2. Agroforestry –research results

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QUEEN'S UNIVERSITY BELFAST

irish agroforestry forum

Research into agroforestry

- There is a huge body of research into the theory and practice of agroforestry worldwide
- A substantial and fast-growing body of research into agroforestry in temperate climates and the EU
- But-a very small research base for agroforestry research relevant to or on the island of Ireland
- The research programme in Northern Ireland started in 1989 and is gradually being extended across the island

Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

The European Agricultural Fund for Rural Development:
Europe investing in rural areas

afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

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AGFORWARD
Agroforestry for Europe

EURAF
European Agroforestry Federation

The evidence base…

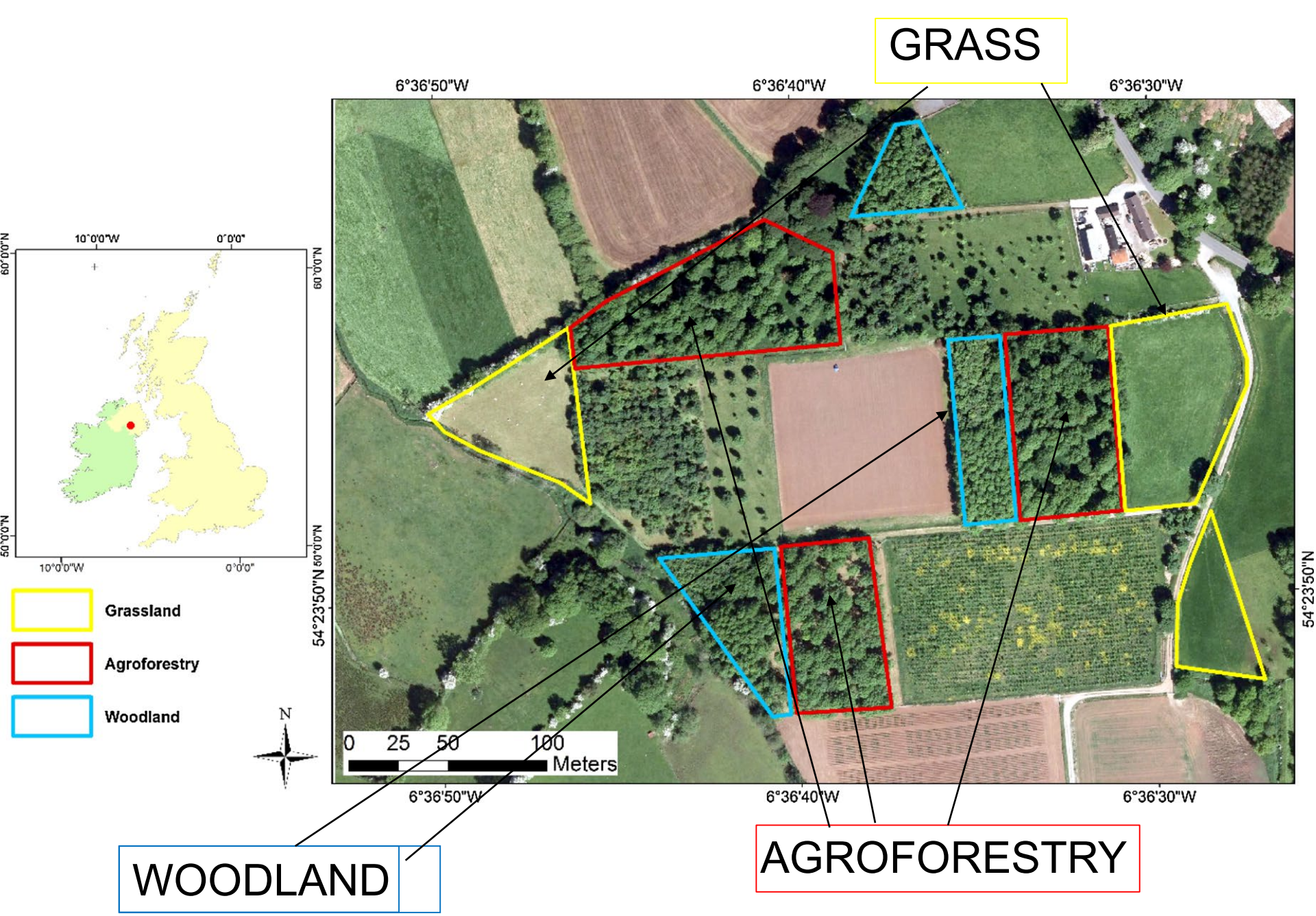
30 years ago our driver was to : Make grasslands in Northern Ireland more sustainable by increasing tree cover to improve biodiversity, nutrient capture and water quality & soil health.

