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Driving Excellence & Innovation
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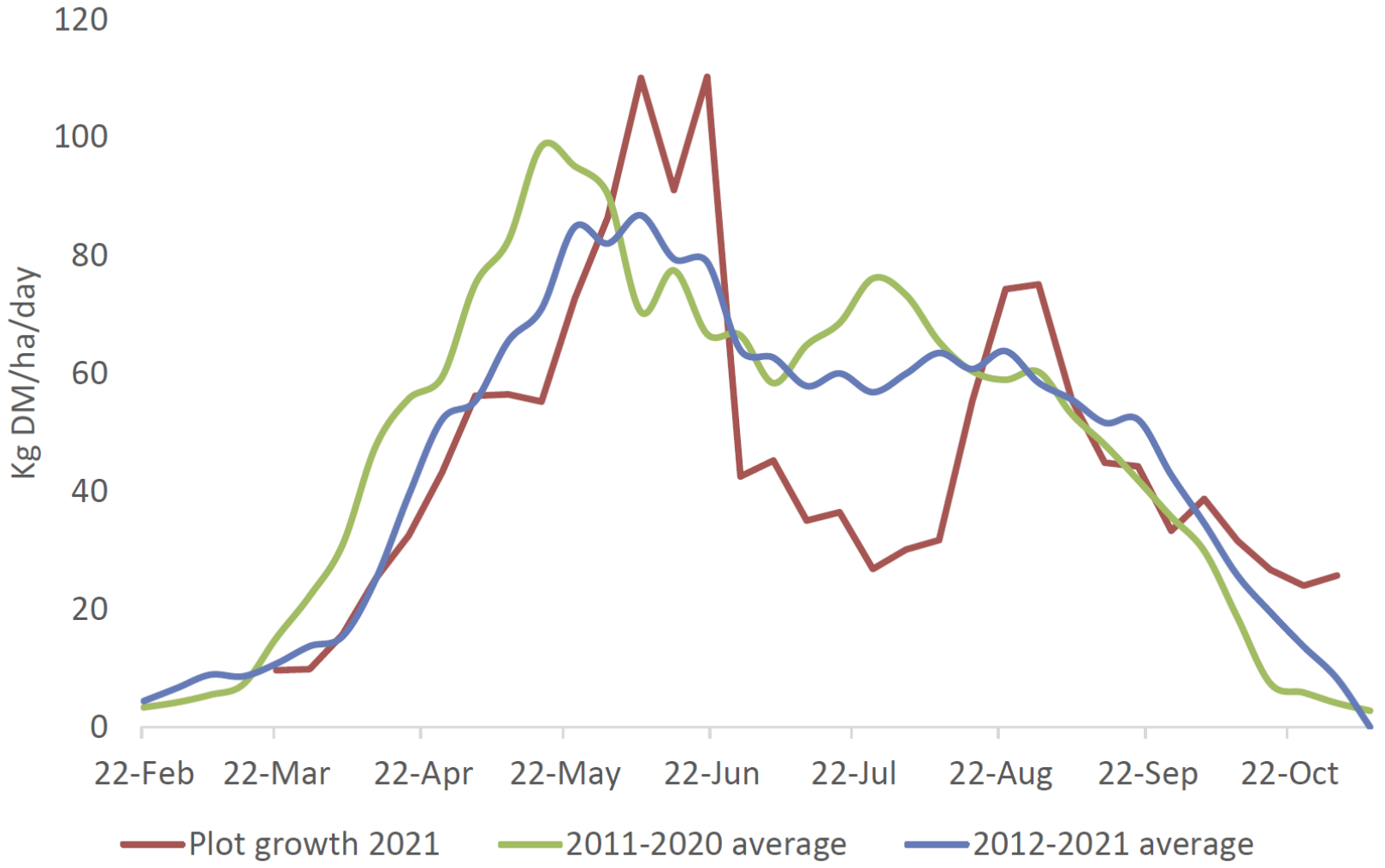
AGRI-FOOD & BIOSCIENCES INSTITUTE
cafre
College of Agriculture, Food & Rural Enterprise
QUEEN'S UNIVERSITY BELFAST
Multi-Species Swards
A View From The Farm
Tuesday 1st March
at 8pm
rural Development Programme
Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

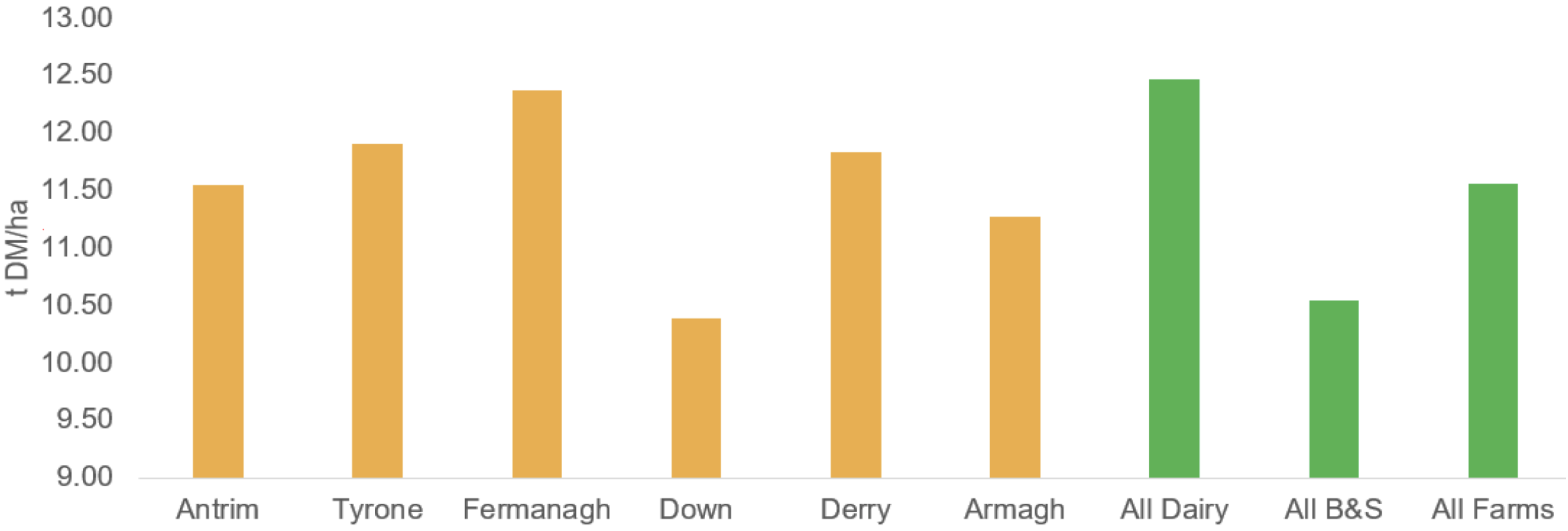

Farming is facing many challenges

GrassCheck 2021: Plot performance

- Total plot yields: 10.9 t DM/ha
- Previous 10 yr average = 12.6 t DM/ha
- Updated 10 yr average: 11.8 t DM/ha
  - Dropped good growth figures from 2011, and impacts of recent years affecting new av. curve
- 2021: -0.9 t DM/ha – largely in dry summer

