afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

AgriSearch NI
Driving Excellence & Innovation

QUEEN'S UNIVERSITY BELFAST

Multi-Species Swards for Beef & Sheep EIP Group

Multi-Species Swards
"Learning by Doing"

Monday 13th June
Paul & Frank Turley's
Downpatrick, Co. Down

For further information please visit www.agrisearch.org

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

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

rural Development Programme

TODAY'S FARM WALK

STOP 1 INTRODUCTION TO THE FARM AND THE MULTI-SPECIES SWARDS FOR BEEF & SHEEP EIP GROUP

STOP 2 ESTABLISHMENT OF MULTI-SPECIES SWARDS

STOP 3 ANIMAL HEALTH

STOP 4 SILAGE WITHOUT FERTILISER

STOP 5 GRASSLAND MANAGEMENT AND ANIMAL PERFORMANCE

STOP 6 WHERE NEXT, TAKE HOME MESSAGES & ACKNOWLEDGEMENTS

FOREWORD

Farmers are facing many challenges including the rising cost of fertilisers, anthelmintic resistance and extremes of weather, as well as demands to reduce their carbon footprint and improve biodiversity. Research results from other parts of the British Isles and further afield have indicated that multi-species swards present an opportunity to address many of these challenges through reduced need for artificial fertilisers, resilience to weather extremes (particularly drought), improved soil quality and carbon sequestration, reduced need for anthelmintics and enhanced biodiversity above and below ground

There is rapidly growing interest in multi-species swards amongst Northern Ireland farmers but there is a lack of practical information about how multi-species swards can be established, managed and utilised successfully. The farmers in our group have been "learning by doing" and in a short space of time have accumulated valuable knowledge and experience which they will impart at this farm walk.

Over the past 18 months' six beef and sheep farmers have been working together to explore the feasibility and practicality of incorporating multi-species swards on Northern Ireland Beef and Sheep farms via a European Innovation Partnership (EIP) group led by AgriSearch with scientific support from AFBI and Queen's University Belfast. Their experiences to date are the focus for today's farm walk.

Paul, a beef farmer, established six different sward mixes over 40 acres in 2021, ranging from a diverse 18 species mix to a simple pure chicory sward, and a number the more usual 6-species and red clover silage mixes in between. As Paul expected some have fared better than others and have given him an excellent insight into what species and mixes are best suited to his needs. Incorporating MSS wasn't without it's challenges with weeds being a particular issue but a change in mindset and perseverance have paid off with the swards now performing extremely well. Apart from the pure chicory mix no artificial N fertiliser has been sown since the swards were established in April last year.

I would like to take this opporunity to thank Paul & Frank Turley for hosting us today and to the other farmer members of the "Multi-Species Swards for Beef & Sheep" EIP group (Roger & Hilary Bell, Sam Chesney, Andrew Clarke (farm manager for Wayne Acheson), Crosby Cleland and Dale Orr) who have inspired me with their enthusiasm and committment to this project.

I would also like to thank scientific colleagues from AFBI and Queen's University Belfast who have made an invaluable contribution to this EIP Operational Group.

Finally I would like to acknowledge our funders. The European Innovation Partnership (EIP) scheme is part of the Northern Ireland Rural Development Programme (NIRDP). It is jointly funded by the European Agricultural Fund for Rural Development (EAFRD) and the Department of Agriculture, Environment and Rural Affairs (DAERA).

Jason Rankin
General Manager
AgriSearch

Multi-Species Swards – Learning by Doing

Multi-species Swards for Beef and Sheep

European Innovation Partnership (EIP) Group

Project Start: November 2020

Project End: June 2023

Funding:

- Jointly funded by the European Agricultural Fund for Rural Development and DAERA
- Designed to bring farmers, researchers and advisors together
- Help NI farmers innovate and address specific opportunities and challenges

Group Membership:

- Dale Orr, Strangford
- Andrew Clarke (W. Acheson), Cookstown
- Crosby Cleland, Saintfield
- Paul Turley, Downpatrick
- Roger Bell, Kells
- Sam Chesney, Kircubbin
- AFBI
- QUB
- AgriSearch (Lead)