Considerable investment went into establishing a replicated trial comparing grassland, silvopastoral and woodland systems at the Department's research station at Loughgall, Co Armagh.

Pasture with perennial ryegrass(*Lolium perenne*)

Silvopastoral system planted with ash (*Fraxinus*) trees (400 stems ha-1)

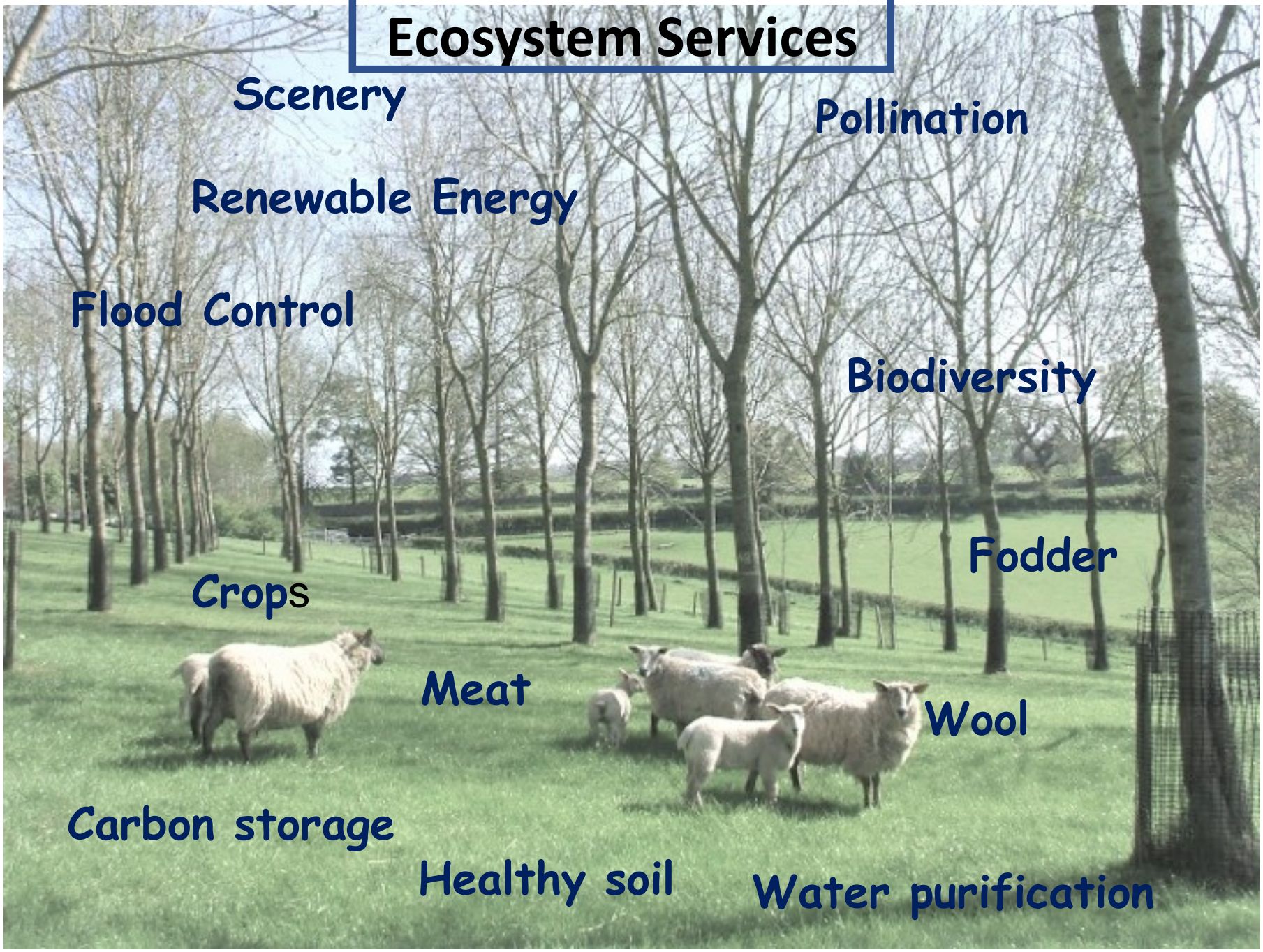
Woodland planted with ash trees (2500 stems ha-1)