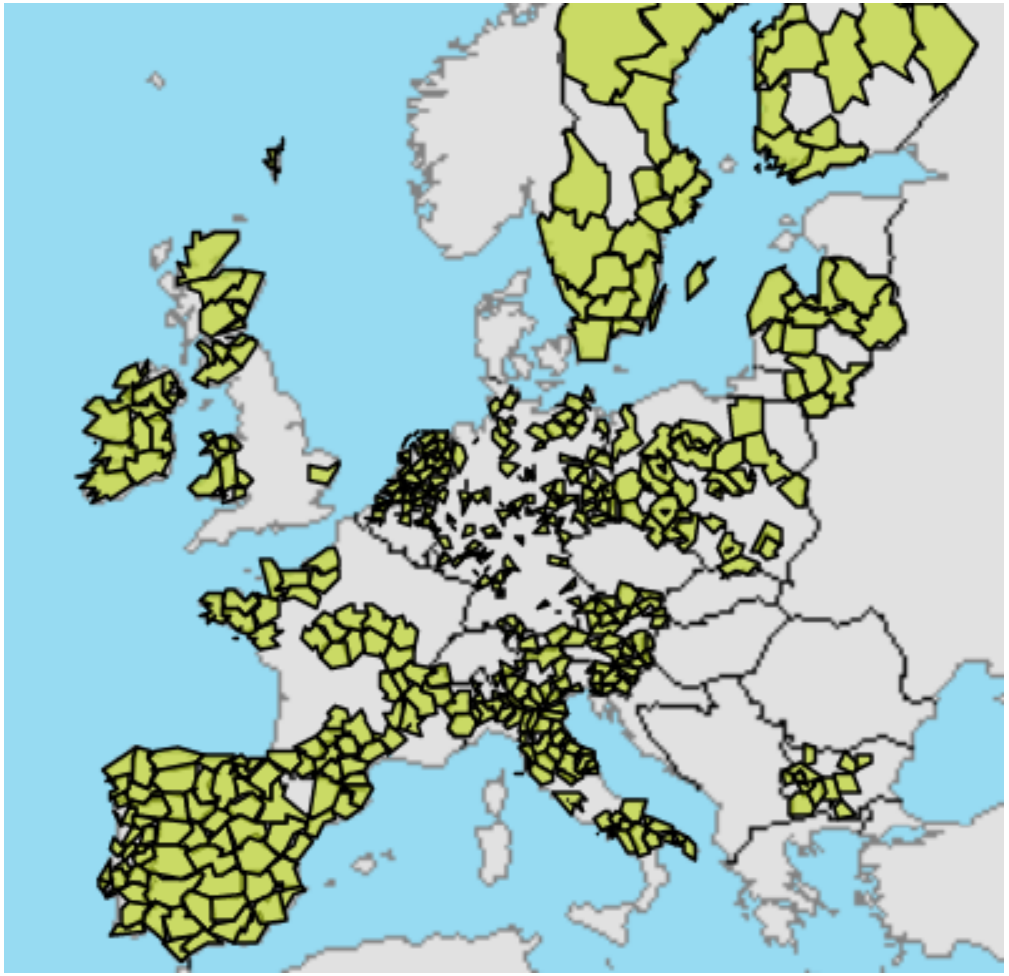


GrassCheck 2021: Grass production by county



European Innovation Partnership (EIP) Projects

- Designed to bring farmers, researchers and advisors together to help NI farmers innovate and address specific opportunities and challenges
- Jointly funded by the European Agricultural Fund for Rural Development and DAERA
- £120,000 funding available for each successful group
- Projects started November 2020
- Projects conclude June 2023



Multi-Species Swards for beef and Sheep EIP Project

Group Members:

- AgriSearch (Lead)
- Crosby Cleland
- Roger Bell
- Dale Orr
- Sam Chesney
- Paul Turley
- Andrew Clarke/Wayne Acheson
- AFBI - Denise Lowe
- QUB - Nigel Scollan

Project Aims:

- to investigate the feasibility and practicality of incorporating multi-species swards on NI commercial beef and sheep farms
- to significantly increase the knowledge of MSS establishment, management and use specific to NI
- to assess impact of MSS incorporation on animal performance (profitability) and wider environment
- share project outcomes and findings with the wider NI agricultural sector

SUPER-G

SUSTAINABLE PERMANENT GRASSLAND

- ✓ SUPER-G is a five-year project that brings farmers and policymakers from across Europe together to co-develop sustainable permanent grassland systems and policies.
- ✓ The project involves 21 partners from 14 countries across Europe
- ✓ One aim of the project was to recruit commercial and experimental farms to test different innovations that have the potential to improve PG management and ES delivery.

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Funded by the Horizon 2020 Framework Programme of the European Union GA 869274

Multi Species Swards

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QUEEN'S UNIVERSITY BELFAST

Dr David Patterson AFBI

Research Results

- Literature reviews
- Grazing and plot studies
- On farms project

Impact of rooting traits?

THE SOIL CARBON PROJECT

Duchy College, Rothamsted and Plymouth University

Preliminary findings – MSS have the potential to:

- break up compacted soils
- place carbon deeper into the soil
- improve soil organic matter
- & drought tolerance

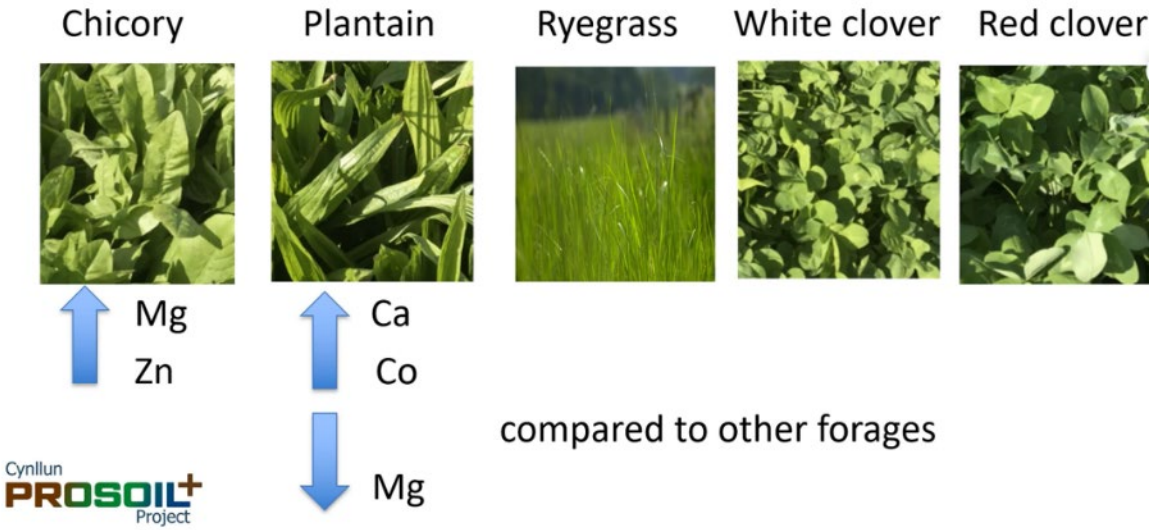
Multi-Species Swards

Mineral uptake – Animal health

Evidence of differences between grasses/ legumes/herbs:

- Darch *et al* (2020) showed herbs were highest in I and Se, grasses in Mn and legumes in Cu, Co, Zn and Fe
- Marley *et al* (2021) found that chicory had higher Ca and Cu and plantain had higher Cu and I than PRG.

Also:



Chicory

Plantain

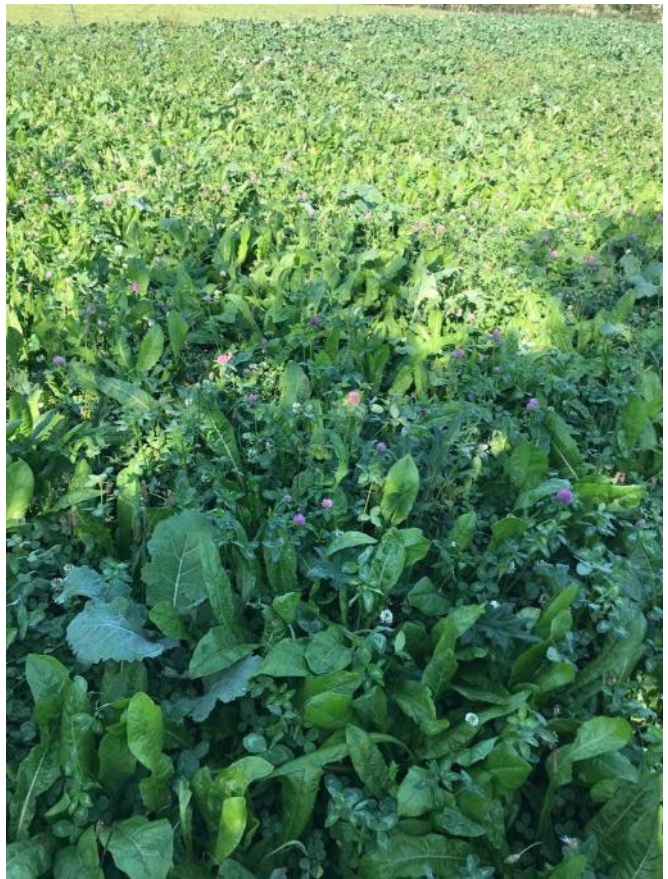
Conclusions from Literature Reviews

BENEFITS

- MSS have potential to use less artificial N fertiliser, with lower emissions
- more resilient to drought
- improved soil structure
- improved performance in lambs
- potential of improved mineral uptake
- lower requirement for anthelmintics