Multi-Species Swards – Learning by Doing

Multi-species Swards for Beef and Sheep

European Innovation Partnership (EIP) Group

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 Northern Ireland
- to assess impact of MSS incorporation on animal performance and wider environment
- determine prospects for success of widespread MSS incorporation on NI commercial farms
- share all project activity and results

Multi-Species Swards – Learning by Doing

Multi-species Swards for Beef and Sheep

European Innovation Partnership (EIP) Group

Activity to date:

- Literature review
- Establishment
- Study Tour
- Webinar
- Sward Management
- Animal Performance Monitoring
  - DLWG
  - Anthelmintic Effect

Multi-Species Swards – Learning by Doing

About the farm

- Paul & Frank Turley, Downpatrick
- 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 – Learning by Doing

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)

DLF 6 Species

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

Drought Resistant Mix (Dale Orr's)

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

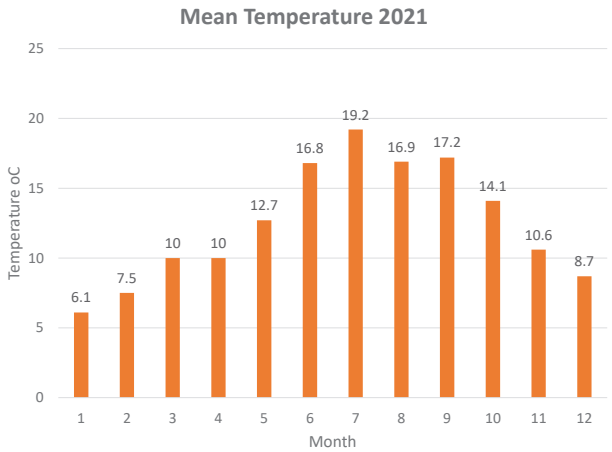
Cotswold Worming Paddock Mix

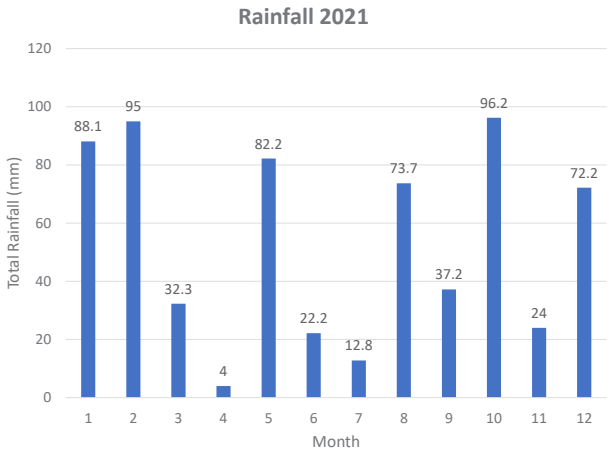
- Sanfoin
- Meadow Fescue and Timothy
- Chicory, Birdsfoot Trefoil, Plantain

Picture: Drought resistant mix 22/08/2021

Multi-Species Swards – Learning by Doing

F & P Turley – Farm Climate





Total Rainfall in 2021 – 639.9mm

Multi-Species Swards – Learning by Doing

Farm Walk – Field 1 – 6 Species Sward

Seed mixture:

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

Experience:

- Established April 2021
- Cover: _____ kg DM/ha
- Days since grazed:
- Rotation No:
- Current Growth: _____ kg DM/ha/day
- Cumulative growth _____ t DM/ha

Multi-Species Swards – Learning by Doing

Farm Walk – Field 1A – "No Grass" Sward

Seed mixture:

- Red Clover
- White Clover
- Plantain

Experience:

- Established April 2021
- Cover: _____ kg DM/ha
- Days since grazed:
- Rotation No:
- Current Growth: _____ kg DM/ha/day
- Cumulative growth _____ t DM/ha

Multi-Species Swards – Learning by Doing

Farm Walk – Field 2 – 18 Species Sward

Seed mixture:

