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Potential for Silvopasture to deliver climate - resilient livestock systems in Ireland

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Original objective (1985) : Sustainable Intensive Grassland Farming

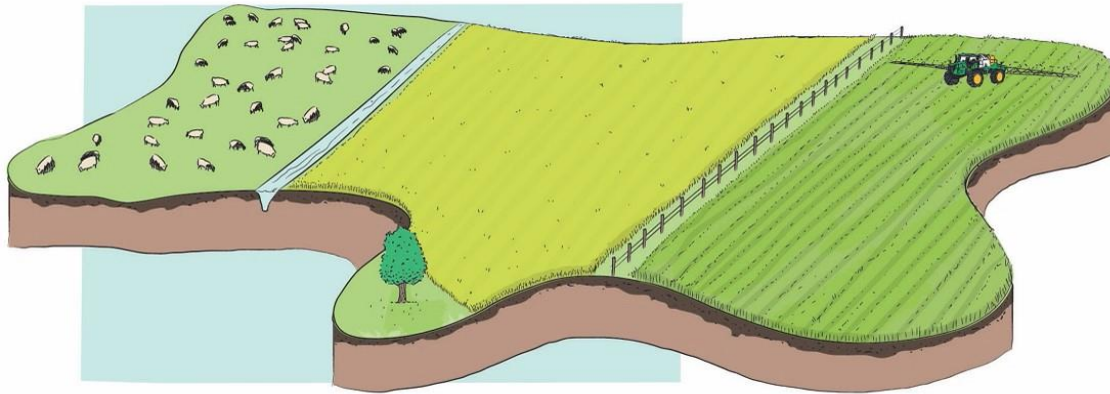
Problems:-

- Low biodiversity
- Homogeneous habitat
- Impoverished landscape
- Eutrophication
- Soil degradation
- Rural depopulation

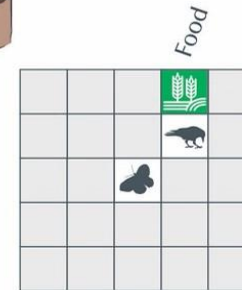


The aim was to move...

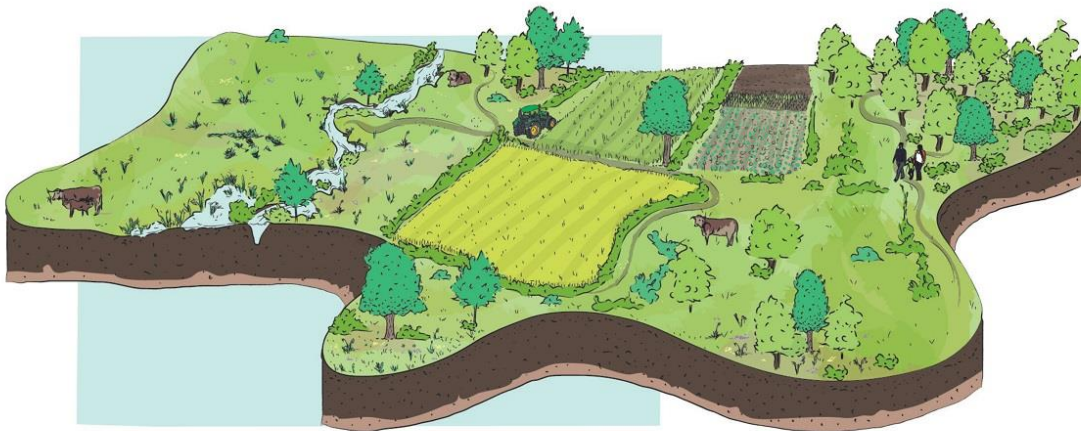
From this...



Low public goods



To this...



