The Organic Research Centre

UK Agroforestry Network Group Meeting

Management and Maintenance of Silvopasture Systems

Tuesday 2nd July 2019

Claydon Estate, Buckinghamshire

ORGANIC RESEARCH CENTRE ELM FARM

WOODLAND TRUST

AFINET AGROFORESTRY INNOVATION NETWORKS

ABACUS AGRICULTURE

Farm Woodland Forum Farming with Trees

AGROFORESTRY INNOVATION NETWORKS

Supporting innovation in agroforestry by enhancing knowledge transfer between farmers, foresters, researchers and advisors

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Trees and livestock group

1. Andrew Barbour, Pitlochry, May 17 – why plant trees?
2. Tim Downes, Jan 2018 - why plant trees?
3. David Rose, July 18 – how to design your system
4. Dartington, Feb 19 – how to implement your design
5. Claydon, July 19 – management and maintenance

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Agenda

10.00: Welcome and introductions

10.10: Overview of silvopastoral systems in the UK, including Key findings from the ash Silvopasture trial at Loughall (Jo Smith)

10.30: Discussion around experiences of planting an agroforestry system in the UK (Richard Gantlett, Stephen Briggs and others)

11.00: UK Agroforestry Network – what we have achieved and where next? (Sally Westaway and Ian Knight)

11.30: Tour of the Claydon trial and discussion around management led by Steve Newman with discussions chaired by Stephen Briggs

13.00: Lunch and depart

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Silvopasture in the UK

Jo Smith

Principal Researcher, Agroforestry Programme

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"both ecological and economic interactions between the trees and the other components of the system" **Lundgren, 1982**

Traditional silvopasture

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Riparian buffers

Trees for environmental protection

Shelter belts

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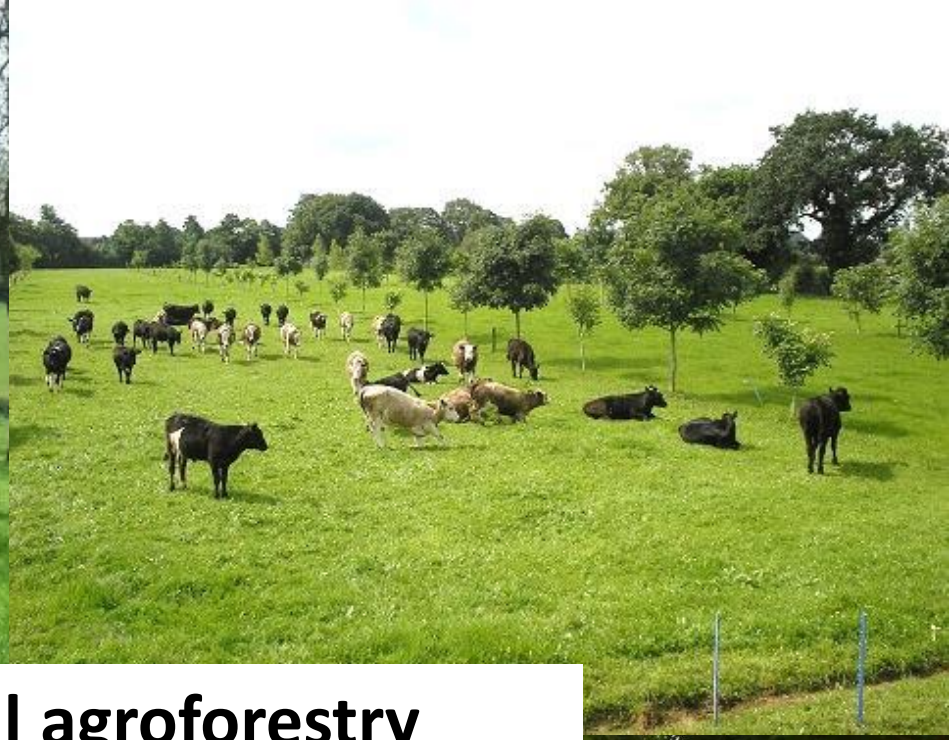
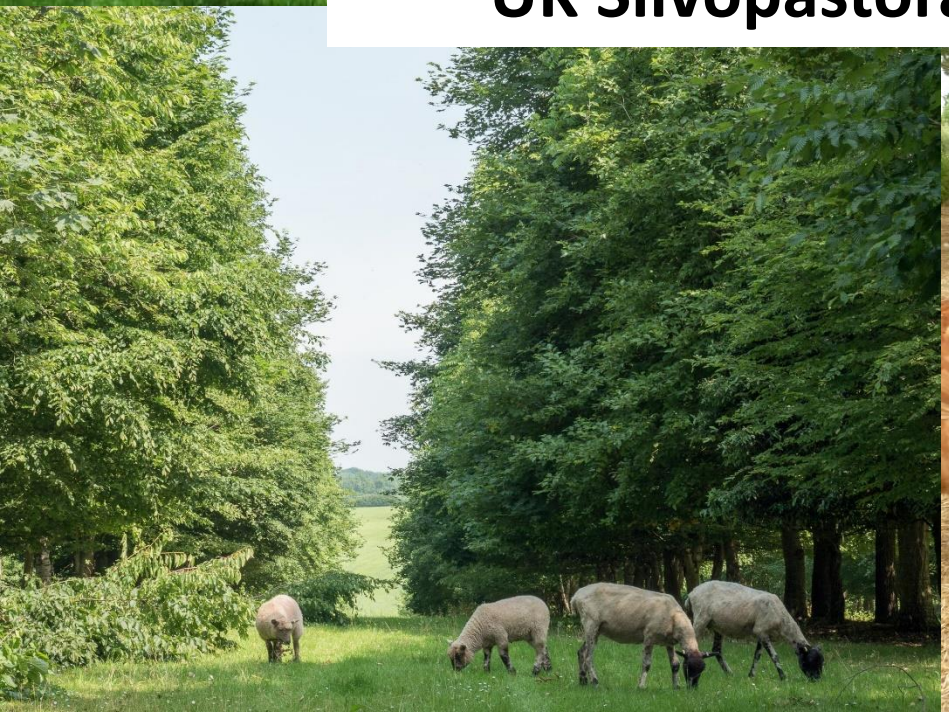
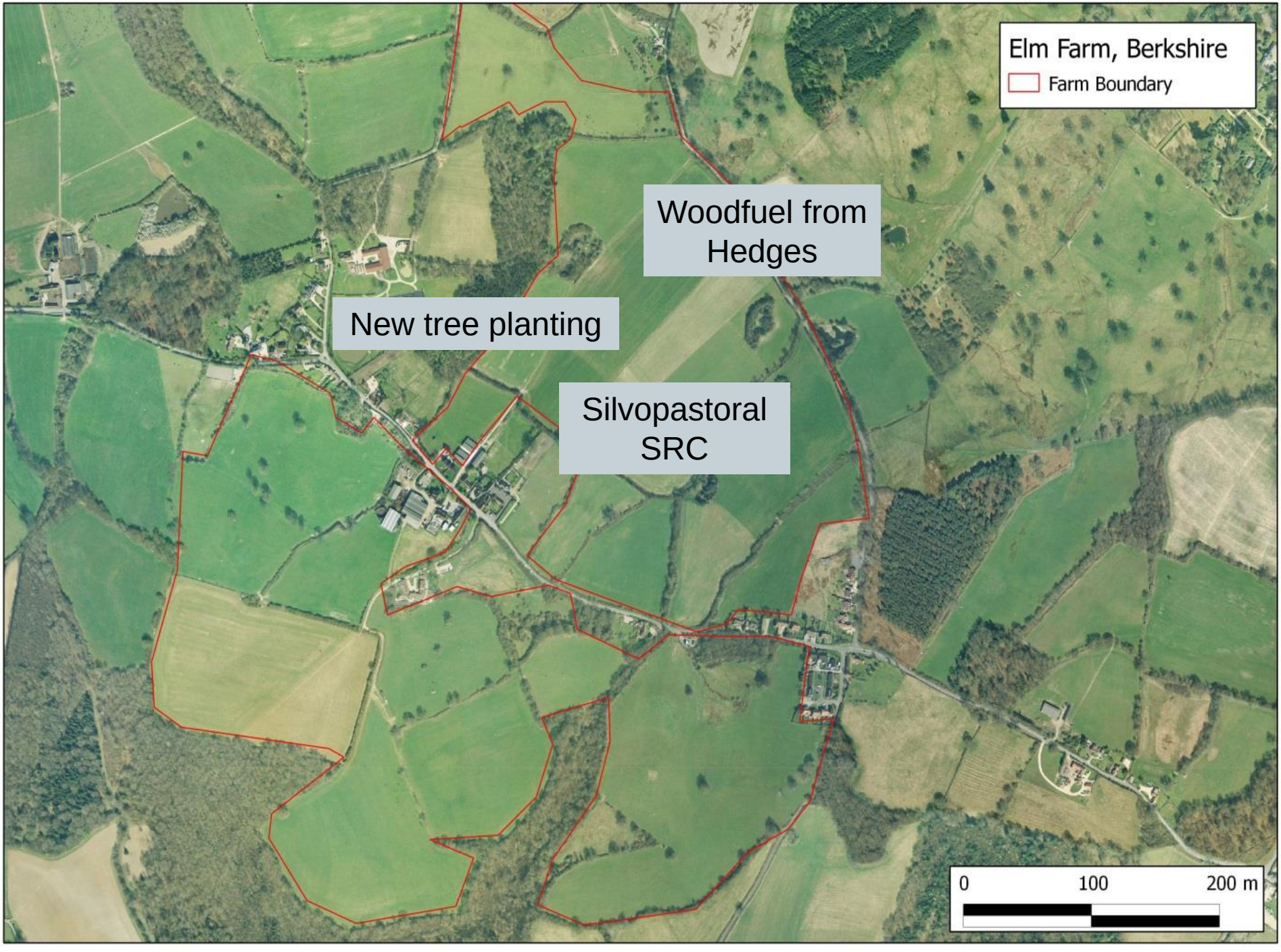
UK Silvopastoral agroforestry