- PRG (Tetraploid & Diploid)
- Cocksfoot
- Timothy
- Fescue (Meadow & Tall)
- Alsike Clover, Red Clover, White Clover, Sweet Clover, Vetch
- Plantain, Chicory
- Sainfoin, Birdsfoot Trefoil, Burnet, Yarrow, Sheep's Parsley, Knapweed

Experience:

- Established April 2021
- Cover: _____ kg DM/ha
- Days since grazed:
- Rotation No:
- Current Growth: _____ kg DM/ha/day
- Cumulative growth _____ t DM/ha

Multi-Species Swards – Learning by Doing

Establishment – Field Selection

- With MSS there is very limited use of herbicides so select fields that do not have a heavy burden of weeds
- Fields with a good grass content can be overseeded with a clover/herbs only mixture
- The basic field requirements are broadly similar to those for grass/clover swards:
  - correct soil pH (pH 6.5) required
  - correct soil index for P and K required (Index 2+ or above)
  - avoid heavy, poorly drained fields
- Soils can be improved through lime, farm yard manure, P&K fertiliser (avoid high N compound fertiliser).
  - e.g. Index 2: 50kg Phosphate/ha and 40-60kg Potash/ha with a later application of N 25kgN/ha only if required. Seed bed N may only encourage weeds and boost existing grass sward when overseeding.

Establishment - Seed Bed Preparation

- A firm, well consolidated, fine seed bed is essential
- When using min-till methods, create some bare earth at the surface and reduce the competition from the existing grass sward by repeated passes with spring tine harrows.
- To minimise any trash residue at or near the soil surface:
  - graze as tight as possible (ideally with sheep) prior to seed bed preparation OR mow for silage
  - harrow the soil surface with passes in different directions
- The depth of seed bed is very important. If seeds are placed too deep, the seedlings will never emerge. Clover, Timothy, chicory & plantain are all very small seeds therefore aim to place seeds no deeper than 10mm

Multi-Species Swards – Learning by Doing

Post - Sowing

- After sowing the seed bed may need to be rolled twice, once in either direction.
- Seed:soil contact and soil moisture are vital for successful germination. If surface is very dry and no rain is forecast, wait for the correct weather window.

Weed Control

- It is essential to control any broad-leaved weeds such as docks, thistles pre-sowing, as once the sward is established there are no herb-safe herbicides available to control dock, chickweed etc.
- After ploughing the ‘stale seed bed’ method can be used to ‘exhaust’ the population of weed and grass seeds near the soil surface.
- Sowing in April or in July-August is recommended, as germination and growth is limited when soil temperatures drop below 10°C in late summer.
- Slug pellets can be used to enhance establishment if required.

Stale Seed Bed Method

- Spray off old sward before soil preparation
- Cultivate to prepare the seed bed
- Leave the field for at least 10-14 days (soil moisture-depending) to allow the weed seeds to germinate
- Remove the germinated weed seeds:
  - Spray off (preferred option), or
  - Use a trailed harrow to dislodge weed seedlings - this must be shallow to prevent more weed seedlings coming through at a later date.
- As soon as possible after weed removal sow the seed mixture, with minimal soil disturbance

Multi-Species Swards – Learning by Doing

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

May 2021
Slow to establish, high weed burden

Multi-Species Swards – Learning by Doing

June 2021
Grazed / trampled then topped. (Weeds or herbs?!)

