



Synthesis of the Research and Development Protocols related to Agroforestry for Livestock Systems

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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. Although the field-testing of innovations is occurring in four agroforestry sectors, this particular report focuses on agroforestry for livestock systems which is the focus of work-package 5. This report, [Milestone 22 \(5.3\)](#) summarises nine research and development protocols developed within the work-package. Fuller details of each protocol can be found on the AGFORWARD website using the references at the end of this report.

2 Background

Work-package 5 focuses on the application of agroforestry in livestock systems across three sectors: i) poultry, ii) pigs, and iii) ruminants. The work-package will seek to identify innovations that address the bottlenecks identified by livestock farmers, with the aim of improving productivity and profitability whilst enhancing the environment.

Based on the outcome of a number of workshops in the established networks ([Milestone 20](#)), the most relevant agroforestry innovations were identified in January 2015 ([Milestone 21](#); Hermansen et al. 2015). Three types of work were identified: desk work, comparative classical experiments, and case studies and demonstration activities. The desk work included the need to identify best practice in relation to design of agroforestry livestock systems, and the need to expand and improve an existing database describing the nutritive value of types of tree fodder.

3 Synthesise “best practice” knowledge and expand feed database

3.1 Best practice

The objective is to identify and communicate ‘best practice’ in relation to the design and management of agroforestry for free-range poultry production, free-range pig production and ruminant systems. Guidelines on integrating trees and/or shrubs in livestock production systems will be produced, e.g. with regards to tree species, tree density, animal density, management and design of the system. Data, information, and experiences gathered at commercial farms and research plots will be combined with theoretical knowledge using the steps described in Table 1.

The Organic Research Centre (ORC) in the UK will be heading the activities regarding poultry with contributions from Louis Bolk Institute (LBI) in the Netherlands, and Aarhus University in Denmark. Aarhus University will be heading the activities regarding pigs with contributions from the University of Santiago de Compostela (USC) in Spain USC and Veneto Agricoltura (VEN) in Italy. INRA in France

will be heading the activities regarding ruminants with contributions from the Agrifood and Biosciences Institute (AFBI) in Northern Ireland, the Louis Bolk Institute, and the Organic Research Centre.

Table 1. Collection of data, information and experience for agroforestry systems with poultry, pig and ruminant systems

Step	Activity	Time
Literature review	Literature from the partner countries and elsewhere will be reviewed. Existing knowledge will be analysed and discussed.	Until May 2016
Interviews	Interviews with livestock producers, consultants and forestry/horticulture experts will be carried out	Jan-April 2016
WP5 skype meeting	Meeting with partners to exchange progress and prepare workshop	May 2016
WP 5 workshop	Workshop with partners to compile collected knowledge	May 2016 (General Assembly)
Publication	Producing report	August 2016

4 Feed database

LBI has an existing database regarding feed values of tree components. This database will be expanded in terms of tree species and feed quality characteristics with input from all partners. Based on the database farmer friendly fact sheets will be produced lead by LBI (Luske et al., 2015).

5 Poultry: planned experiments and demonstration activities

In the UK, the Organic Research Centre will investigate shade tolerant sward mixtures that could contribute towards the nutrition and health of the birds. This will be done in a comparative study with different three species (native broadleaves and conifers) and different types of understory vegetation. Key parameters to be investigated are plant biomass and biodiversity as well as invertebrate biodiversity (Smith, 2015a).

In The Netherlands, Louis Bolk Institute will collect and further explore data from an existing network 'Trees for chickens' and evaluate the advantages and disadvantages of using fruit trees, willow or miscanthus in poultry areas in terms of labour, tree damage by chickens, and profitability. The results will be a report comparing three tree types of trees in a format suitable for farmers (Bestman 2015). LBI will further investigate the opportunities and barriers to fruit farmers, tree nurseries, and poultry famers working together (Bestman, 2015).

6 Pigs: planned experiments and demonstration activities

In Spain, University of Santiago de Compostela will perform a comparative study of the growth and feeding value for pigs of different clones of *Morus alba* and *Morus nigra* grown at different sites in Galicia with different weather conditions (Fernández Lorenzo et al. 2015).

In Denmark, Aarhus University will conduct a comparative experiment to study the impact of including poplar in lactation paddocks for sows and the importance of layout of the paddocks on

nitrate leaching from the paddocks. In addition sow behaviour as well as damage on trees will be investigated (Kongsted and Hermansen 2015).

In Italy, Veneto Agricoltura will demonstrate different methods for protecting trees varying in species and age, and the corresponding biomass growth and animal behaviour (Bondesan 2015).

7 Ruminants: planned experiments and demonstration activities

In France, INRA will determine the nutritive value of trees and scrubs for ruminants through detailed chemical, in-vitro, and in situ methods. Approximately 20 species will be included. Further, a comparative study will study the spatial organization of trees in a dairy system. The three types of trees being studied are: high stem trees, pollards, and coppiced trees. Labour and other costs, animal behaviour, understory production, nutrient deposition and tree production will be quantified (Novak et al. 2015). Also in France, IDELE will monitor biomass production, quality and flora composition in swards with or without trees (Novak et al. 2015).

In UK, the Organic Research Centre will undertake an experiment comparing system productivity and pasture management in systems with non-lactating cattle grazing in between alleys of short rotation coppice (willow and/or alder) and including two swards mixtures. Focus will be on biomass production and biodiversity of swards, animal behaviour and the nutritive value of tree components (Smith, 2015b).

In the Netherlands, Louis Bolk Institute will work in participation with selected farmers who are managing agroforestry with ruminants to optimize the system by analysing the present situation, suggesting adaptations, and monitoring the impacts of management change. This includes the monitoring of farm inputs and outputs of tree compartments to allow economic evaluation (Luske et al. 2015).

In Northern Ireland, AFBI will review existing experimental research, where the results have not been fully interpreted to investigate the impact of trees on pasture production, sheep behaviour, growth and wool production. The existing research include a series of on-farm experiments as well as the long-term experiments at the research station at Loughgall (McAdam 2015).

8 Conclusion

Through the research and demonstration activities we will gain knowledge on how the trees can support the welfare and nutritional requirements of livestock, what species of trees that are most relevant to different types of livestock, and how to design agroforestry systems in terms of production, the environment and socio-economic considerations.

9 Acknowledgements

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