GRASS
6°36'50"W
6°36'40"W
6°36'30"W
54°23'50"N
10°0'0"W
0°0'0"
60°0'0"N
50°0'0"N
Grassland
Agroforestry
Woodland
N
0 25 50 100
Meters
WOODLAND
AGROFORESTRY

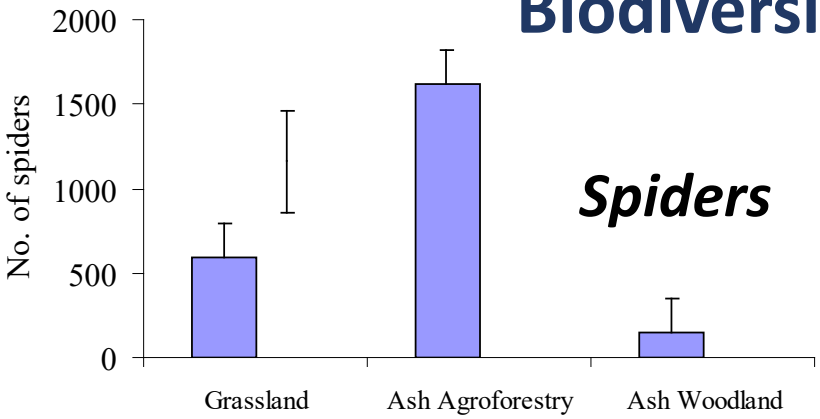
Establishing silvopasture

19 yr old


26 yr old

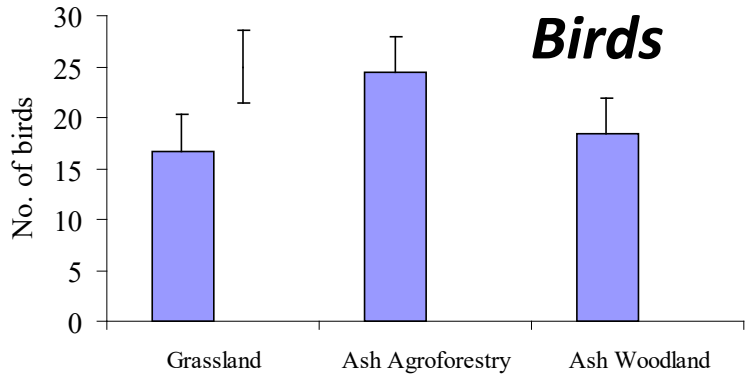

Ecosystem Services
Scenery
Pollination
Renewable Energy
Flood Control
Biodiversity
Fodder
Crops
Meat
Wool
Carbon storage
Healthy soil
Water purification