Multi-Species Swards – Learning by Doing

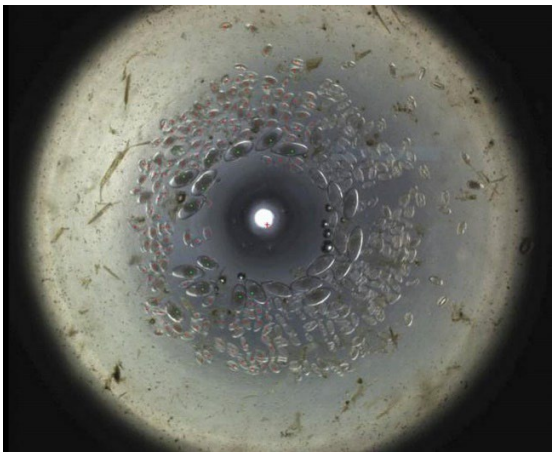
July 2021
Looking a lot better

August 2021
Pure Chicory stand

Multi-Species Swards – Learning by Doing

Anthelmintic Effect – Faecal Egg Counts

- Plantain and Chicory contain beneficial levels of condensed tannins which have been suggested to possess anthelmintic properties through reduced survival, growth and/or fecundity of nematodes in the gut
- Regular Faecal Egg Counts being undertaken on farm to determine the extent of the impact – potential to reduce need for anthelmintics



FecPak G2 - Faecal Egg Count Sample

Multi-Species Swards – Learning by Doing

Farm Walk – Field 4 – Red Clover Silage Mix

Seed mixture:

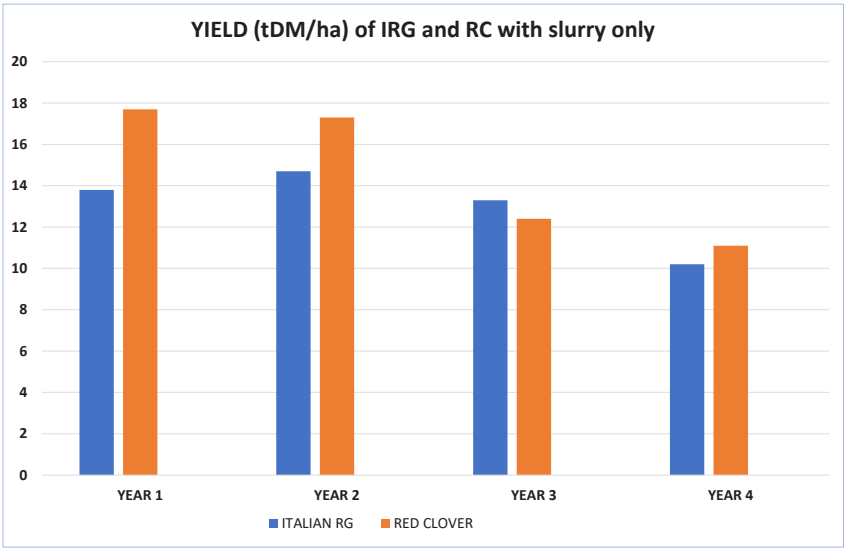
- 29% Late perennial ryegrass (Aspect)
- 21% Late perennial ryegrass (Solas)
- 50% Red Clover blend

Experience:

- Established April 2021
- Cover: _____ kg DM/ha
- Days since grazed:
- Rotation No:
- Current Growth: _____ kg DM/ha/day
- Cumulative growth _____ t DM/ha

Multi-Species Swards – Learning by Doing

Silage without Fertiliser



SWARD TYPE	4 YEAR YIELD AVERAGE (tDM/ha)	% Difference (Relative to PRG)
PERENNIAL RG	10.1	
HYBRID RG	11.8	+17%
ITALIAN RG	13.0	+29%
PRG/WHITE	12.6	+25%
RED CLOVER	14.6	+45%

Source: low input forages for ruminant production systems. Dale et al (2011)

Multi-Species Swards – Learning by Doing

Red Clover for Silage

Teagasc Grange monitored grass-red clover silage mixtures over 6 years:

- Grass-red clover with no N fertiliser produced similar total annual DM yield to a grass-only sward receiving 412 kg N/ha per year (15.8 vs. 15.7 tDM/ha)
- Early harvest (26th May) compared to late harvest (11th June) increased sward red clover content (62% vs. 46%)
- Red clover content and herbage production were greater when 0 kg N/ha was applied (61% and 15 tDM/ha, respectively) compared to when 50 kg N/ha were applied (48% and 14.8 tDM/ha, respectively)