High public goods



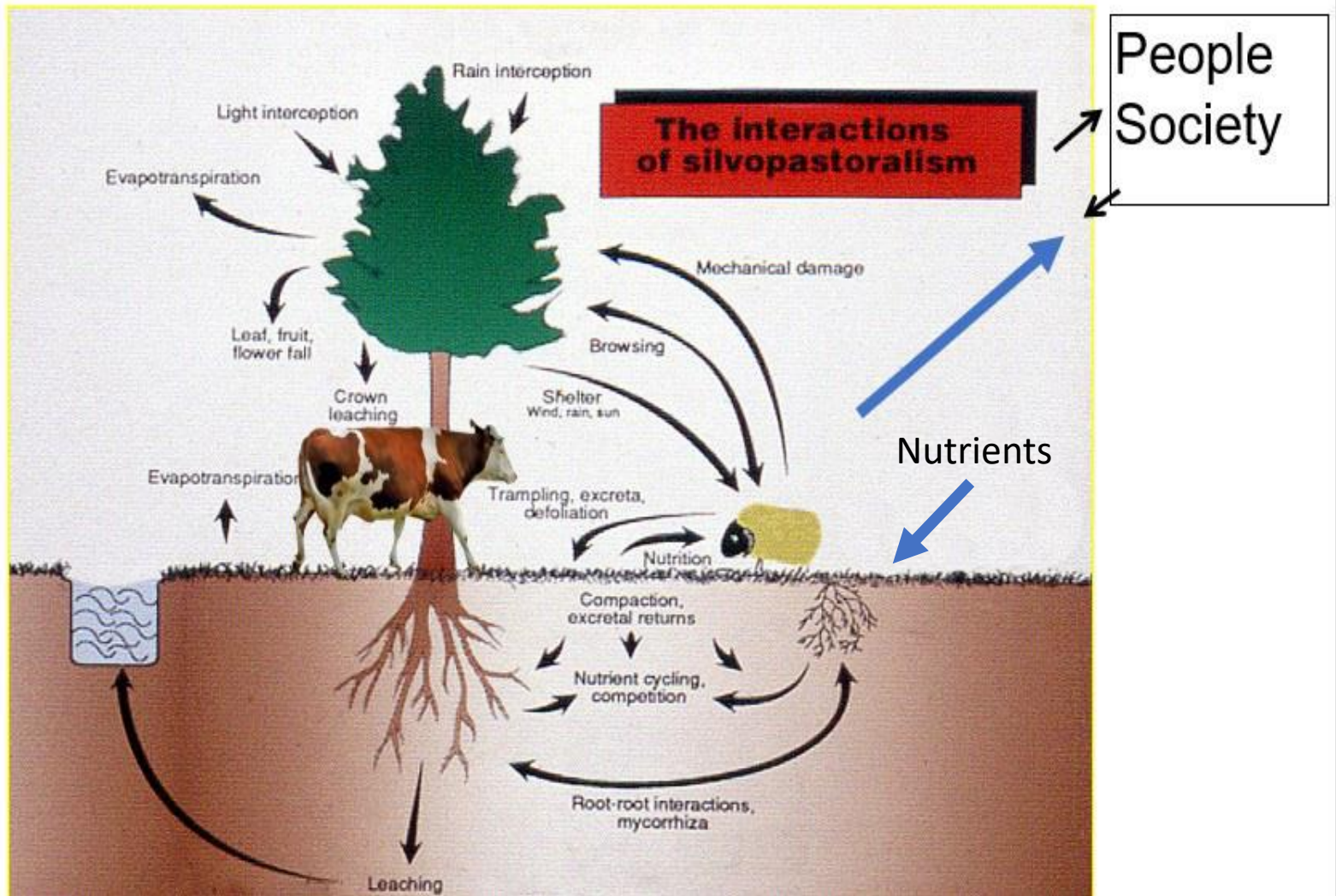
Proposal-

Silvopastoral agroforestry (wide-spaced trees in grassland) can make these intensive grassland landscapes more sustainable by-.

Delivering a wide range of ecosystem services

Silvopasture

An integrated multifunctional land use option delivering a range of ecosystem services.



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.



Pasture with perennial ryegrass (*Lolium perenne*)