Biodiversity benefits

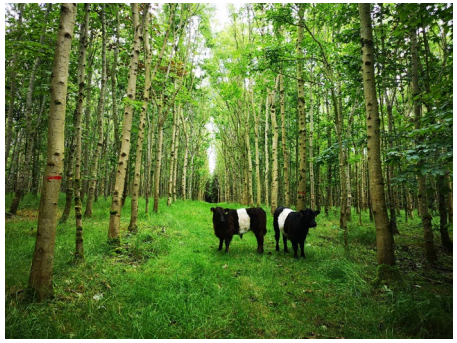


Spiders

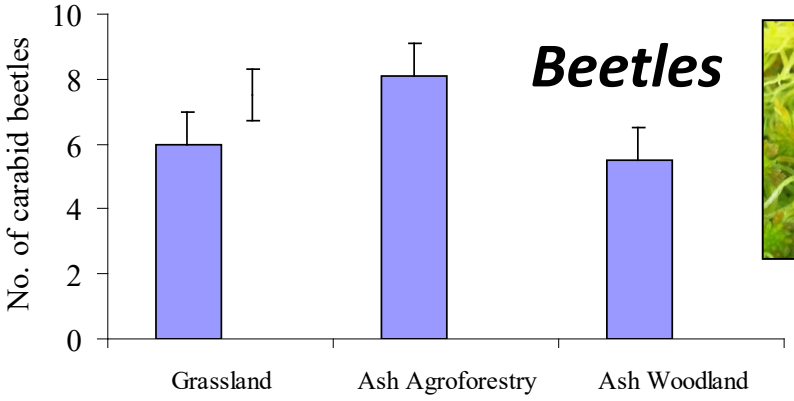
Earthworms



Birds



Flora



Beetles

Pollinators

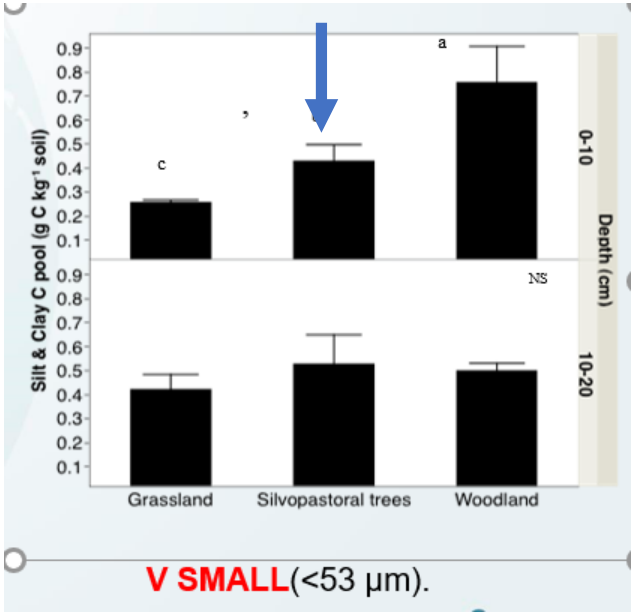
Carbon stored in ash trees (dry weight) growing in agroforestry (21 years old)

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

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

There is more ‘stable’ carbon stored in the ash silvopasture than the grassland.