Multi-Species Swards – Learning by Doing

Management of Red Clover

- Seeding rate: 20-22 kg/ha of grass seed plus 7-10 kg/ha* of red clover seed white clover added at a rate of 1 kg/ha if required. (*13kg/ha RC only)
- Establishment year: allow RC to flower before harvesting 1st cut silage to aid root and N-fixing nodule development
- Silage harvesting: cut at intervals of 6-8 weeks (between bud development and early flowering).
- Take 3-4 silage cuts, with the last cut no later than mid-October.
- In autumn: cut or graze (October) without poaching, soil compaction and avoid physical damage to the plant crowns.
- Silage crops: mow to a residual height of 7-8 cm.
- Post-grazing sward height of 6 cm.
- N.B. Oestrogen levels can lower ewe fertility – current advice is do not allow breeding ewes to graze red clover swards or eat red clover silage for +/- 6 weeks around mating.
- Red clover typical lifespan: two to four years.

Multi-Species Swards – Learning by Doing

Farm Walk – Field 5 – Drought Resistant Mix

Seed mixture:

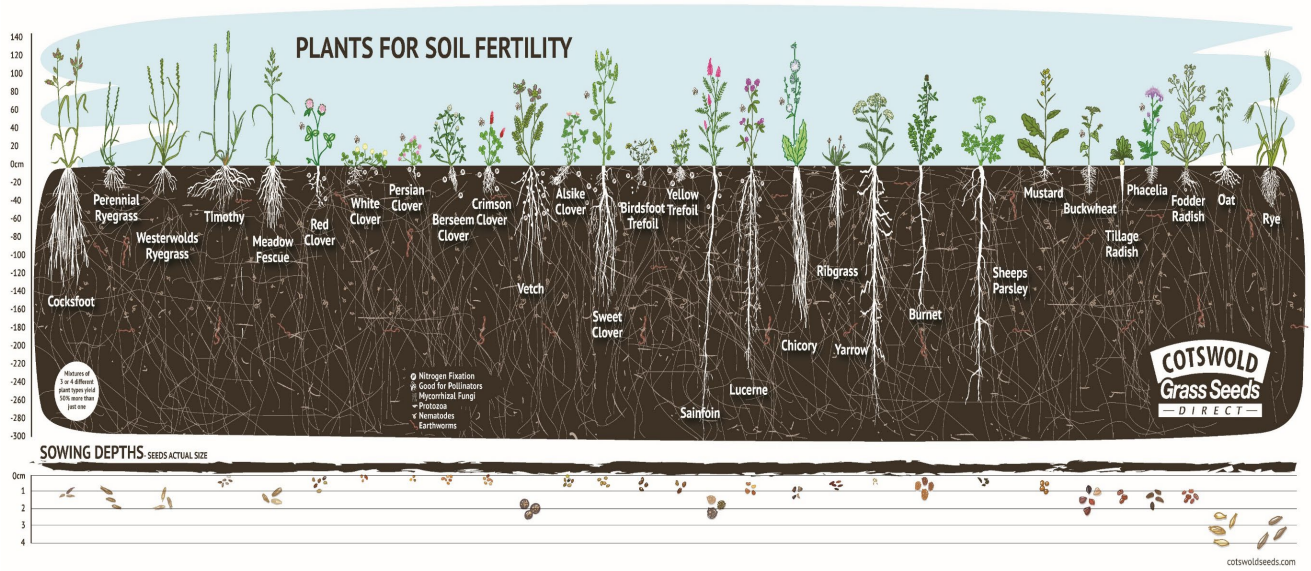
- Cocksfoot
- Timothy
- Meadow Fescue
- Red Clover, White Clover
- Plantain and Chicory
- Burnet, Yarrow, Sheep's Parsley, Sainfoin

** Kale Nurse Crop

Experience:

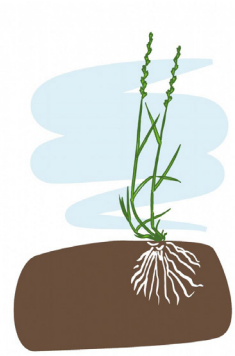
- Established April 2021
- Cover: _____ kg DM/ha
- Days since grazed:
- Rotation No:
- Current Growth: _____ kg DM/ha/day
- Cumulative growth _____ t DM/ha

Which species to use?