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



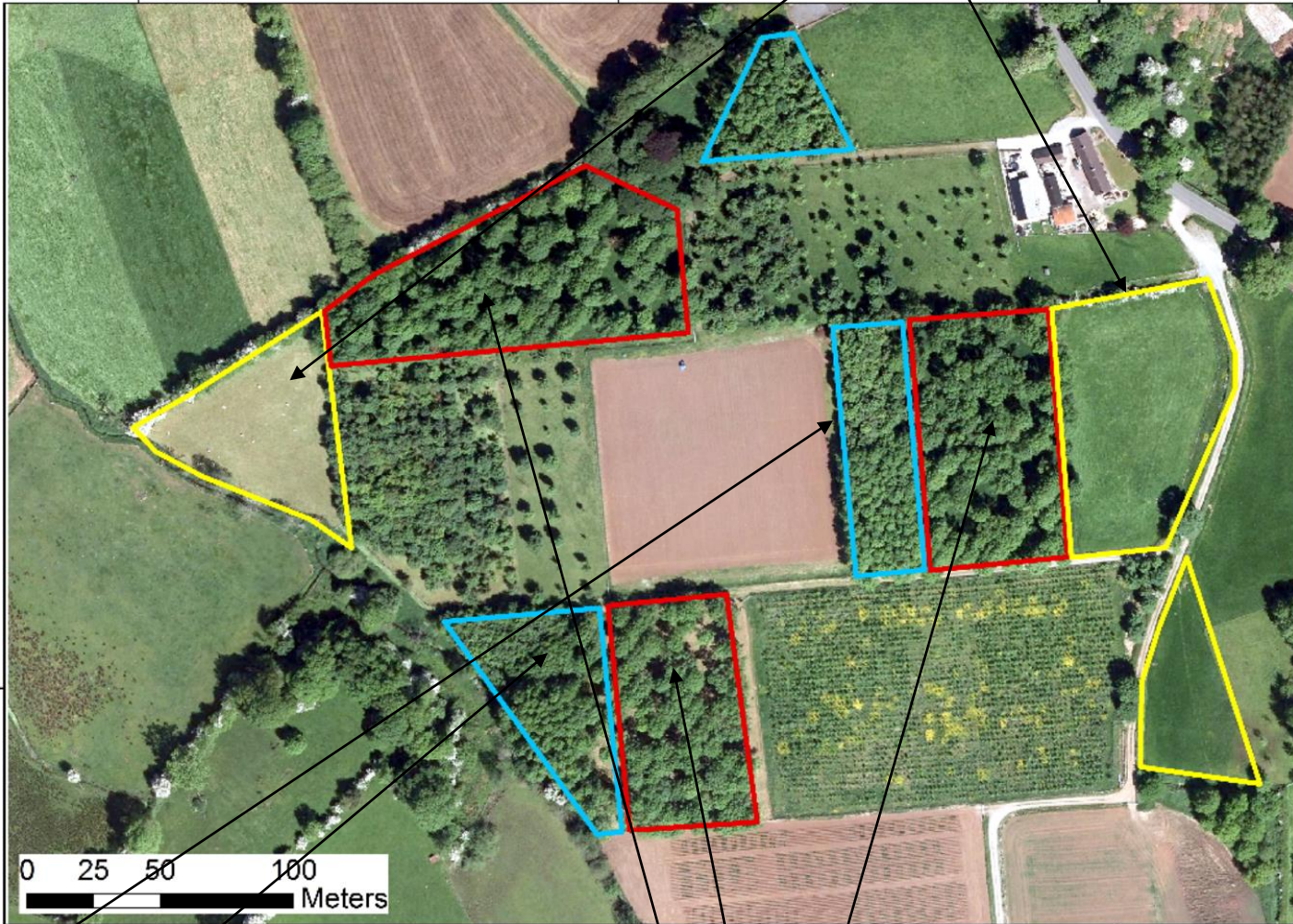
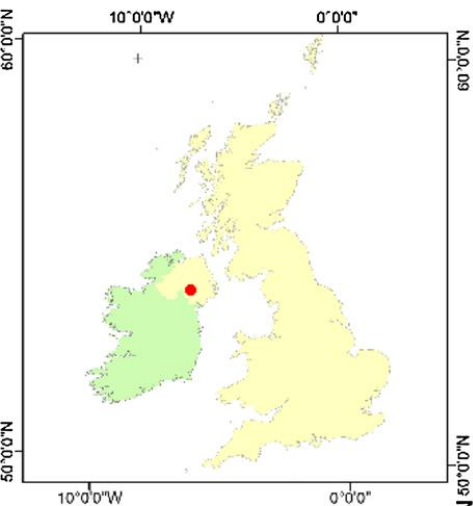
Woodland planted with ash trees (2500 stems ha⁻¹)