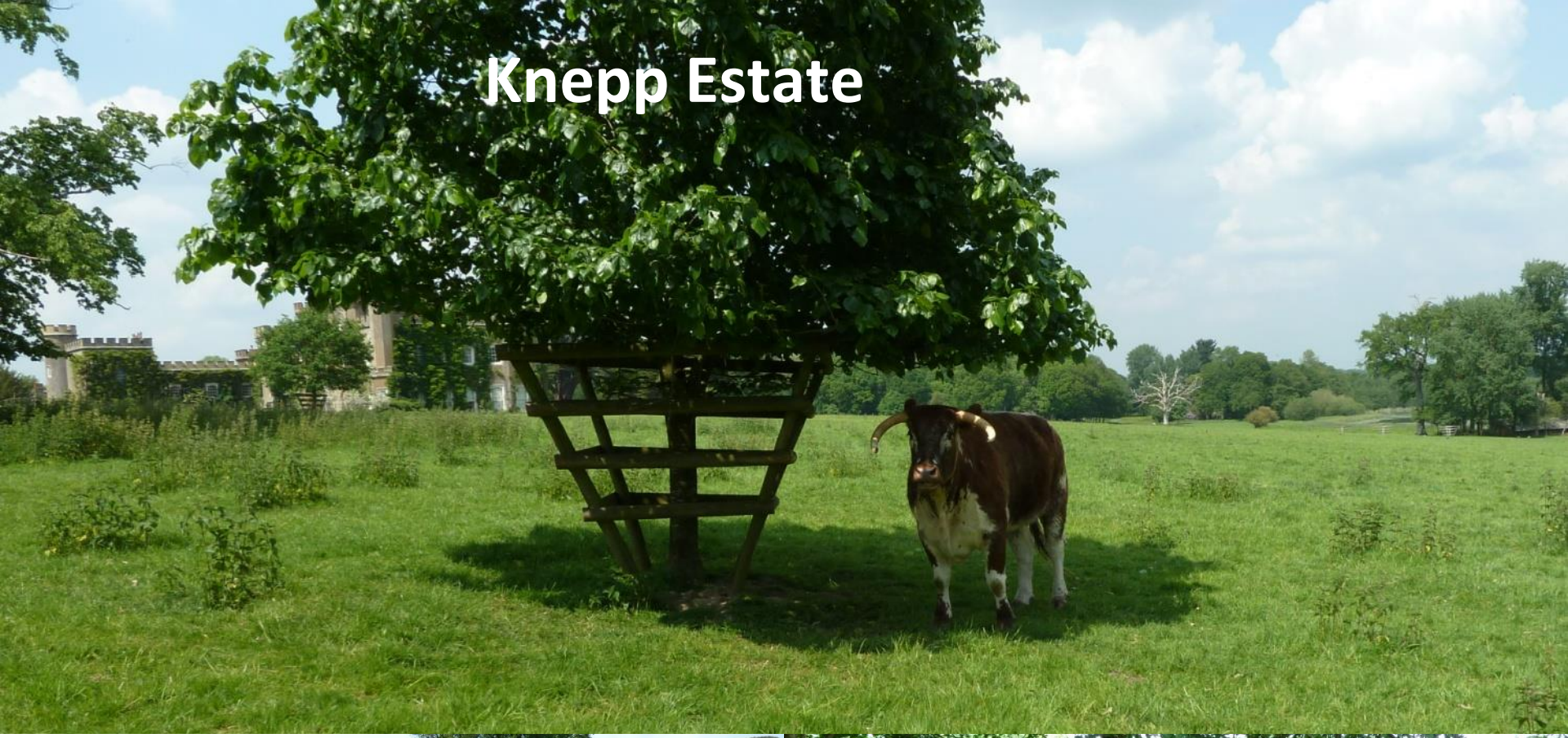





Elm Farm, Berkshire
Farm Boundary
Woodfuel from Hedges
New tree planting
Silvopastoral SRC
0
100
200 m


OU14 EBN

Knepp Estate



Pigs and forestry at Esgair

Photo: David Pilbeam

Forest grazing, Fife

Shropshire silvopasture

www.silvaspin.org.uk

- 20 acres
- 20m wide alleys
- Trees at 5m spacing
- N/S orientation
- Electric fencing
- Trees for browsing – ash, elm, honey locust, black locust, plus nut trees – walnut, hickory, sweet chestnut, almond, hazel

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Tim Downes, Shropshire

1. Nutritional browsing trial (*Acer pseudoplantanus*, *Carpinus betula, Tilia , Ulmus glabra* – 3 rows, 8m apart)

2. Medicinal trial

(*Salix fragilis* and *Salix alba* – 2 rows 25m apart)

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Game & Wildlife
CONSERVATION TRUST
The Allerton Project

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UK Agroforestry Research Networks

- Silvopastoral National Experimental Network: established late 1980s on 6 sites (3 upland, 3 lowland, sycamore & sheep)
- Silvoarable National Experimental Network: established 1992 on 3 sites (poplar and arable)
- Measured productivity, interactions, economics and environmental impacts

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NNE
Glensaugh
Broughshane
Loughgall
Henfaes
Bronydd
Mawr
North Wyke

NNE Key Results: Silvopastoral

- No reduction in agricultural production (sheep) in 9 years post-planting – trees at 400/ha
- Increased species diversity of ground insects and birds
- Sheep use trees for shelter – but caused compaction around tree
- Higher water infiltration in silvopastoral plots
- Red alder trees appear to have had a beneficial effect in terms of nitrogen fixation, as the production in the alder plots was as high as in the pasture control plots with 160 kg N ha^{-1} yr^{-1} applied

Pasture with perennial ryegrass(*Lolium perenne* L.)

Silvopastoral system planted with ash trees (400 stems ha^{-1})

Woodland planted with ash trees (2500 stems ha-1)

Experimental agroforestry trials at AFBI's field station in Loughgall, Co. Armagh.