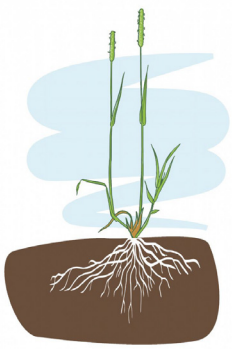


Multi-Species Swards – Learning by Doing

SPECIES IDENTIFICATION GUIDE - Grasses



Perennial Ryegrass



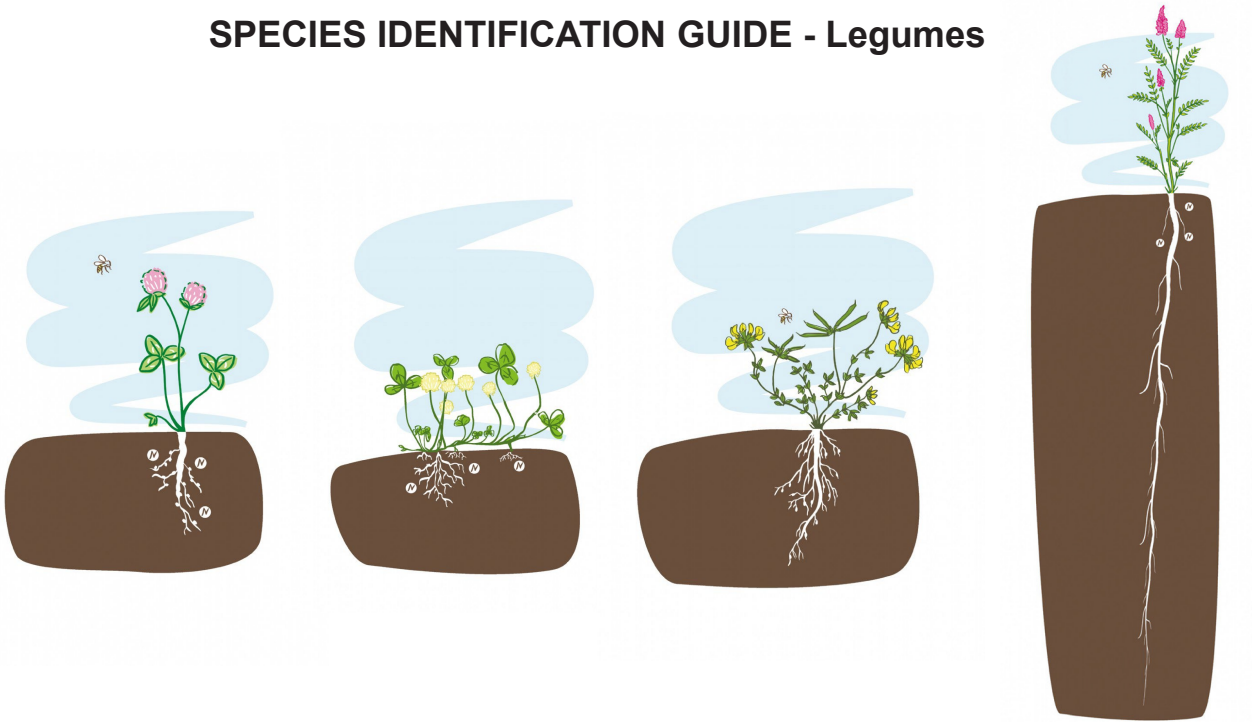
Timothy

Cocksfoot

Festulolium

Multi-Species Swards – Learning by Doing

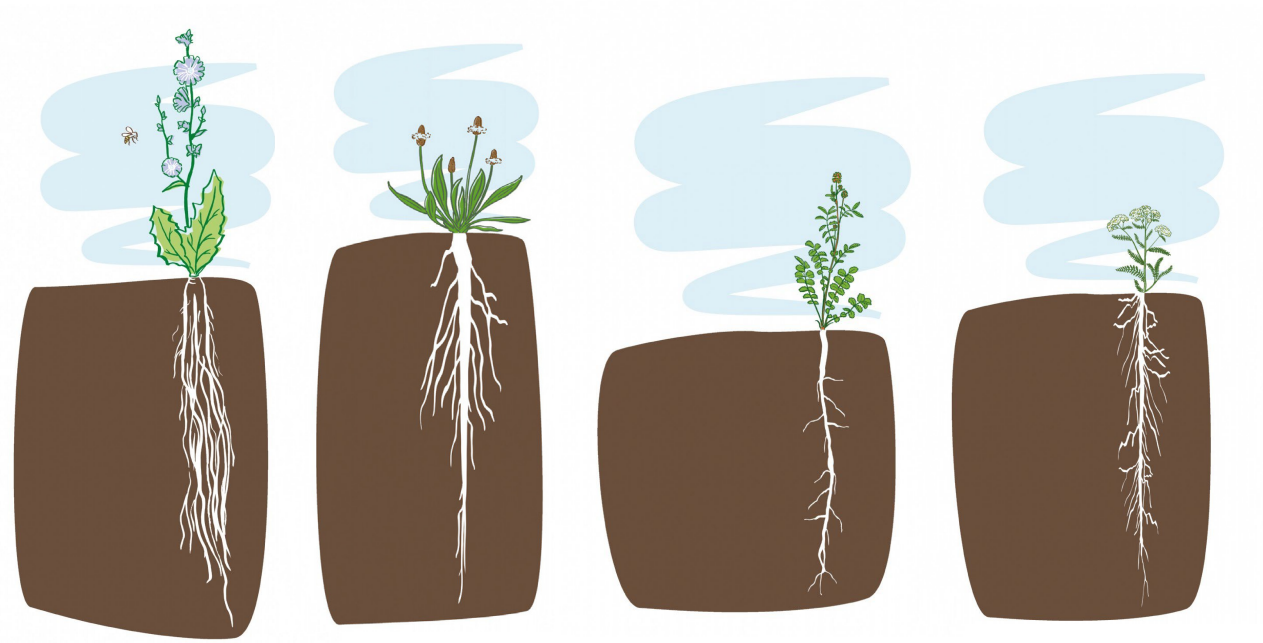
SPECIES IDENTIFICATION GUIDE - Legumes



Red Clover | White Clover | Birdsfoot Trefoil | Sainfoin

Multi-Species Swards – Learning by Doing