GRASS

6°36'50"W

6°36'40"W

6°36'30"W



54°23'50"N

54°23'50"N

6°36'50"W

6°36'40"W

6°36'30"W

- Grassland
- Agroforestry
- Woodland



WOODLAND

AGROFORESTRY

Establishing silvopasture

3 yr old



6 yr old



8 yr old



8 yr old



16 yr old



8 yr old



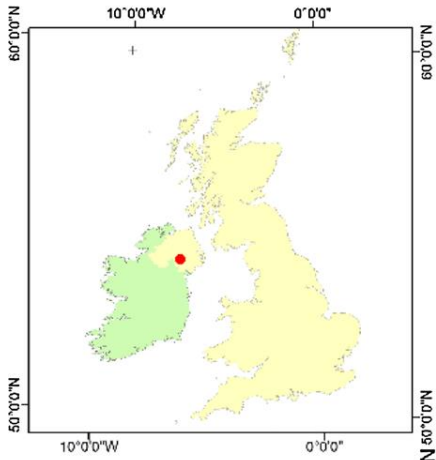
19 yr old



6°36'50"W

6°36'40"W

6°36'30"W



Grassland



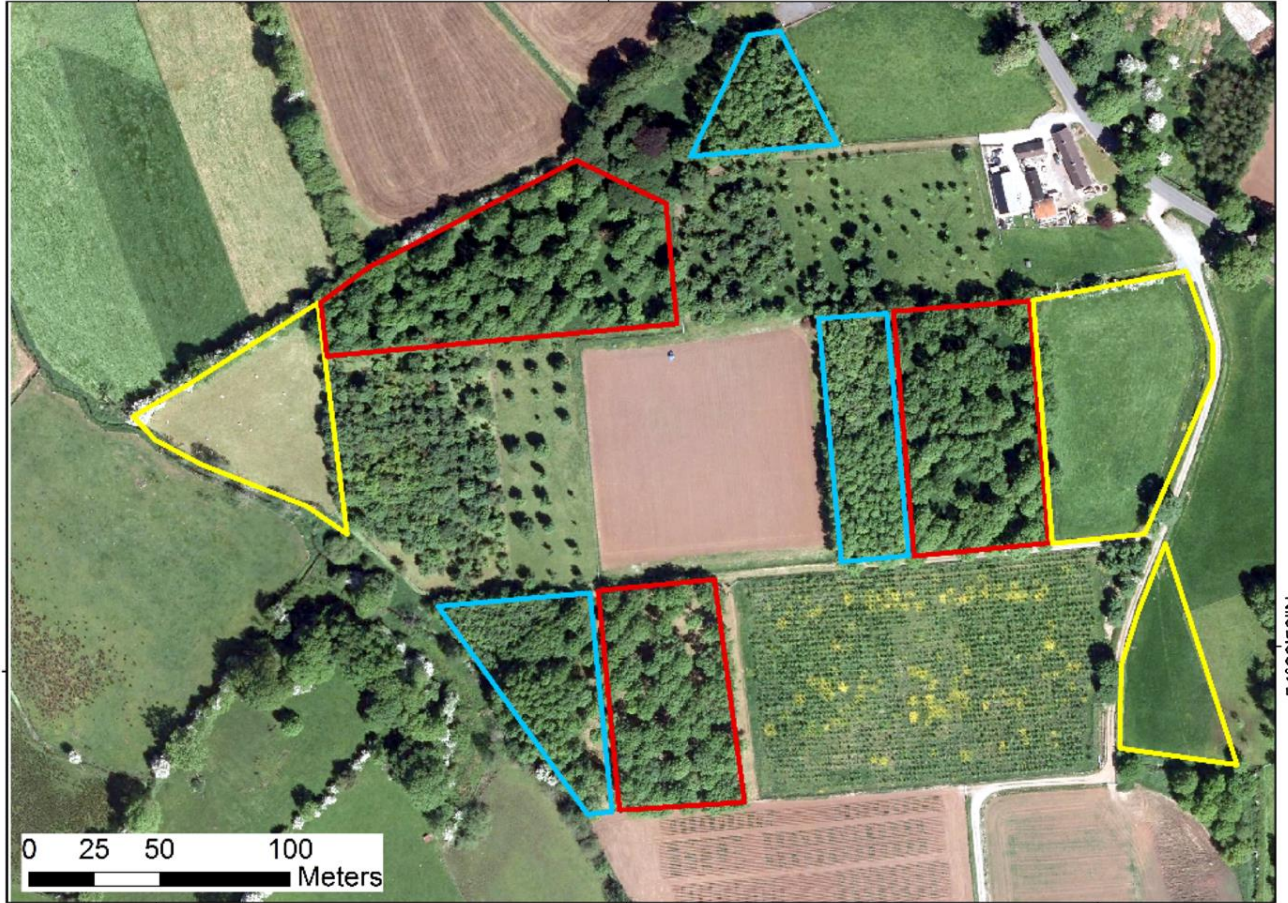
Agroforestry



Woodland



60°0'0"N
50°0'0"N
54°23'50"N



6°36'50"W

6°36'40"W

6°36'30"W

54°23'50"N

26 yr old





Ecosystem Services

Scenery

Pollination

Renewable Energy

Flood Control

Biodiversity

Crops

Fodder



Meat