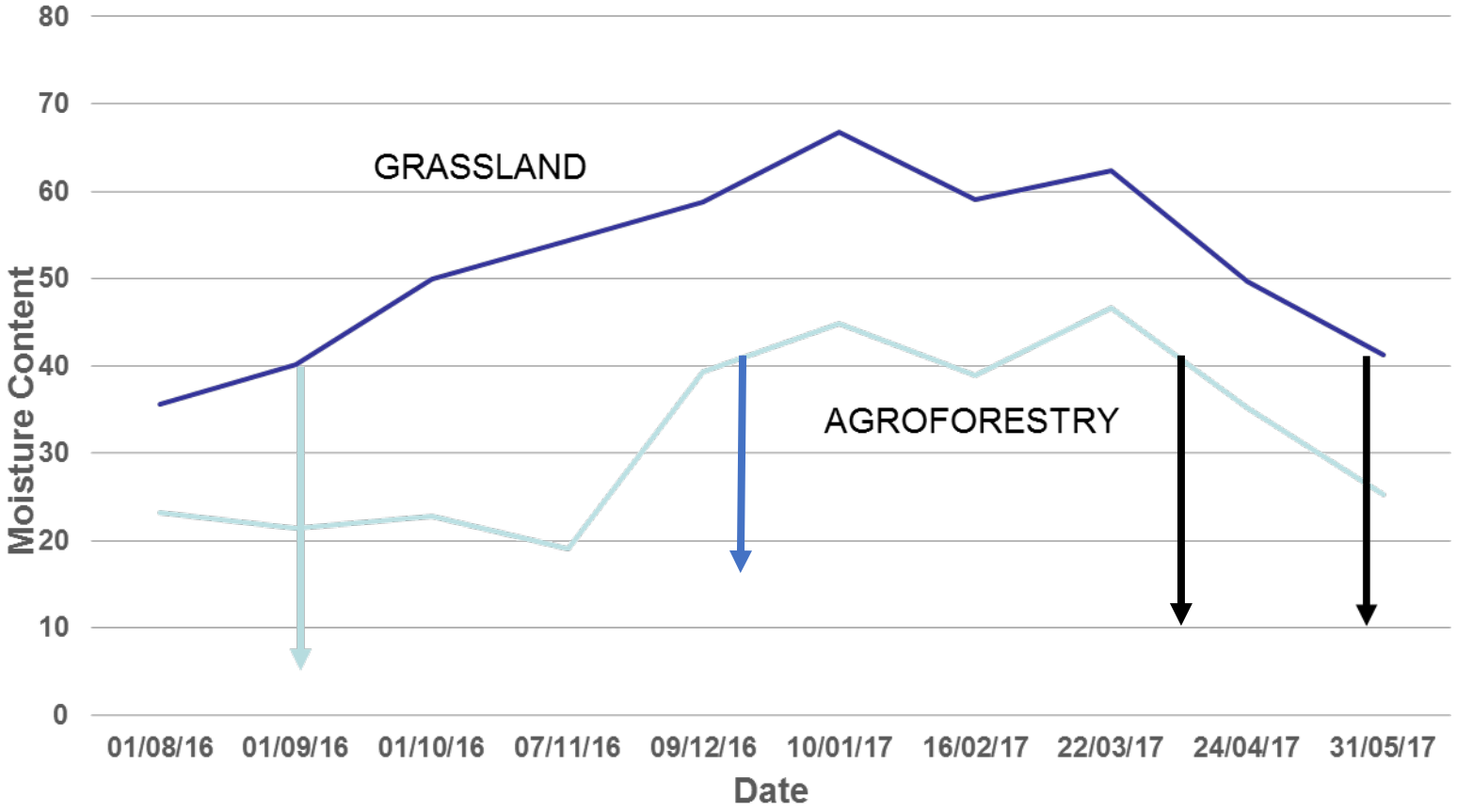
- When the carbon stored in the wood is added in, these systems have the potential to store ”long term” and “short term” carbon

Carbon sequestration

Land Use Practice	Species	tC/ha/yr
Silvopasture	Ash /Mixed Species	2.4
Pasture	Perennial ryegrass	0.6-1.0
Forest plantation	Sitka Spruce	3.8

