm Woods, Co. Antrim. Tearmann. *Irish Journal of Agri-environmental Research* 2: 39-52.
- McEvoy, P.M., McAdam, J.H. (2005). Woodland grazing in Northern Ireland: effects on botanical diversity and tree regeneration. In: Mosquera-Losada, M.R., McAdam, J.H., Rigueiro-Rodriguez, A. (Eds) In: *Silvopastoralism and Sustainable Land Management*. Wallingford, UK: CABI.
- McEvoy, P.M., McAdam, J.H. (2008). Sheep grazing in young oak *Quercus* spp. and ash *Fraxinus excelsior* plantations: vegetation control, seasonality and tree damage. *Agroforestry Systems* 74: 199-211.
- Murphy, J. (2000). Agroforestry: The effect of tree spacing on lichen growth. Unpublished Nuffield Science Bursary Scheme dissertation carried out at Department of Agriculture and Rural Development (DARD) and The Queen's University of Belfast.
- Murray, M.T. (1999). A study of ground beetle (*Coleopter: Carabidae*) biodiversity on a lowland silvopastoral site, Co. Armagh. Unpublished B.Agr (Hons) thesis. The Queen's University of Belfast.
- O'Sullivan-Breen, M. (1999). The effect of some agricultural practices on ground beetle diversity. Unpublished B.Agr (Hons) thesis. The Queen's University of Belfast.

- Short, I., Culleton, N., Douglas, G., McAdam, J.H., (2005). Silvopastoral Agroforestry. International Grassland Congress Poster.
- Short, I., McAdam, J.H., Culleton, N., Douglas, G. (2004). Establishment of a bovine (cattle)/*Quercus* silvopastoral experiment in lowland Ireland. In: Mosquera-Losada, M.R., McAdam, J.H., Rigueiro-Rodriguez, A. (Eds) In: Silvopastoralism and Sustainable Land Management. 197-199. Wallingford, UK: CABI.
- Sibbald, A.R., Eason, W.R., McAdam, J.H., Hislop A.M. (2001). The establishment phase of a silvopastoral national network experiment in the UK. *Agroforestry Systems* 39: 39-53
- Toal, L., McAdam, J.H. (1993). Bird populations in establishing silvopastoral systems on a lowland and upland site. Xxx pp 19-21. Agricultural Botany Research Division DANI
- Toal, L., McAdam, J.H. (1995). Avifauna in establishing silvopastoral systems in Northern Ireland. DANI, Personnel communication.
- Warnock, J. (1995). An investigation of soil moisture profiles under various agroforestry treatments using the neutron probe assessment method. Unpublished MSc Diploma thesis. The Queen's University of Belfast.
- Warrington, I. (2000). The response of pasture to grazing in silvopastoral agroforestry systems. Unpublished BSc (Hons) thesis. The Queen's University of Belfast.
- Whiteside, T., (1998). Canopy structure and carabid diversity in wide-spaced broad leaved trees. Unpublished BSc (Hons) thesis. The Queen's University of Belfast.
- Wilson, S., (2000). The effect of grazing on tree and pasture performance in silvopastoral system. Unpublished BSc (Hons) thesis. The Queen's University of Belfast.