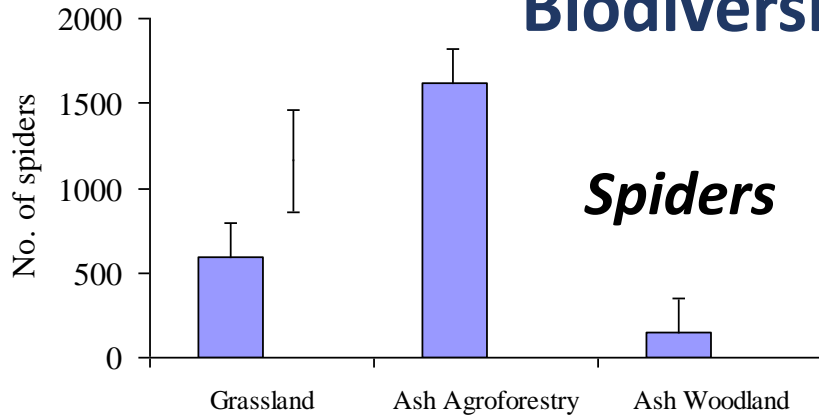
Wool

Carbon storage

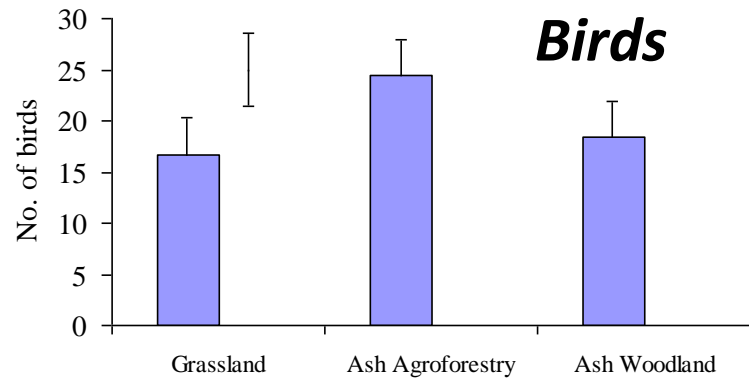
Healthy soil

Water purification

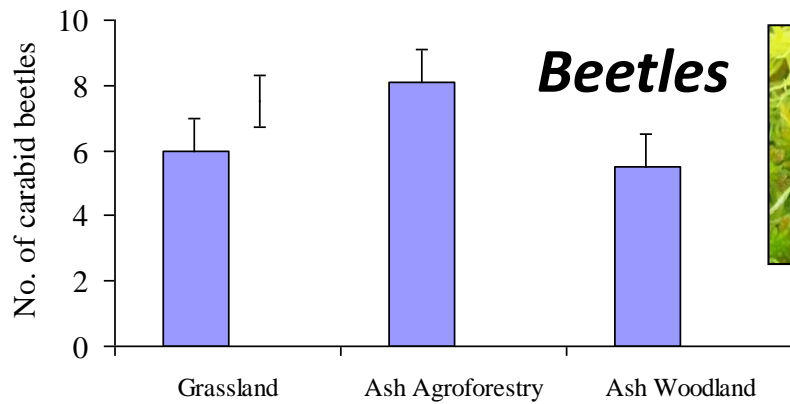
Biodiversity benefits



Earthworms



Flora



Pollinators

Carbon storage

When the carbon stored in the wood, pasture and soil 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

Resilience to extremes of weather

22 NEWS

Future for Ireland is 'warmer and wetter'



been hit with multiple storms and torrential rain causing localised flooding. (S.) Andy Gibson

John FitzGerald

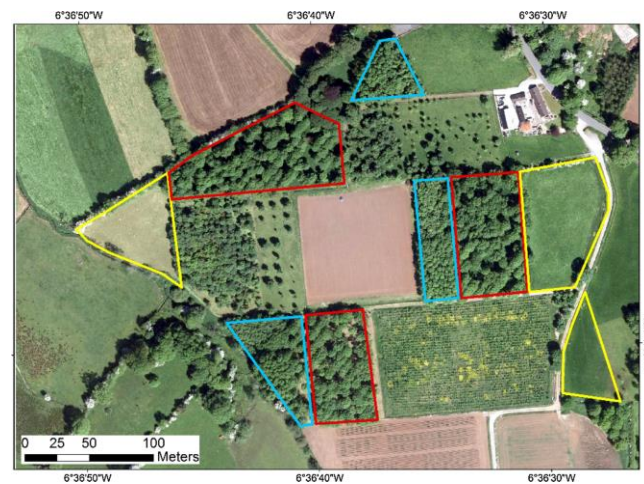
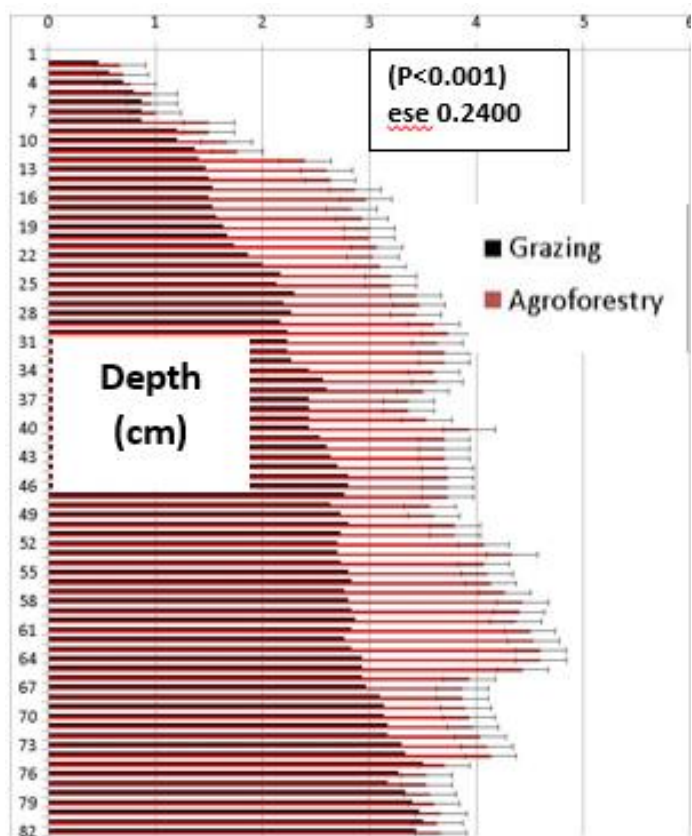