With thanks to Prof. Jim McAdam

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Planted 1989/90

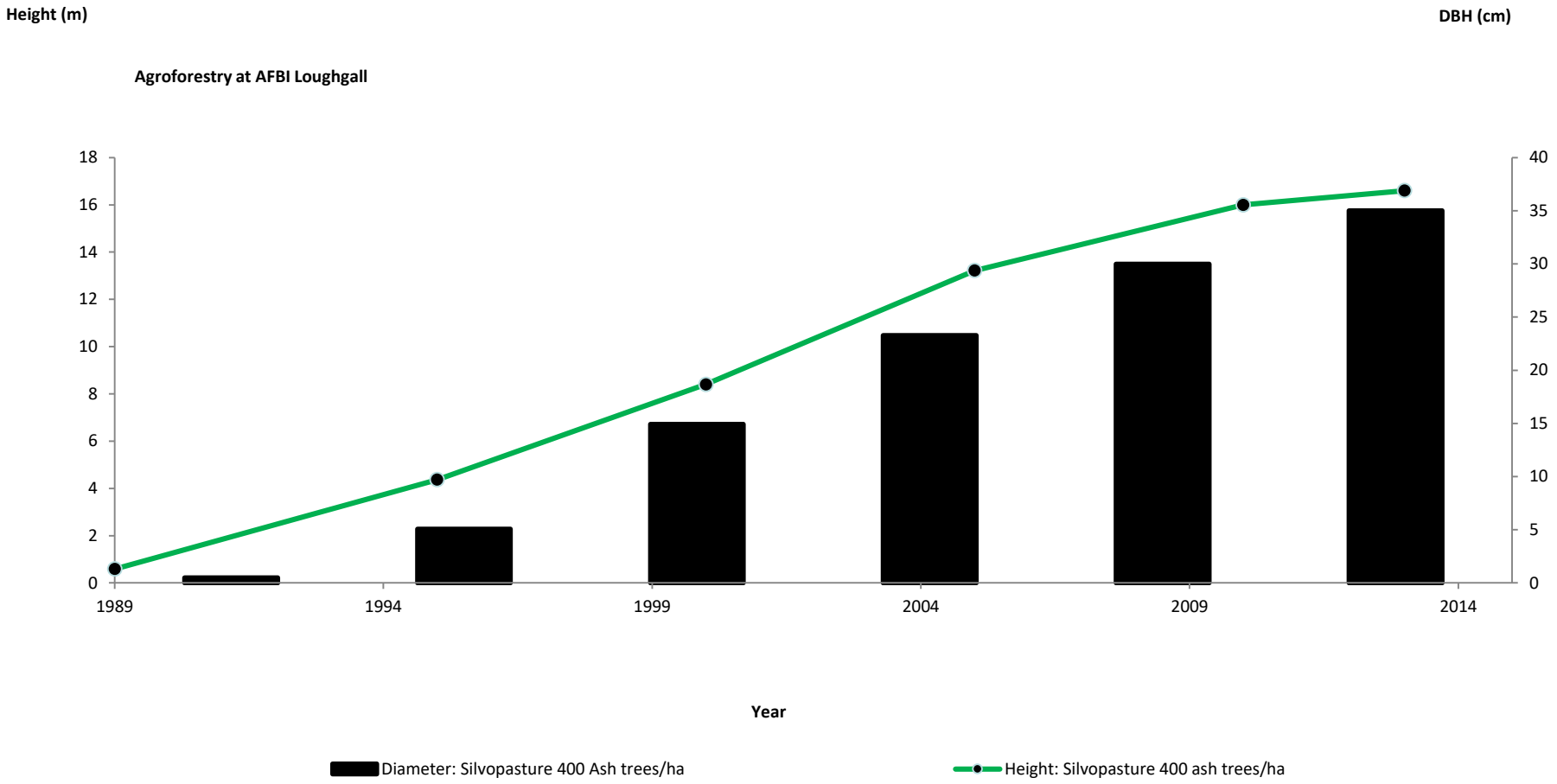
3 Yr Old

6 Yr Old

8Yr Old

19 Yr Old

Tree growth



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Economic

- **Basic Payment unaffected**
- **Full sheep output for 12 yrs**

Year 13-(2003) ash at 400 stems/ha – 7.21m^3 hurley quality ash butts sold @ €272/m^3 from 1.87ha

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i.e. **€1048/ha (£786)**

With thanks to Prof. Jim McAdam

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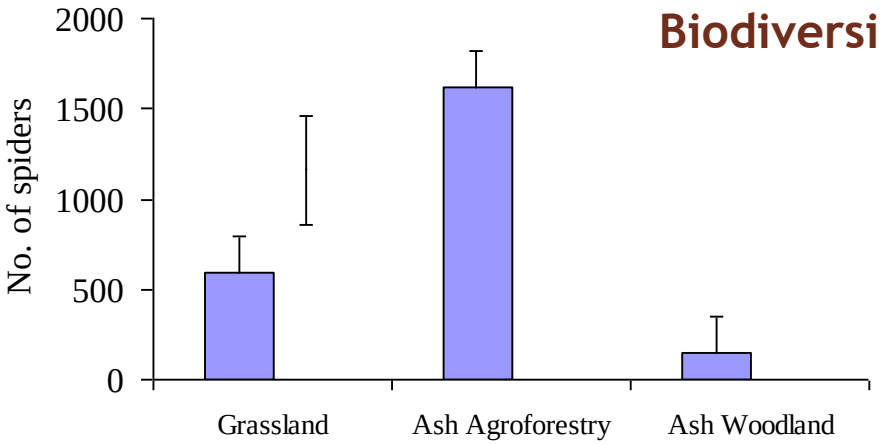
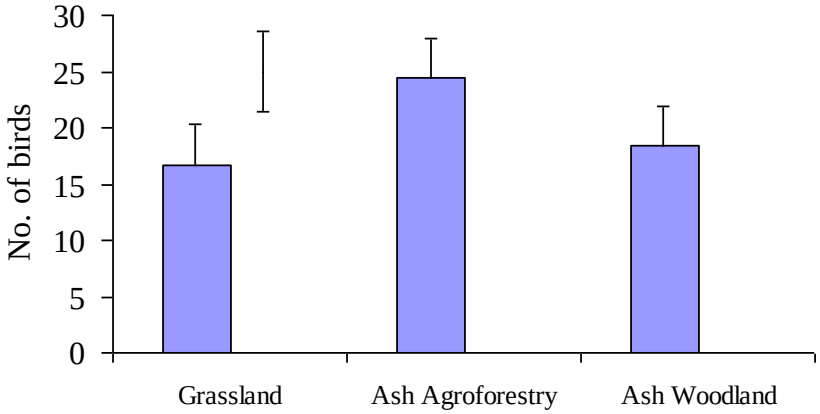
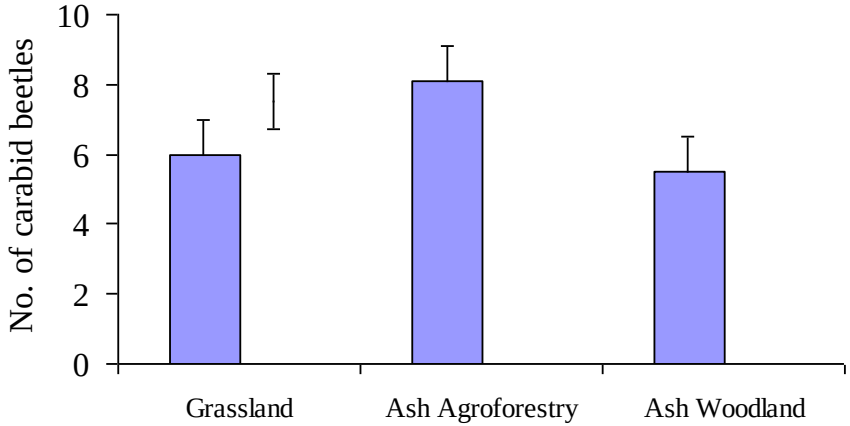
Biodiversity benefits