Ability to sustain grazing-soil trafficability

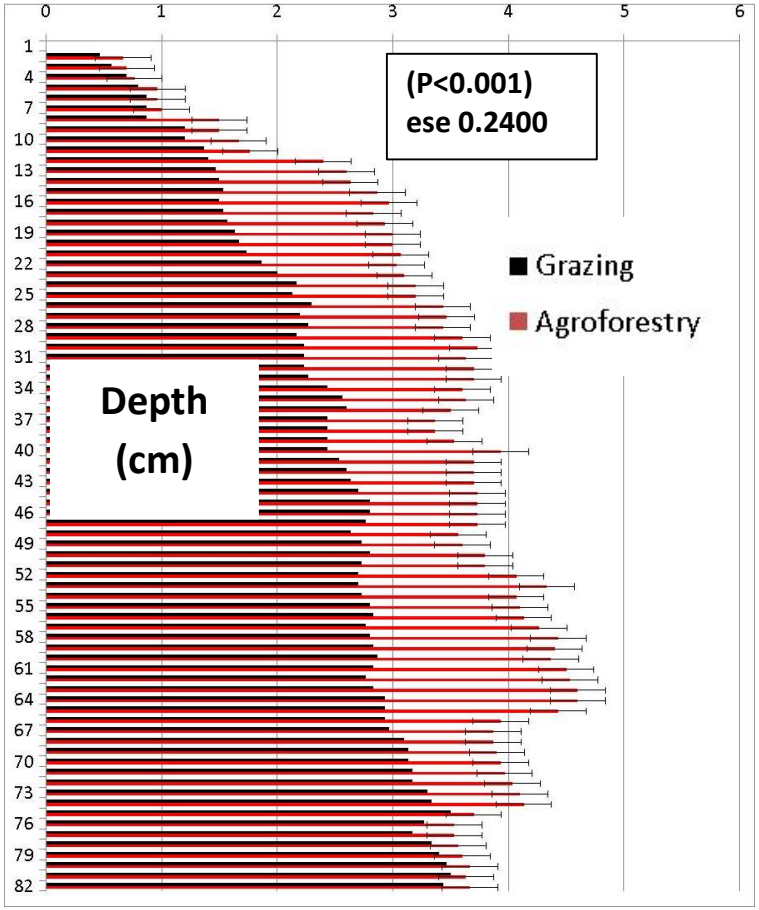
Extended grazing season under agroforestry



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

Resilience to extremes of weather

- Silvopasture increases soil permeability
- **infiltration potential was greater in the silvopasture than the grassland** treatment down to 76cm (Sept-Nov)



Results in-

- Extended grazing season under agroforestry (we measured 13-17 weeks)
- Greater levels of grass utilisation
- Reduced ammonia emissions from livestock
- Reduced N20 emissions
- Improved animal health
- Increased resilience to flash flooding
- Improved biological soil health

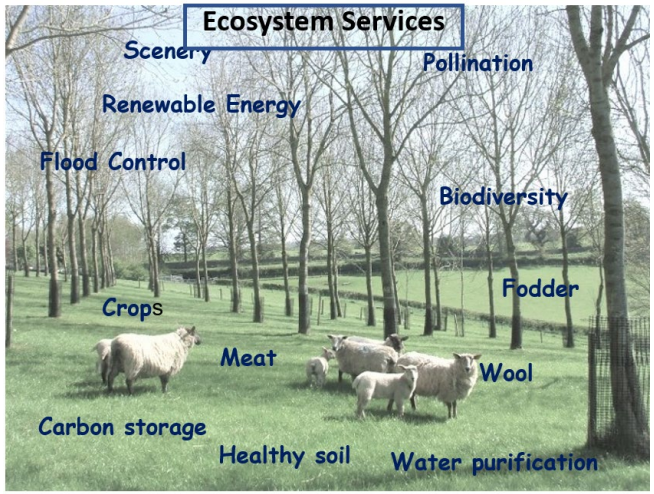
Proven benefits from silvopasture

Silvopasture was found to:-

- extend grazing season …….higher grass utilisation resilience to grazing during extreme rainfall & drought : reduced ammonia emissions
- increase biodiversity
- carbon sequestration
- reduce water run off
- provide renewable fuel
- ‘mine’ P from greater volume of soil.

There have been other trial sites in NI

Research challenges



- We know that the system actually works and can deliver a range of ecosystem services
- The evidence base is largely from one site with one tree species -need to widen the scope
- Need more research on the relevance of silvopasture to cattle - based farms
- How can we better present agroforestry as a viable, sustainable, climate - resilient system?
- **What are the factors limiting uptake- now underway**

Two very positive moves..

Walsh Fellowship Project-Rachel Irwin

Woodland Support Project-Irish Agroforestry Forum

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