We need to prepare for a world with more floods

We also need to invest in nature-based solutions, such as strategic planting of trees and other vegetation that raise the capacity of soils to absorb water. Fifty

- Planting trees in the right place will allow water to permeate into the soil and reduce the risk of flash flooding
- Trees in agroforestry will also dry out wet land and result in a more productive understorey crop.

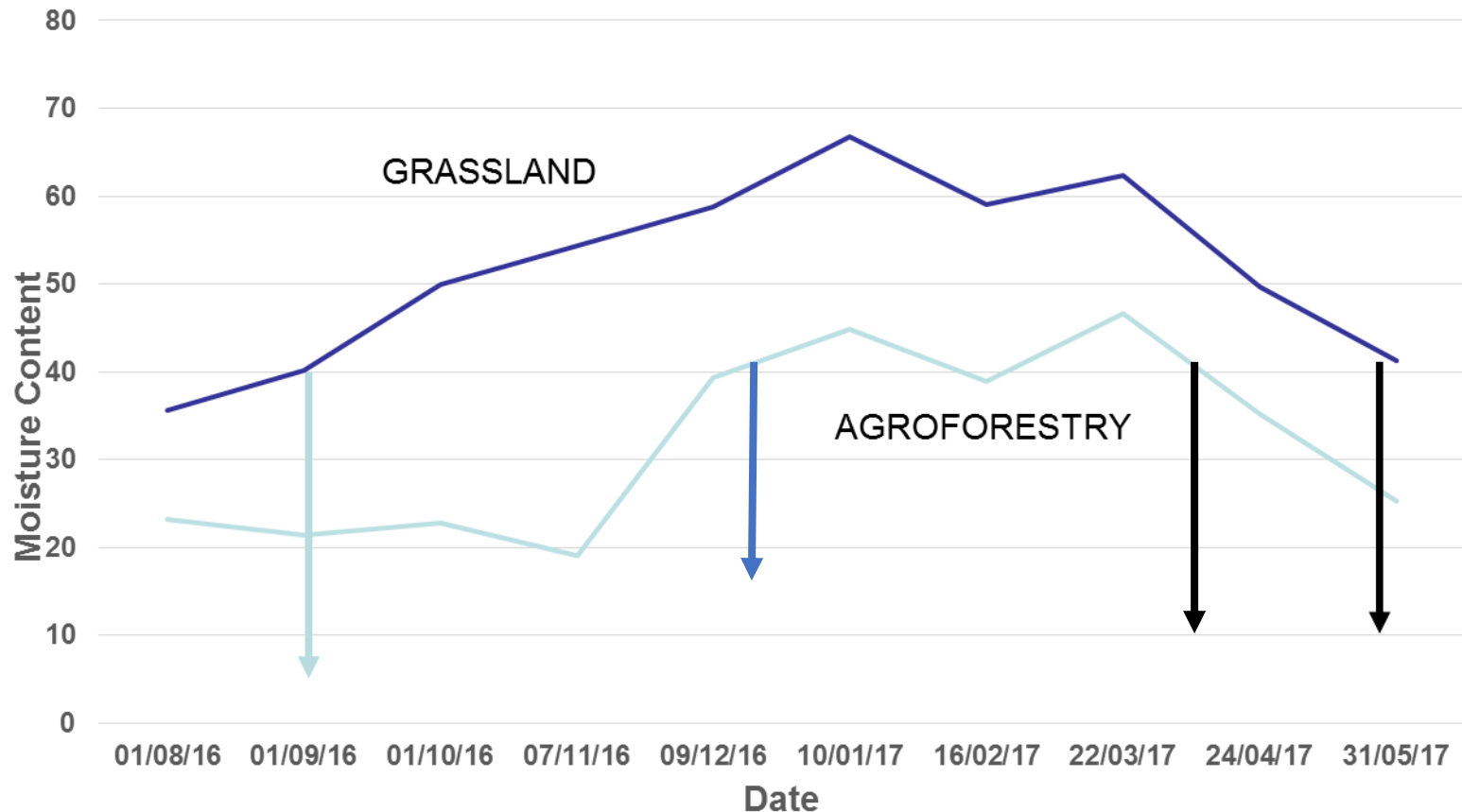
EVIDENCE ?!