Spiders



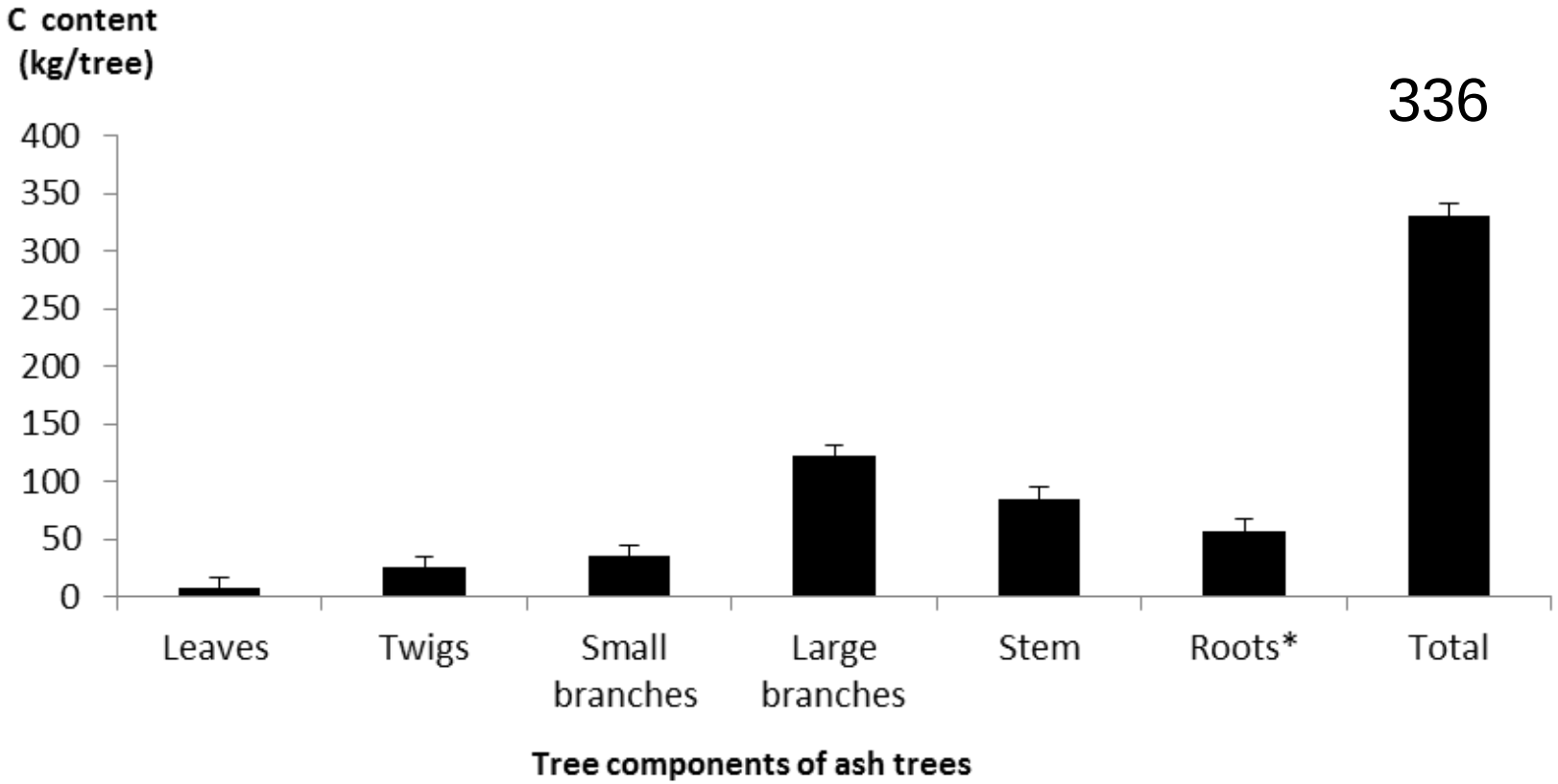
Birds



Beetles

With thanks to Prof. Jim McAdam

Carbon stored in ash trees (dry weight) growing in agroforestry (21 years old)



Total C in woody biomass- **77.28 t/ha**

With thanks to Prof. Jim McAdam

Source: Olave, R., Higgins, A., Sherry, E., Fornara, D., McAdam, J (2016). Agroforestry as a land use option to sequester carbon in a cool temperate climate. World Congress Silvo-pastoral Systems 2016. University of Évora, Portugal. 27-30 September 2016. 32-33.

Soil carbon

- The ash silvopastoral and woodland systems have more carbon stored in the soil than the grassland
- When the carbon stored in the wood is added in, these systems are very sustainable-moving towards carbon –neutral livestock farming.

With thanks to Prof. Jim McAdam

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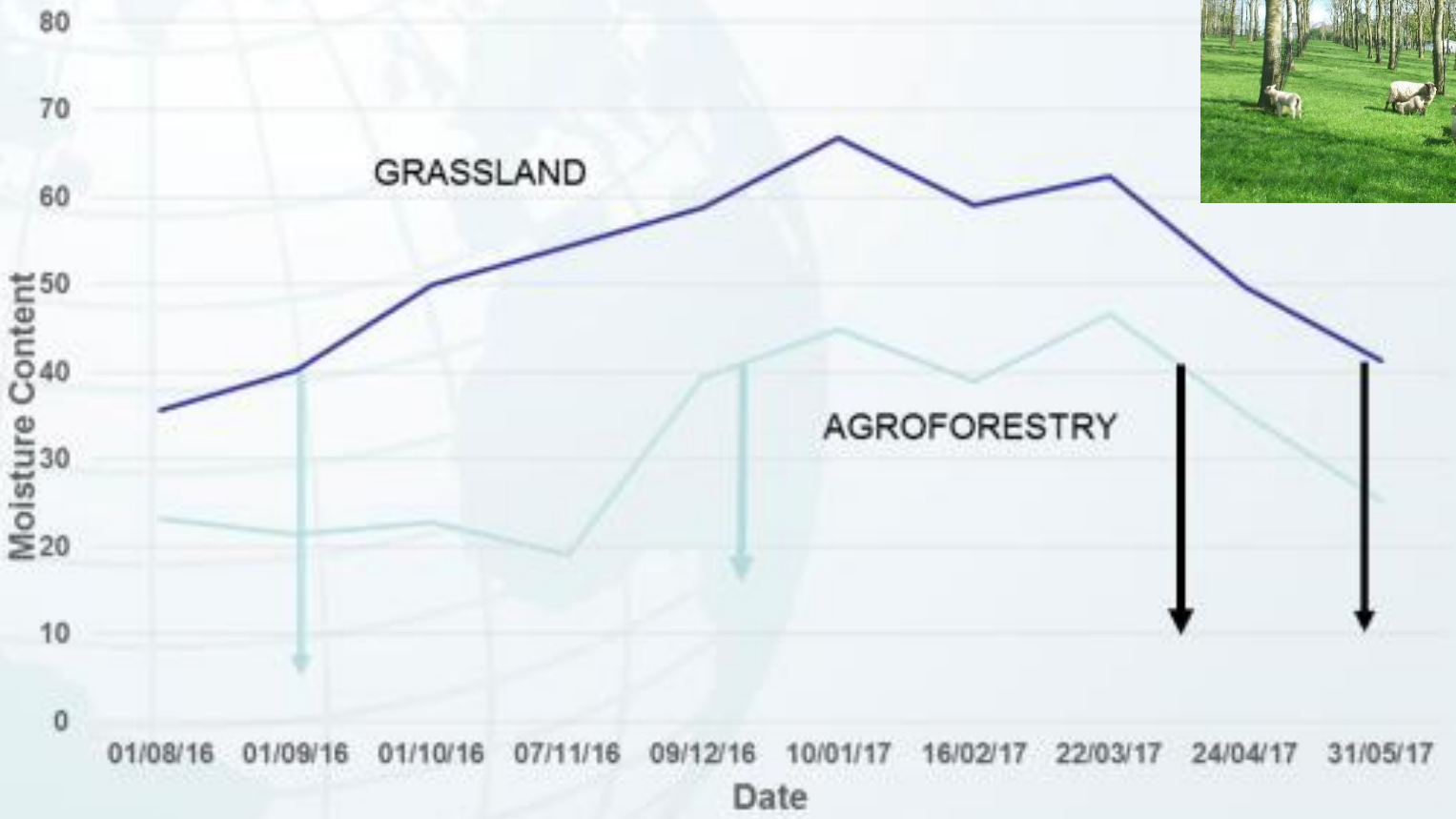
Extended grazing season