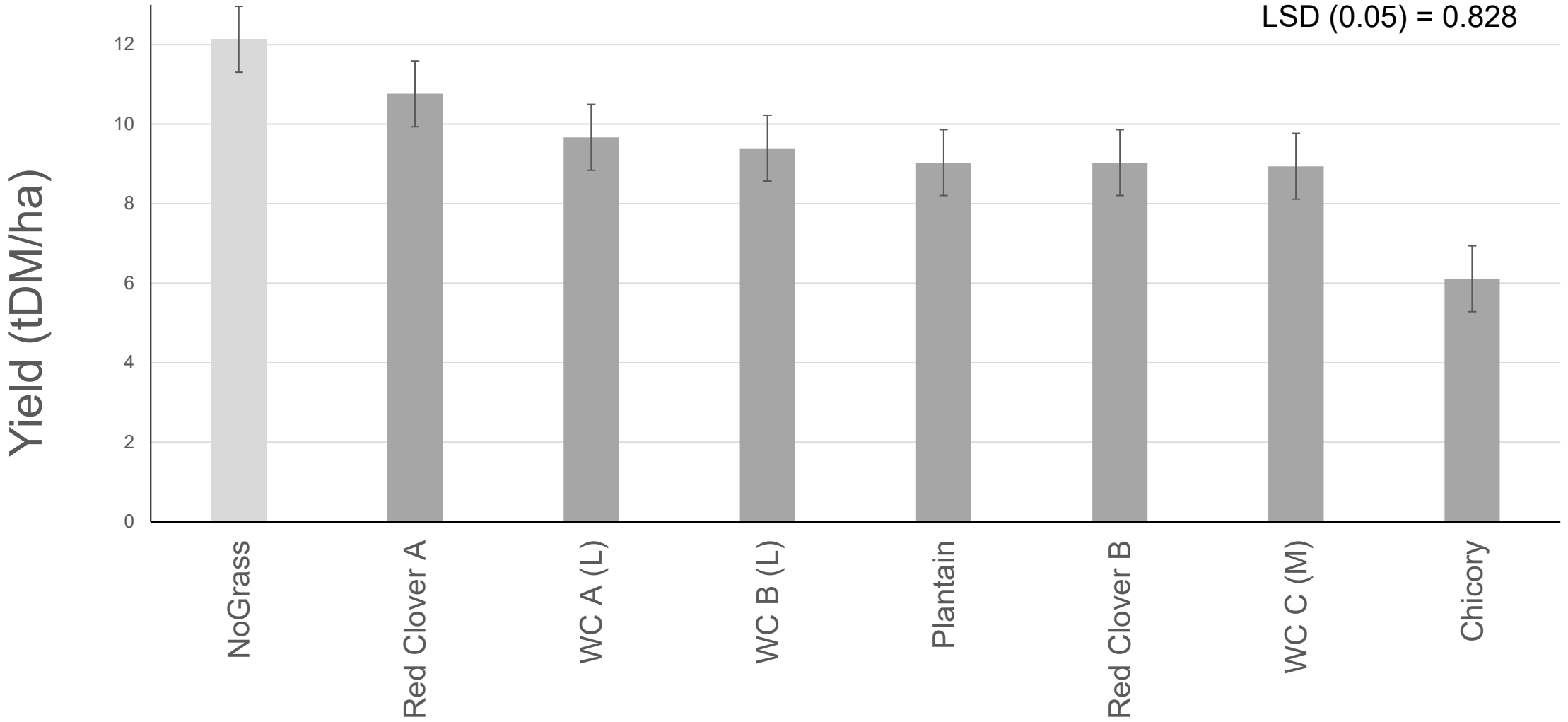
CHALLENGES

- requires different sward management
- persistency - maintaining herbs in the sward



Super G - AFBI Loughgall & Hillsborough trials

Herbage Yield (tDM/ha) of *NoGrass* and component varieties in 2021



Multi-Species Swards

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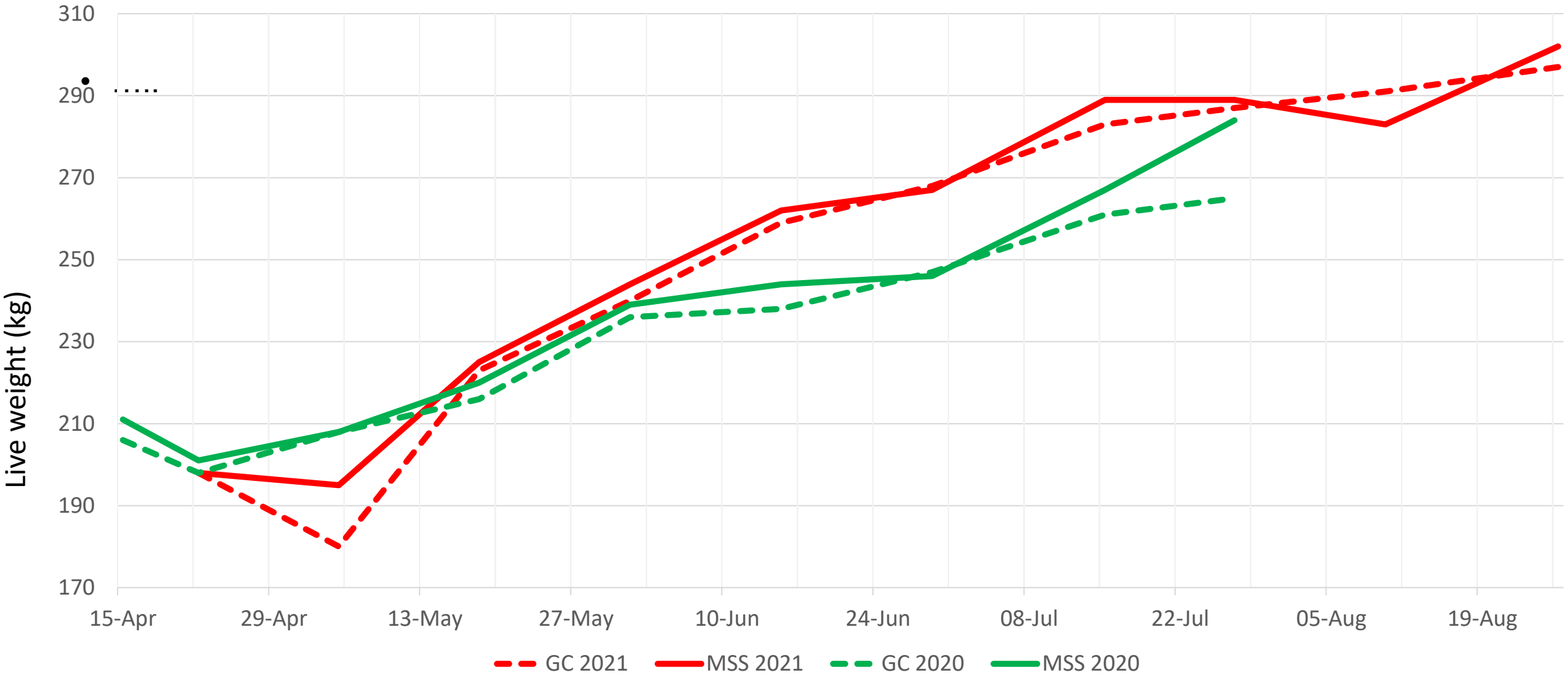
SUSTAINABLE PERMANENT GRASSLAND

Grazing study: AFBI Hillsborough

Performance of dairy origin calves on Grass/clover or MSS swards at AFBI



Animal health

Faecal Egg Count

	Mix A (GC)	Mix B (MSS)
20/4/2021	0	0
18/5/2021	39	18
15/6/2021	27	15
10/8/2021	108	51