infiltration potential was greater in the silvopasture than the grassland treatment down to 76cm (Sept-Nov)

Ability to sustain grazing-soil trafficability

Extended grazing season under agroforestry

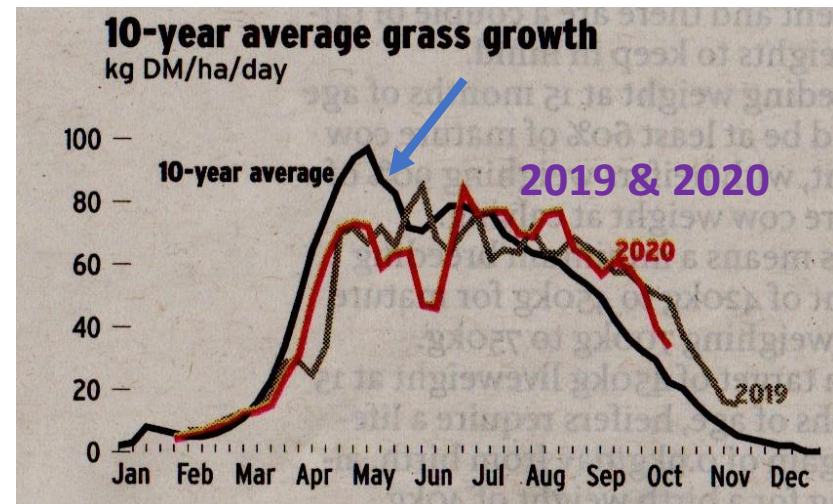
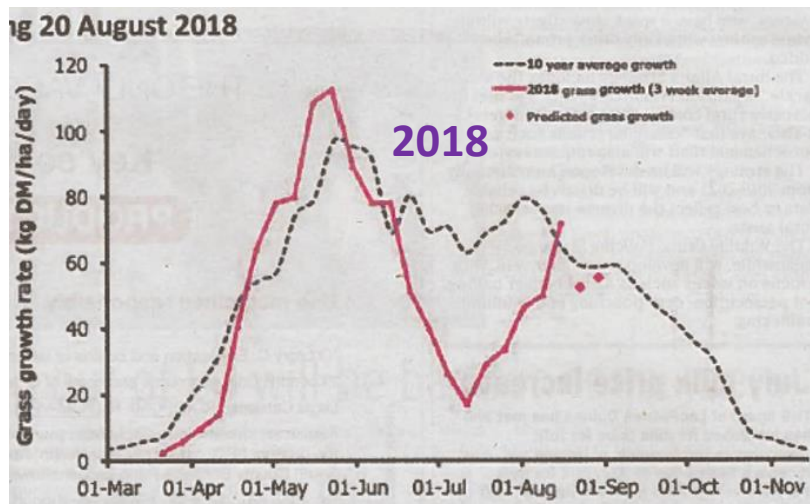


Assume 40% soil moisture content as a cut off, **we have 17 weeks longer “season” under agroforestry-5** in spring, 12 in autumn.

Resilience to weather extremes-

- **Drought**

GRASS GROWTH IN IRELAND



AFBI & Irish Farmers Journal

Wide spaced trees reduce windspeed and evapotranspiration

- **Storminess**

Densely planted trees with interlocked roots are more vulnerable to large-scale windthrow