Thanks to Prof. Jim McAdam, QUB



Assuming 40% soil moisture content as a cut off, we have 17 weeks longer "grazing season" under agroforestry -5 in spring, 12 in autumn.

Looking forward….. Management and Maintenance

Selective thinning to 200 and then 100 trees

Planting the next generation within the gaps

Aim is to maintain benefits of silvopastoral system rather than clear-felling

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Management and maintenance considerations: Stephen Briggs, Whitehall Farm

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Elm Farm
May 17

David Rose's July 18


Pangbourne, Sept 17


Pitlochry, Sept 17

Wakelyns, Aug 18


Dartington, Feb 19


Duchy Home Farm Jan 18


Whitehall Farm Feb 18

Tim Downes, Jan 18

Question asked	Top three answers	Ways to address challenge
What are the biggest problems and barriers to setting up an agroforestry system ?	1. Lack of data on economics, and finance to establish system	Information on available financial support and economic case studies. **Agroforestry handbook**
	2. Policy uncertainties	Regular concise updates on policy
	3. Lack of time, expertise and working examples/ case studies to learn from	Options for alternative working models e.g. split tree/ agricultural tenancies. Training and practical workshops

What additional information on agroforestry would be useful?	1. Working examples and case studies	Programme of agroforestry farm visits, digital map of agroforestry farms with links to case studies

AFINET - Agroforestry Innovation | European Agroforestry Federation | New Tab

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We all change, AFINET as well.

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Agroforestry (AF) is a type of climate-smart agriculture (CSA) practice of deliberately
y vegetation (trees or shrubs) with crop and/or animal systems to
resulting ecological and economic interactions.

nomic and environmental relevance of this activity, a consortium of 13
European countries, launch AFINET (AgroForestry Innovation
matic network aimed to foster the exchange and the knowledge

01-02-2019

Spanish RAIN meet to present and promote innovative agroforestry initiatives

31-01-2019

II Polish Agroforestry Conference: "Perspectives

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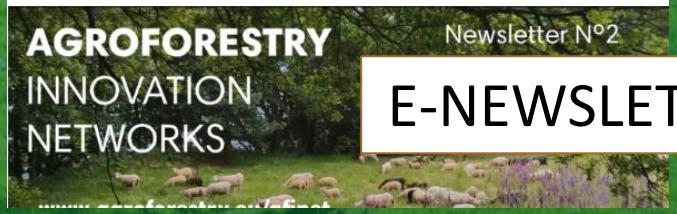

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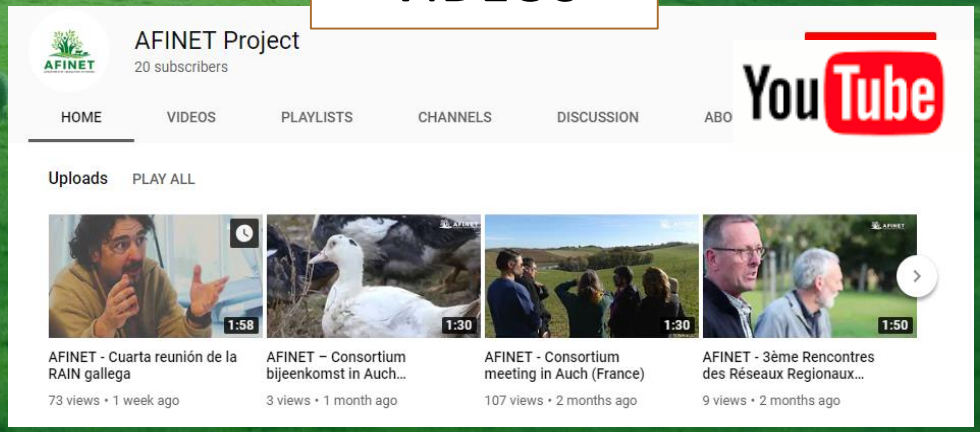

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13

CLOSING THE KNOWLEDGE GAP

TREES FOR SHADE, SHELTER, SURVIVAL AND BODY MAINTENANCE

How offering access to trees can improve the welfare of domestic animals

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THE WHAT AND WHY

Why offer animals access to trees?

The benefits of silvopasture to domestic animals include access to shelter in the winter and shade in the summer, as well as providing scratching posts to maintain coat condition. The behaviour of domestic animals can be grouped into the

when an animal is hungry it will seek and eat food. Similarly, when hot or cold, it seeks shade or shelter and trees, shrubs and shelterbelts can offer effective protection. Coat condition is important in maintaining animal health and tree trunks and branches are readily used as scratching posts. The newborn offspring of farm animals are either hiders (e.g., cattle) or followers (e.g., sheep) but mothers of all species, seek out available shelter when giving birth.