Lower FEC with the MSS animals

Trace element analysis

	Mix A (GC)	Mix B (MSS)
Copper	19.9	20.5
Selenium	153	151

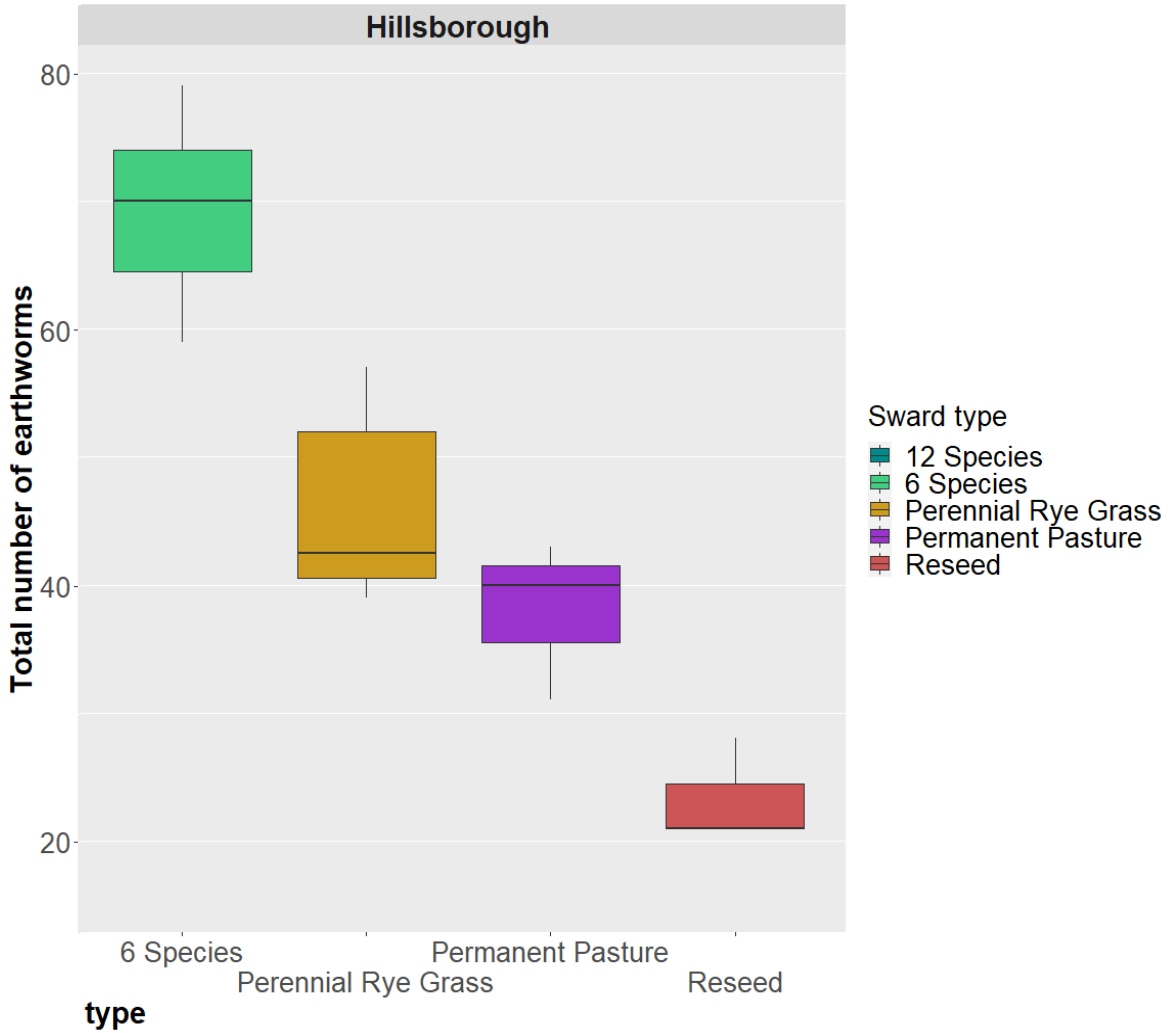
No evidence of differences

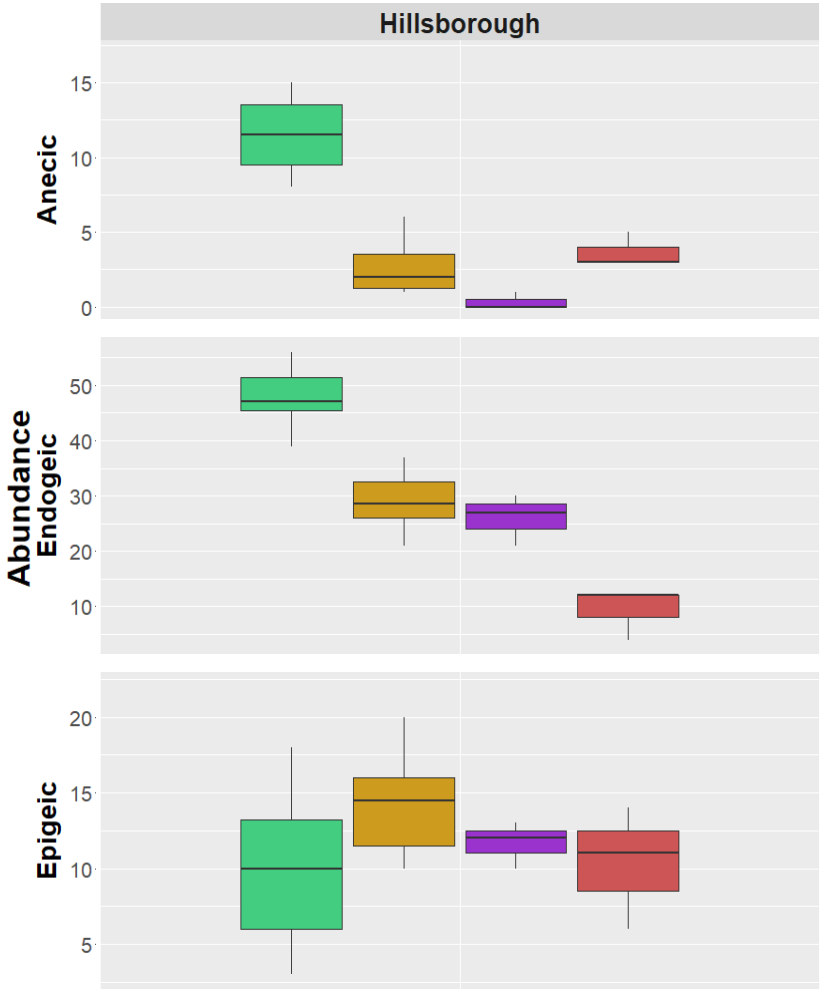
Earthworm samples from a perennial rye grass pasture (left) and a multi-species sward (right) Chris Boughton QUB

Visibly fewer earthworms from the left sample (PRG) compared to the right (MS).

The size of the earthworms can be a key feature for some guilds, larger species are typically anecic species – which are far more abundant on the right photo (MS) than the left (PRG).

Total number of earthworms across different sward types (left) and, Abundance of different earthworm guilds across sward type (right)





N.B.
Both graphs represent samples for the abundance of earthworms (total or guild) per 0.16m²

Preliminary conclusions

- MSS can produce higher yields than their component species, and offer an opportunity to reduce chemical fertiliser use
- MSS can achieve similar animal performance relative to grass/clover
- MSS appear to reduce worm burdens in livestock and reduce anthelmintic use
- MSS promote anecic species of earthworms which have positive impacts on water infiltration and soil aeration

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THIS PROJECT HAS RECEIVED FUNDING FROM THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME** UNDER GRANT AGREEMENT N. 774124

AFBI collaborative research

- Grazing study (beef cattle G/C vs MSS)
- Plot study (monocultures, mixtures, simulated grazing)
- EIP MSS On-farms study
- Long term nutrient study (MSS vs grass only)

- Resilient swards for ruminants (grass/clover & MSS swards–sheep lifetime) - *new*
- Plantain/ryegrass study (dairy cows) - *new*
- Livestock emissions (zero-grazed MSS) - *new*

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Acknowledgements

- EIP Group Members
- SUPER-G project
- Ecosward project
- DAERA & EAFRD funding

SUPER-G

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Ecosward project

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Funded by the Horizon 2020 Framework Programme of the European Union GA 869274