Trees planted at wider spacing are more windfirm

Silvopastoral systems are more resilient to weather extremes

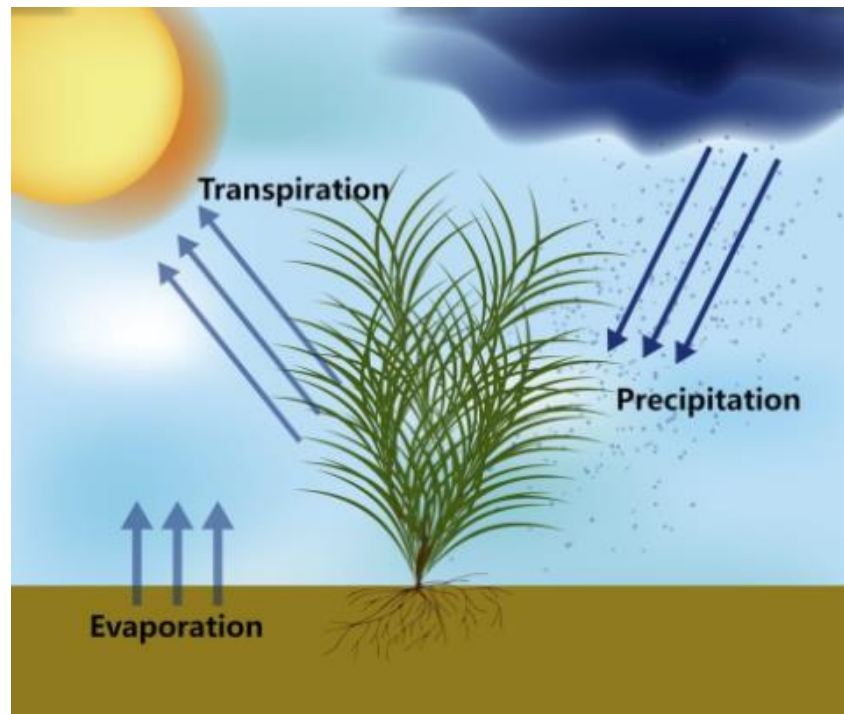
This will impact positively on animal welfare and crop performance

August 2018



Evapo-transpiration

The combined evaporation from the soil surface and transpiration from plants – **evapo-transpiration** - represents the transfer of water back to the atmosphere-ie the reverse of precipitation.



TREES REDUCE EVAPO-TRANSPIRATION

Animal Welfare

How do we measure welfare?

Healthy; mixed diet; variety in surroundings; cope with weather change; contented, not stressed

In silvopasture:

- Animals have a more varied diet, tree fodder, suits Multi Species Swards, - healthier
- Extension of grazing season - animals have reduced incidence of respiratory diseases.
- Variation in habitat structure. Reduces boredom?
- Stock seek out shade and shelter

... Significant Marketing Opportunity



Benefits to the animals

- Welfare-shelter and shade – diversity of surroundings



Tree fodder ...



There is evidence that eating twigs and leaves from trees can reduce methane emissions from ruminants



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Soil health

- There is a lot of evidence worldwide for the benefits agroforestry brings to soil health
- Soil physical structure-improved porosity, earthworms
- Organic matter-carbon in particulate matter,
- Mycorrhizal fungi
- The understorey component can be a multi-species sward to deliver more nutritious, carbon sequestering fodder.



- **Healthy soils are more climate - resilient**

SYSTEM OPTIONS

Trees can be incorporated into farms in a range of scenarios



- Silvopasture
- Hedgerows contain large quantities of stored carbon and sequester large amounts of CO₂ from the atmosphere annually



Examples of local agroforestry systems







On-farm innovation in tree protection

Conclusions

- Agroforestry gives increased climate resilience to farming and forestry systems
- Fits well into proposed **Ecoschemes**-and **carbon farming projects**-we now have a strong environmental evidence base.
- Agroforestry lends itself very well to organic and low-input systems
- Agroforestry can sequester more carbon than grassland alone
- By integrating trees into farms in a range of spatial options we can deliver carbon neutral livestock systems and reduce GHG emissions, improve soil health, carbon storage capacity, biodiversity enhancement, flood mitigation and cleaner water-***all climate positive***

How can we promote silvopasture on farms?

Two pronged attack

1. As a tree-production system whereby a form of forestry, using high-value trees, can be of great value to the beleaguered farming and forestry industry,
2. As a grassland system to produce nutritious wholesome food where farms can be made more sustainable and carbon friendly by incorporating trees at a range of levels.

Attitude and change

- We need a cultural and behavioural change to the role trees can play on farms
- Agroforestry is an innovative culture
- Innovation sometimes needs a new attitude, language, way of thinking,
- Its successful integration is one tool in a diverse suite of options working towards a sustainable agricultural industry and maintaining healthy rural communities.
- How can we do better? –Think about this!

(Thanks to Réamaí Mathers)

We need to promote agroforestry across the island - even if not everyone might want to hear the message!



Sustainability

How to make farms more climate resilient? The solution is simple: trees

(Catherine Cleary)