10

INNOVATION

MANAGING THE TREE ROW UNDERSTOREY IN AGROFORESTRY SYSTES

A range of possibilities

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THE WHAT AND WHY

The tree understorey – challenges and opportunities

In a silvoarable agroforestry field, there is always a certain area under the tree canopies (e.g. strips of land under the tree rows in alley cropping systems), where it is difficult to cultivate the main crop. We call that the tree row understorey here. However, these areas can have several important functions: (I) tree protection against possible damage through e.g. agricultural vehicles, (II) giving access to the tree row for tree maintenance aspects like habitat biodiversity. The tree row understorey can also be part of the AF production system itself, although the management of this area seems often to be a challenge where following questions need to be addressed: (I) What is the optimal width of the tree row understorey? (II) What is the best way to manage this area? Managing the tree row understorey in silvoarable practices can be done in many ways, and will depend on the main objective of the trees, the type or understorey vegetation, the available machinery and the amount of time one can or wants to spend.

Evergreen plantation: a living barn providing shade and shelter for dairy cattle, 2021 in Over Vaksum, Denmark
L. Whitehorne

Short rotation coppice (hazelnut) at an agroforestry field at Wakelyns farm.
Victoria Neilsson – Consortium Agroforestry Visandarien

the benefit of animals

offers protection against insects, since pine species have insect repellant properties. The positioning of trees is important in their effectiveness as protection against the weather. Shelterbelts offer good protection when perpendicular to the prevailing wind and porous shelterbelts slow down wind, offering better shelter than dense barriers that cause high levels of turbulence. Access to tree trunks and low branches enable animals to use them as scratching posts.

ade, Shelter, Grooming, emoestasis, Silvopastoral

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12

CLOSING THE KNOWLEDGE GAP

BROWSE, PRESERVED TREE FODDER AND NUTRITION

How offering access to browse and feeding tree fodder can supplement the diet of domestic animals

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THE WHAT AND WHY

Why offer animals access to browse or tree fodder?

In general, browse (i.e. fresh tree leaves and small branches) and tree fodder (preserved browse) are good sources of nutrition and compare favourably with grasses grown in the same environment. Trees are also a good source of micronutrients including vitamins and particularly minerals. Where animals have access to trees or hedgerows, they will readily browse indicating its attractiveness as a feed. Browse can range from 12-55 %, 20-76 % and 60-93 % for cattle, sheep and goats respectively. Goats tolerate high levels of browse in the diet due to their saliva that can bind tannins and a large liver that effectively processes tannins. Although the gastrointestinal tract of cattle is well adapted to a grass diet, it does not inhibit efficient digestion of browse. Browse is accessible up to a height of 2 m for cattle and 1.2 m for sheep. Goats are termed vertical browsers, having no meaningful browse height, given their physical agility.

Trees with a clear browse line from cattle in 2017 Stonehenge, UK.
L. Whitehorne

Hereford cattle browsing in a mixed-species hedgerow in 2014, Hereford, UK
L. Whitehorne

HOW IS THE CHALLENGE ADDRESSED

The benefits of feeding browse and tree fodder

Sourcing good protein for animal feed is a global issue. Crude and degradable protein levels in tree leaves, particularly in ash, lime and mulberry, compare well with levels found in alfalfa and ryegrass. Additionally, although condensed tannins in browse inhibit normal digestion of protein in the rumen, the stomach enzymes binding the proteins are themselves broken down in the abomasum, effectively delivering a good-quality rumen bypass protein to the small intestine. Mineral content in browse can also be high. Zinc plays a role in important biological functions and promotes the efficient metabolism of protein and carbohydrates. Selenium deficiency is common in natural grazing systems. Selenium and zinc are abundant in willow. Browse can also be an important source of vitamin E, particularly in dry conditions.

Keywords: Tree fodder; Browse; Protein; Minerals; Selective feeding; Learning; Silvopastoral systems.

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01

INNOVATION

MANAGING THE TREE UNDERSTORY

Opportunities for crop diversification

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watch video

Aerial view of Wakelyns Agroforestry, Suffolk UK, shows how 25% of the land area is occupied by the tree rows.
Ref : Permaculture Association, UK

THE WHAT AND WHY

The tree understorey – a waste of space?

Planting trees into arable or vegetable fields means that land is taken out of annual production; depending on the design of the system, this could be up to 25% of the cropping area. There may be no return from the trees for many years after planting; this varies from approximately five years for fruiting species or short rotation coppice systems, to several decades for timber species.

In many agroforestry systems, the area between the trees and under the tree canopy is an overlooked and underutilised space and, unmanaged, this can create problems with weed control. Rather than being viewed as a wasted space, this understorey area could provide new opportunities for introducing new crops, therefore increasing production and diversifying the range of marketable products from the system.

watch video

Rhubarb as an understorey crop at Tolhurst Organics, UK.
Ref: Organic Research Centre

HOW IS THE CHALLENGE ADDRESSED

Herbs, flowers, fruit, vegetables..... take your pick!

One option is to plant new crops in the tree rows to provide an income in the years following tree establishment, or longer term if shade tolerant species are used. Ideally, the new crop will complement what you are already producing (e.g. new lines of fruit or vegetables in a horticultural enterprise) but you may need to find a new market or generate interest for the new crop within your existing

could be established underneath the trees include herbs, flowering bulbs or cut flowers, perennial fruit and vegetables such as globe artichokes or rhubarb, mushrooms and berry bushes. Within the different crop types, some species and varieties will be better suited to the conditions found in tree rows (particularly levels of tolerance to shade) and it may be worth trialling varieties or species on a small scale first to

s for managing the tree understorey

g the tree row

ough mowing.

ae close canopy

he use of mulch materials.

ultivated with short

bs, or through the

s, flowers.

Generally, a width of at least 2 m is recommended (1 m on each side of the trees). However, if you want to manage the strip mechanically, a width of 2 m on each side of the trees is better. The width can be adjusted as the trees grow older; but reducing the width by e.g. ploughing half a meter closer to the trees after 5 years, would damage tree roots with negative future consequences for tree growth and health. Conversely, it is advisable to broaden the strip after a couple of years, for instance to harvest fruit more easily.