AgriSearch NI
Driving Excellence & Innovation

Ecosward project

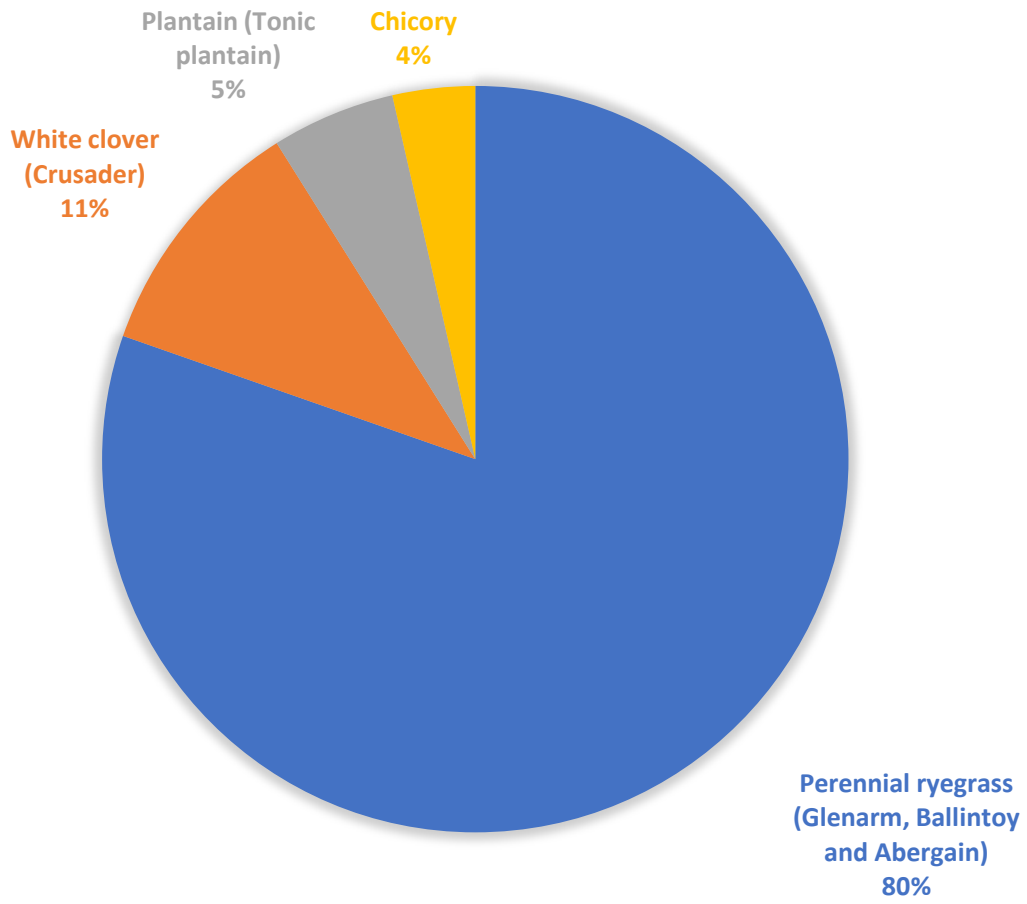
- Aim: Examine the potential role of multi-species swards on commercial farms in Northern Ireland in enhancing production and delivery of ecosystem services

Farm information

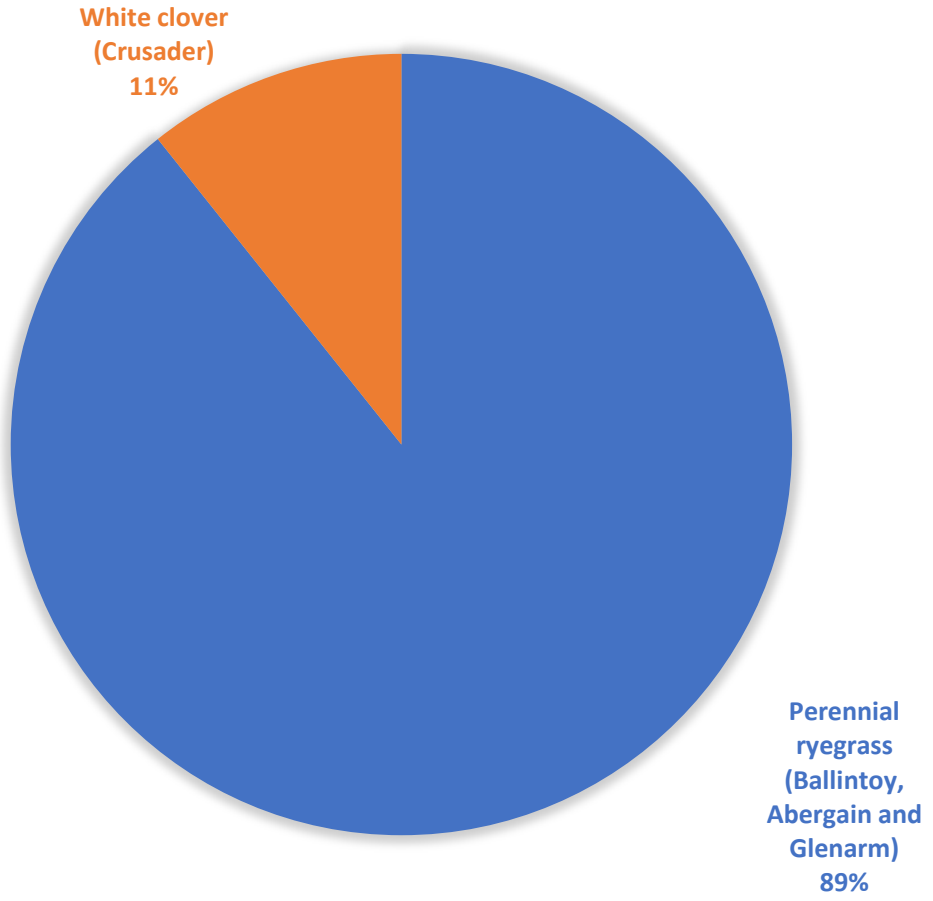
- A total of 7 farms are involved:
  - 2 sheep
  - 3 beef
  - 2 dairy

Sown species

Multi-species mix



Control mix



Farm D: both mixes also include timothy and meadow fescue

Yield results 2021

		Multi-species sward		Grass/clover sward (control)		
Farm	**Livestock**	**Utilised yield (Kg DM/Ha)**	**Fertiliser (Kg N/Ha)**	**Utilised yield (Kg DM/Ha)**	**Fertiliser (Kg N/Ha)**	**Percentage difference in yield (MSS vs Control) %**
A	Sheep	11,178	56	**12,220**	103	-9
B	Beef	**10725**	32	9875	32	+8
C	Dairy	**8577**	96	8029	96	+7
	Dairy	**12,205**	135	10,935	135	+11
D	Sheep	**7822**	25	6358	25	+21
	Sheep	**6140**	53	5193	53	+17

Overall, the multi-species yield was 7% higher than the grass/clover yield, using 11% less N fertiliser

Quality results 2021

Average dry matter:

- MSS - 18.8%
- Control - 20.9%

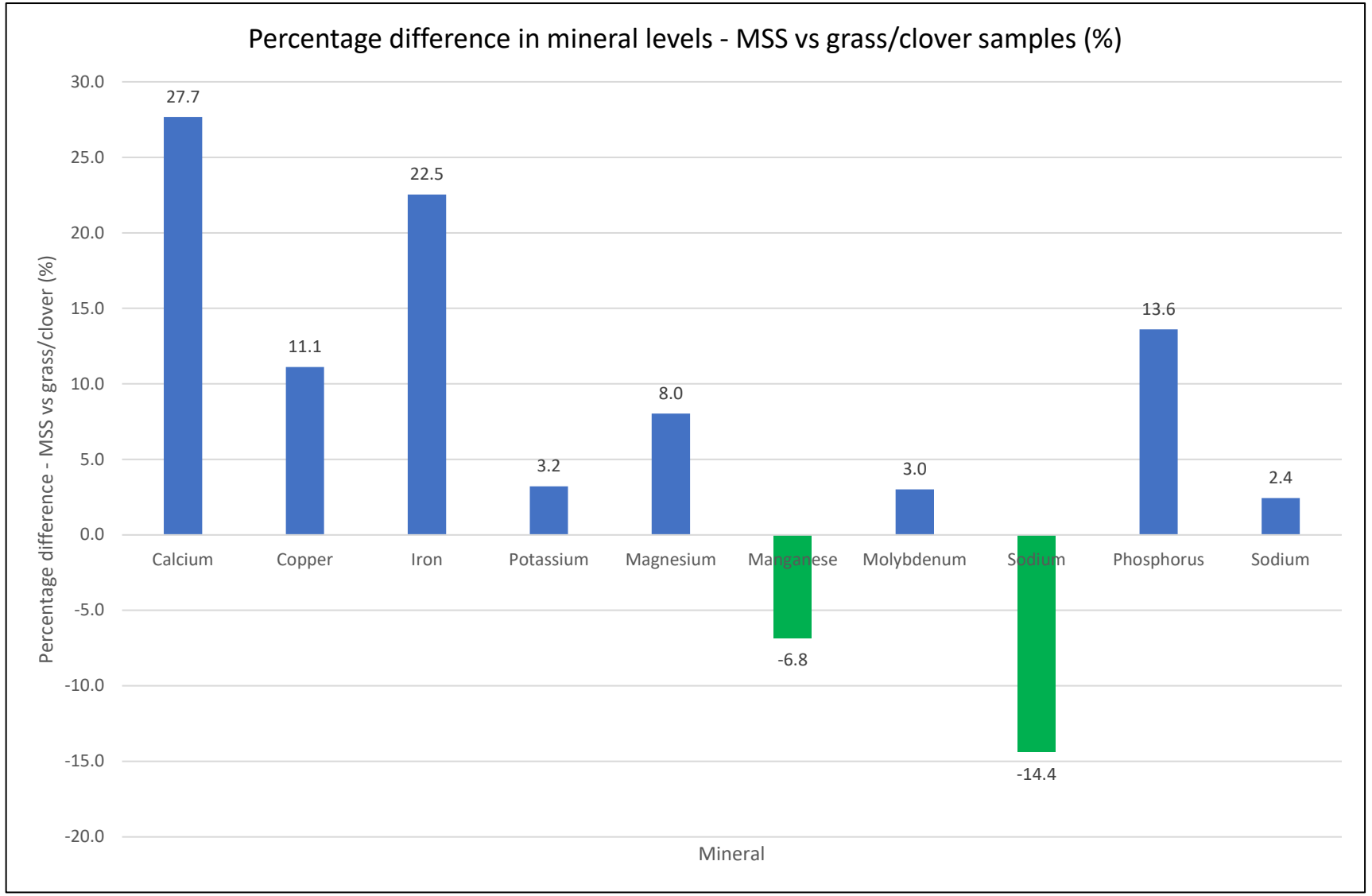
Nutrient	Multi-species sward (g/kg DM)	Grass/clover sward (g/kg DM)	Percentage difference – MSS vs Control (%)
Crude protein	191	199	**-4.1**
Neutral Detergent Fibre (NDF)	364	382.7	**-5.0**
Acid Detergent Fibre (ADF)	176	180.3	**-2.4**
Water soluble carbohydrate	242.2	259.2	**-6.8**

These initial quality analysis results are based on a small number of samples (8 grass/clover and 9 herbal samples)

Herbage quality results 2021

MSS samples were higher in most minerals compared to grass/clover samples

Mineral	MSS samples (mg/kg DM)	Grass/clover samples (mg/kg DM)
Calcium	7823	5921.6
Copper	5.7	5.1
Iron	132.3	105.5
Potassium	29733.1	28792.5
Magnesium	1311	1209.8
Manganese	62.2	66.6
Molybdenum	1.01	0.98
Sodium	2259.8	2610.1
Phosphorus	3028.2	2642.2
Sodium	3558.7	3473.2

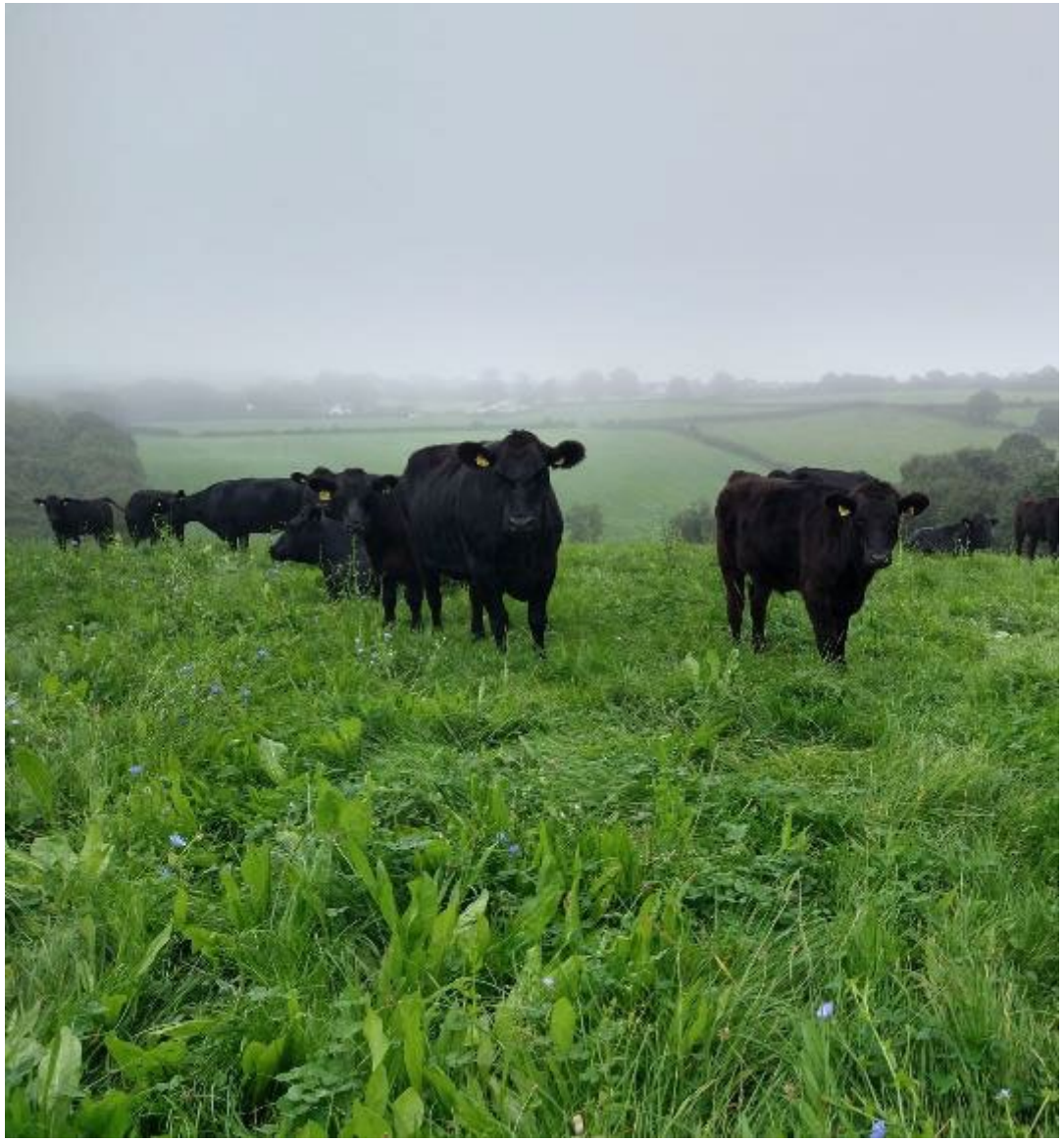


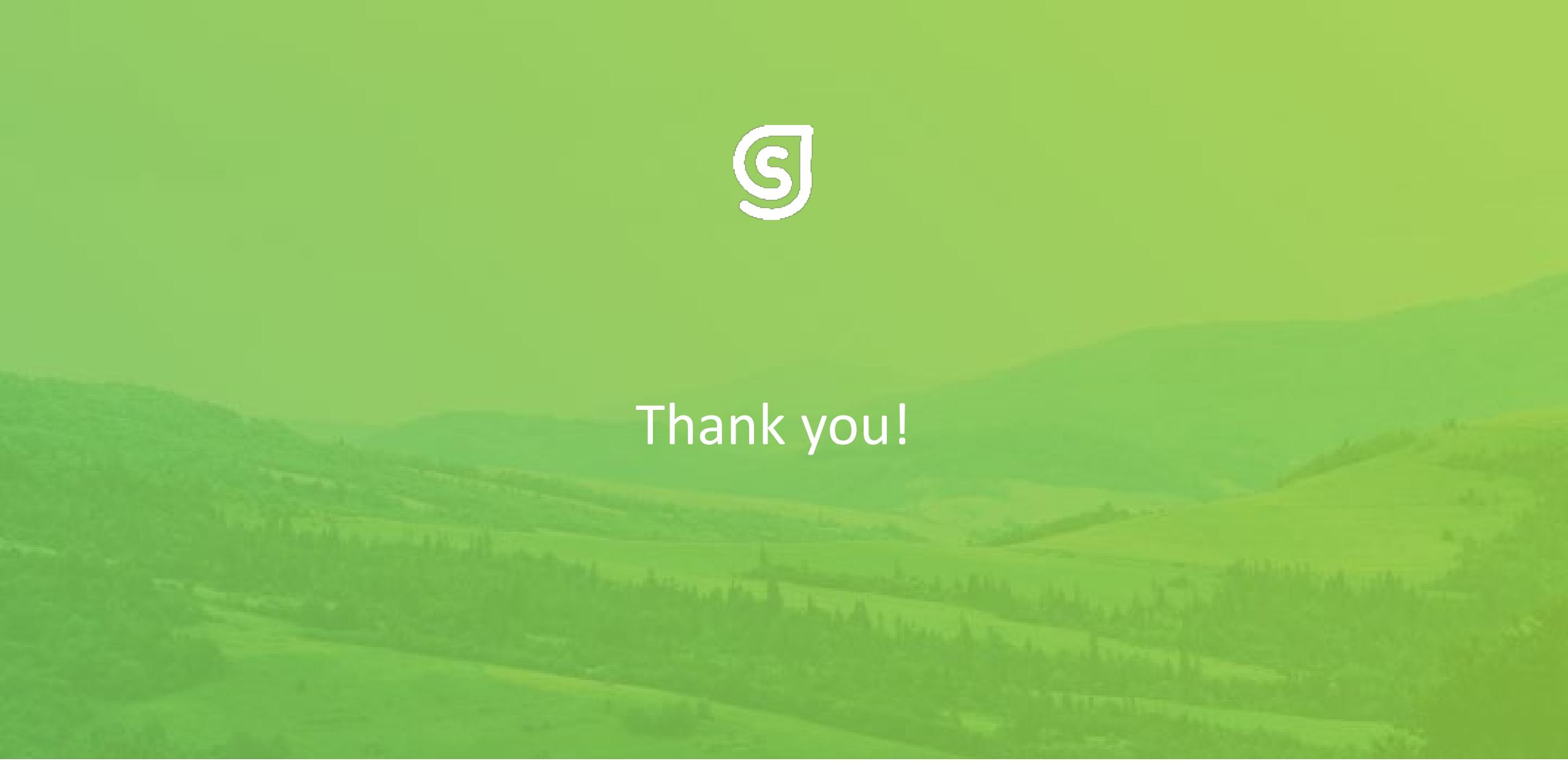
These initial quality analysis results are based on a small number of samples (8 grass/clover and 9 herbal samples)

Conclusions so far

- MSS can produce comparable or slightly higher yields to grass/clover swards, with lower fertiliser inputs

- MSS quality:
  - DM is slightly lower
  - Slightly lower in crude protein, water soluble carbohydrate and sequential fibres (NDF & ADF)
  - Higher in the majority of the minerals that we tested for




Thank you!


Paul & Frank Turley
Downpatrick, Co. Down
Picture: 18 species mix 25/07/2021

Multi-Species Swards

About the farm

- 160ha Farm
  - Aberdeen Angus and Wagyu Beef Enterprise
  - 180 spring calving cows
  - 60 autumn calving cows
- Cattle grazing grass a minimum of 240 days/yr
- Whole farm paddock grazing system
- All cows & most weanlings outwintered on brassica and silage
- Most beef finished of grass
- Clay Soils, Heavy & Medium Classification, pH 6.6 – 7.3 and correct for P & K
- Shallow soils close to rock

Reasons for Multi Species

- Need to try control input costs
- Want to gain a better understanding of:
  - The health and liveweight gain benefits of MSS
  - The potential for carbon sequestration and potential for methane reduction
- Frequent dry conditions in recent years
- Established a range of different MSS mixes to compare what species / mix best suited to the farm

Picture: 6 species mix 20/08/2021

Multi-Species Swards Mixes

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Range of Sward Mixes Sown (40 acres, 10 fields)

Cotswold GS4 Diverse Herb & Legume mix - 18 Species

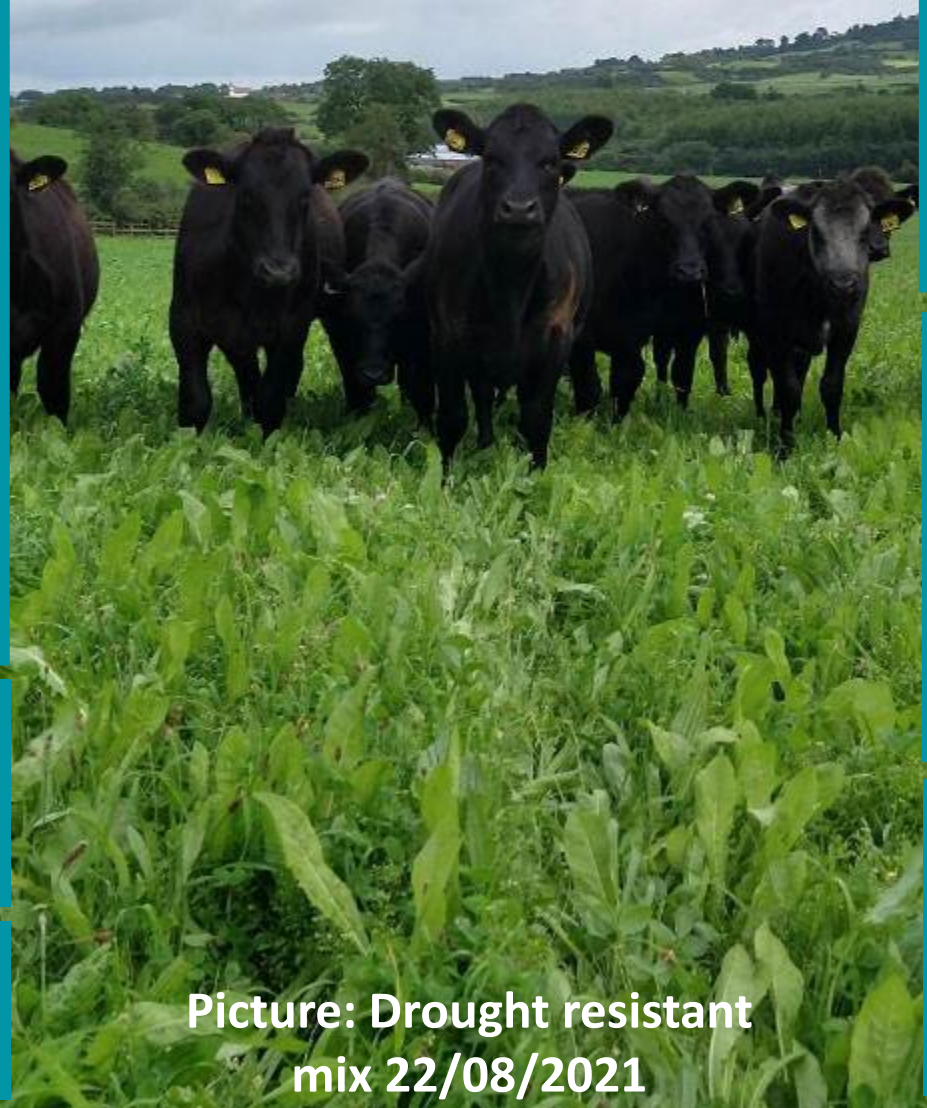
- Tetraploid PRG, Diploid PRG, Cocksfoot, Timothy, Meadow Fescue, Tall Fescue
- Alsike Clover, Red Clover, White Clover, Sweet clover, Vetch
- Plantain, Chicory
- Sanfoin, Birdsfoot Trefoil, Burnet, Yarrow, Sheeps Parsley
- Knapweed Wildflower

No Grass

- Red Clover, White Clover
- Plantain

Pure Chicory

- Chicory (will need nitrogen)



Picture: Drought resistant mix 22/08/2021

DLF 6 Species

- PRG, Timothy
- Red Clover, White Clover
- Plantain, Chicory

Drought Resistant Mix (Dale's)

- Cocksfoot, Meadow Fescue, Timothy
- Red Clover, White Clover
- Plantain and Chicory
- Bag of mixed herbs: Burnet, Yarrow, Sheeps Parsley, Sanfoin

Cotswold Worming Paddock Mix

- Sanfoin
- Meadow Fescue and Timothy
- Chicory, Birdsfoot Trefoil, Plantain

Multi-Species Sward Establishment

April 2021
Plough, power harrow, roll, seed, roll

May 2021
Slow to establish, high weed burden

Multi-Species Sward Establishment

June 2021

Grazed / trampled then topped. (Weeds or herbs?!)