Keywords: Biodiversity; productivity; efficiency; alley cropping; silvoarable

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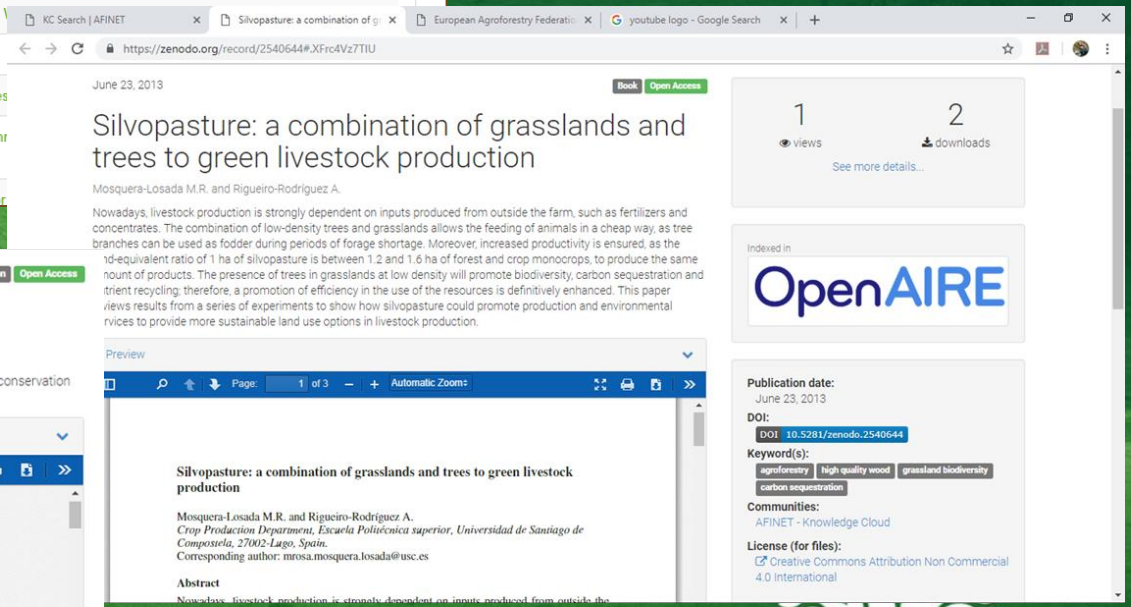

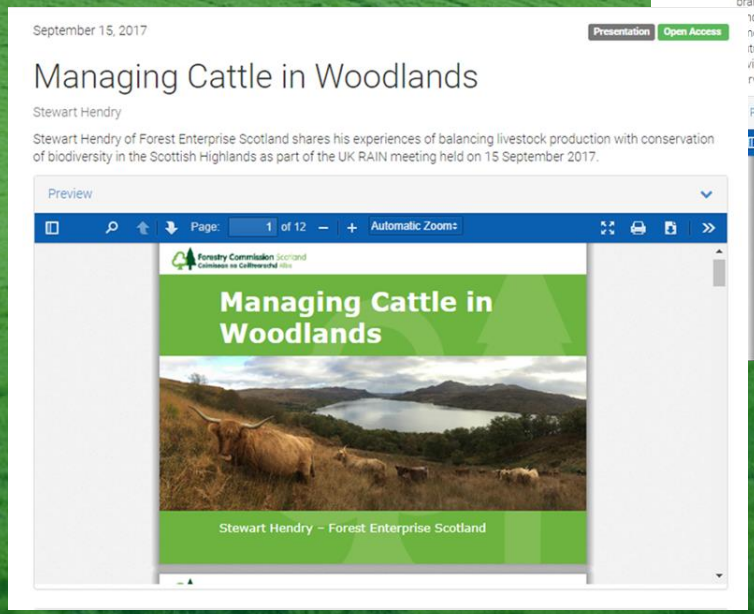

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Forthcoming Events

2018 Farm Woodland Forum Meeting
Tuesday 10th July 2018 to Wednesday 11th July 2018
Arable and Livestock UK Agroforestry Group Meeting
Monday 16th July 2018

The Farm Woodland Forum

The **Farm Woodland Forum** aims to facilitate the generation and exchange of information that supports best practice in and improves opportunities for farming with trees. We are an informal group of farmers, foresters and researchers with a common interest in farming with trees in all its aspects.

The Forum holds annual meetings at which there are presentations to describe the latest research, development and practice related to agroforestry and

Tweets by @FarmWoodForum

AFINET UK Retweeted

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Check out "UK #Agroforestry Network Meeting (livestock and arable)" eventbrite.co.uk/e/uk-agrofores... @Farmwoodforum @abacusagri @orgrescen @afinetproject

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Farm Woodland Forum

www.agroforestry.ac.uk

If you are interested in agroforestry in the UK

JOIN UP!

- **More information at the back**
- **Annual meeting in May/ June each year**

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Innovative Farmers Field Labs

- Peer to peer learning and experimentation
- Farmers set the priorities
- Supported by respected researchers
- **Practical, intuitive, on-farm**
- **Multiple triallists – sharing risk, investment, learning amplified**
- **Small grants scheme up to £10k**

Partnership

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Agroforestry related Field Labs:

- Soil amendments for top fruit growers
- Willow woodchip for scab control
- Managing Shropshire sheep in orchards
- Biochar for soil and livestock health

- Others – is there interest?
  - Tree Protection
  - Tree fodder

Partnership

AGROFORESTRY INNOVATION NETWORKS

Any Questions?

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727872.

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AFINET UK Regional Agroforestry Network (RAIN)

Members Survey

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AFINET Methodology

- **Do you feel that you were kept well informed on the progress of AFINET?**

- **Suggestions for future improvement?**

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Sustainability

- **Would you participate in an Agroforestry network in the future?**
- **Are you willing to be actively involved in future AF events/products?**
- **How should we continue this network?**

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AFINET Conference – the finale!

- **Likely to be in Brussels to lobby European Parliament and present AFINET highlights to policy makers**
- **Any other suggestions?**
- **What about a UK Agroforestry Conference in 2020?**

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Any further feedback?

And many thanks…

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Tour of Claydon Silvopasture Trial

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