Multi-Species Sward Establishment

July 2021
Looking a lot better

August 2021
Pure Chicory stand

Multi-Species Sward Management

February 2022 – 18 species mix
Approx. 1750 kgDM/ha post grazing

Further notes on experience so far:

- Grazing 2021 – mid June – end Oct
- Grazing 2022 – commenced 1st Feb
- No fertiliser applied
- Worming paddock mix – no sainfoin grew (main component!)
- Small number of sainfoin plants in other mixes
- Pigeons ate all pure stand of chicory over winter, now moved onto mixes
- Plantain wintered well (not much frost so far)

Roger & Hilary Bell

Kells, Co. Antrim

Roger & Hilary Bell – Kells, Co. Antrim

- 78ha Farm
  - Lowland and Upland Sheep Flock (Main)
  - Beef finishing
- Spring 2021
  - Lambed 420 ewes & 120 ewe lambs
- Sheep grazing grass a minimum of 275 days/year
- PRG is the main grazing sward on farm
- Enjoy innovating on farm and always aim to improve efficiency – hope to see improved performance of ewes/lambs when grazed on MSS

EIP Project – DLF 6-Species Mix

DLF 6-Species Mix:

- PRG
- Timothy
- Chicory
- Plantain
- Red Clover
- White Clover

Detail

- Established 2021 – 7 acres (1 field)
- Silty Clay Soils, Organic Classification, pH 6.2
- 700mm rain 2021 (906mm 2020)
- Wetter farm conditions were a consideration in mix selection

Establishment

Stale Seed Bed Establishment Method:

- Spray off old sward (End April 2021)
- Plough and Disc to create seed bed (Mid May 2021)
- Wait (10-14 days soil Moisture depending)
- Remove germinated weed seeds – spray or harrow (Mid-June)
- Sow and Roll (End July 2021)

(+ drain, land level, & lift stones!)

NB - Weather had an impact

Stale Seed Bed Weed Growth

EIP Experience so far…

6 Species Mix February 2022

- Sward Sown – Late July 2021
- First Grazing 2021 – September
- Last Grazing 2021 - November
- First Grazing 2022 - March

Main Benefits/Challenges so far…

- Stale Seed Bed method a long process
- Didn’t sow enough to keep a batch of lambs exclusively on MSS – will be looking at how it performs as part of a grazing rotation
- Cover management – grazing too tight?

Crosby Cleland

Saintfield, Co. Down

Crosby Cleland – Saintfield, Co. Down

- 74ha Farm with a Lowland Sheep Flock
- 850 Lleyn, Highlander X and Aberfield X ewes, with Primera, NZ Suffolk and Abermax terminal sires
- Rearing from 1.5 to1.6 lambs per ewe put to the ram each year
- Aim to improve grassland management and lamb output with less days to slaughter
- Looking to use MSS to improve DLWG of the flock and keep growth in sward during draught summer periods

EIP Project – Farm Specific Mix

Detail

- Establishing in 2021 – 19.3 acres over

  2 silage fields & 4 x 2 acre paddocks
- Clay Soils, Organic Classification, pH 6.2-6.9, P Index 2
- 770mm rain in 2021 (850mm 2020)
- Consideration in species mix selection:
  - Soil type
  - Climate/Weather
  - Sheep Palatability
  - Heading time
  - Grazing only/ Grazing & Silage

Species Mix:

- PRG
- Timothy
- Tall Fescue
- Cocksfoot
- Chicory
- Plantain
- White Clover
- Red Clover in Silage sward only so far

Establishment- Direct Drill

- Reseed in late summer and with no tillage required I am less dependant on weather conditions
- Grazed tight (didn't spray this year – have previously
- Direct Drill (Einbock) – Criss-cross Runs
- Rolled twice along with sheep tramping in seed

- Stitched in Silage fields June 2021 directly after silage removed.
- Stitched in the grazing paddocks mid August 2021
- Waiting to see the full results this Spring
- Direct drill means less weeds, less work & less costs for me and with sheep this works really well.
- Animal performance looks good and with more paddocks now in MSS especially during the 8 weeks with no rain last summer
- I will be comparing lambs DLWG on these sward compared to PRG only mixed swards this year.

EIP Experience so far…

EcoSward PRG/WC (Left) vs. MSS (Right)
Late July 2021 – Direct Drilled Summer 2020

Sam & Lauren Chesney

Kircubbin, Co. Down

Sam Chesney – Kircubbin, Co. Down

Farm Details

- 80ha Farm
  - Suckler Beef, Store Cattle and Blade Calves
  - Lowland Sheep Flock
- Fairly Intensive Grassland System

Why MSS?

- Drought tolerance
- Maximise Yield
- Improve soil structure and fertility
- Sequester more carbon
- Nitrogen Fixing (clover)

EIP Project – MSS Establishment

Species Mix:

- PRG
- Timothy
- Chicory
- Plantain
- Red Clover
- White Clover

Grass Clover

Plantain

Chicory

Detail:

- Established May 2021 – 5 acres (1 field)
- Clay Soil, Heavy Classification, pH 6.4
- Plough, power harrow, roll, spray, wagtail
- Redstart nurse crop

Sward Management

2nd July 2021

- First grazing of multi-species sward
- 48 hour time difference between the photos

Sward Management

Mid July 2021

- Multi-species sward (left) still growing 12 days after being grazed despite the dry soil conditions and hot weather!
- Compared to a regular grass only field (right) also grazed 12 days previous

EIP Experience so far…

- Have grazed both cattle and sheep on MSS so far
- Focus will be on suckler cows and calves in the EIP project going forward as part of a mixed grazing rotation
- MSS performed well in the dry conditions last summer – didn't graze till July and still grew 10t
- Noticeable increase in biodiversity in the MSS fields – insects and birds
- Putting in more paddocks (10 acres this summer)
- Cattle now have a preference for the herbs
- Heavy field – does get tramped easily – need to take this into account

Dale Orr

Churchtown Farm, Strangford, Co. Down

Dale Orr – Churchtown Farm, Strangford, Co. Down

- 204ha Owned/Rented – Organic System
- Spring 2021
  - Lambed 368 ewes & 73 ewe lambs - 806 live lambs
  - Calved 80 cows & 26 heifers - 103 live calves
- Sheep grazing grass a minimum of 300 days/yr
- Sheep outwintered on stubble turnips & silage
- Aim to maximise output from minimal inputs
- Have a range of grazing mixes on farm for different purposes
  - PRG/White Clover
  - PRG/Red Clover
  - MSS Mixes

EIP Project – Drought Resistant MSS Mix

Seed mixture (per acre):

- 6kg Baraula Cocksfoot
- 1.5 kg Barvital Meadow Fescue
- 0.5 kg Comer Timothy
- 1 kg Aberclaret Red Clover
- 1.5 kg Aberpasture White Clover
- 1 kg Tonic Plantain
- 0.5kg Puna 11 Chicory

Nurse Crop (per acre):

- 1.5kg Redstart (Hybrid Brassica)

Detail:

- Clay Soils, Heavy Classification, pH 6.4-7.1
- Established 2021 – 14.6 acres (3 fields)
- Standard Establishment (Plough, Harrow, Sow, Roll)
- Have had 3 dry spring/summers in the last 4 years
- Trial Mix - Hope to compare and contrast

Sward Management

- Rotational grazing
- Paddocks of around 5 acres in size
- Take stock out at higher covers than ‘normal’
- Weeds will be present

Performance

- Sward Sown – Mid-April 2021
- First Grazing 2021 – Late June 2021
- Last Grazing 2021 – Early Dec. 2021
- First Grazing 2022 - Early March 2022
- Should yield 10t DM/ ha with no nitrogen inputs

EIP Experience so far…

Drought Resistant Mix February 2022

- Organic – No fertiliser - Good/comparable Yields
- Drought tolerant
- Has been able to finish lambs quickly – approx. 350g/day
- Possible anthelmintic effect (exploring this in more detail next year)

But…

- Needs a change of mindset – different management to a PRG sward to be successful

Discussion

Questions & Answers

Forthcoming Events

3rd March	Webinar: NI Sheep Programme - Developing A Sustainable System
10th March	Webinar: Leatherjackets in Grassland – The Challenge
27th April	Farm Walk: ARCZero at the farm of Hugh Harbison, Aghadowey
Summer (TBC)	Farm Walk: Multi-Species Swards