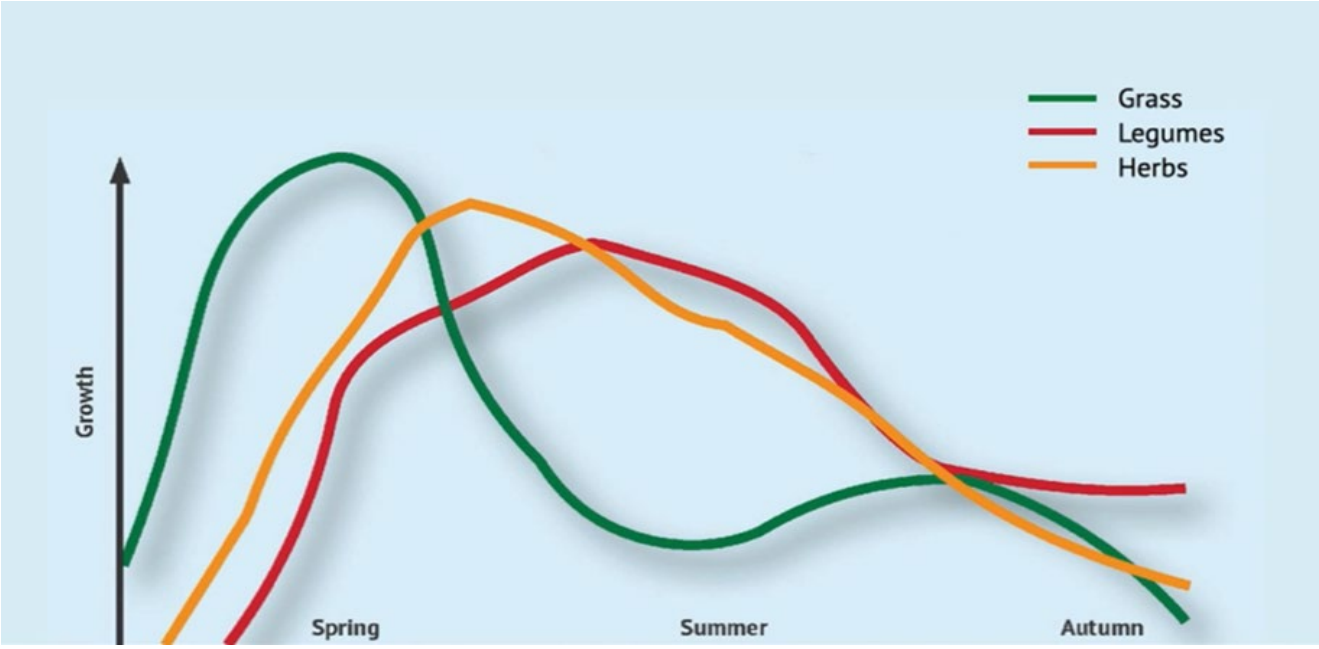
SPECIES IDENTIFICATION GUIDE - HERBS



Chicory | Plantain | Burnet | Yarrow

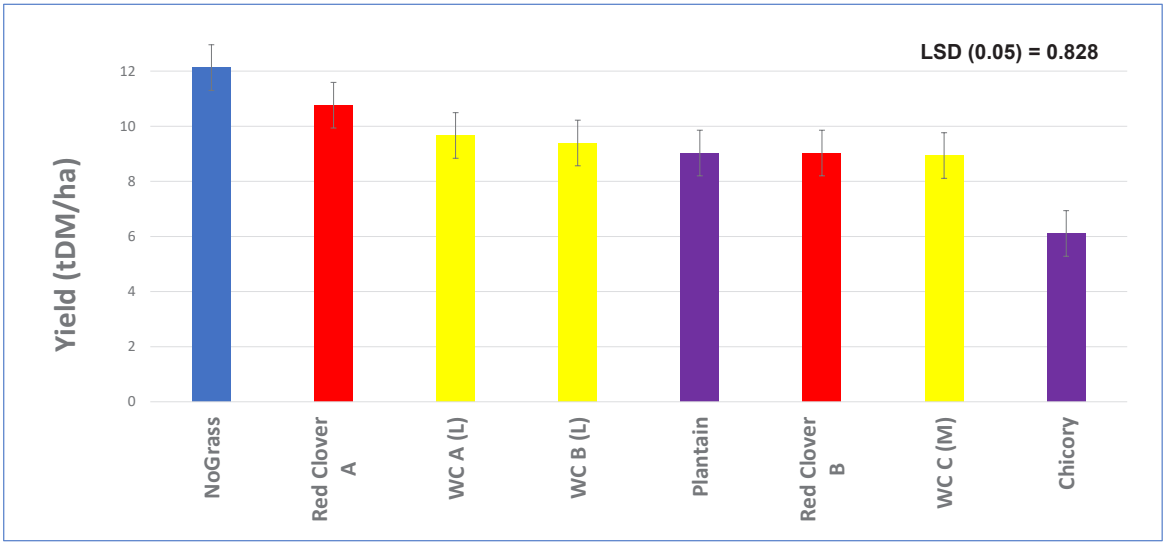
Multi-Species Swards – Learning by Doing

SEASONAL GROWTH PATTERNS



Multi-Species Swards – Learning by Doing

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



Multi-Species Swards – Learning by Doing

CLIMATE RESILIENCE

- Drought and waterlogging are the main causes of yield variation
- Drought tolerance of herbs & diverging growth patterns results in higher in-year yield stability
- Within and between functional group interactions assist in maintaining yields under environmental stress
- Deep-rooting species such as chicory and red clover can increase the sward's ability to tolerate dry conditions in the upper soil layers

Source: EcoSward review

Multi-Species Swards – Learning by Doing

SOIL HEALTH

Preliminary findings:

- deep rooting species can break up compacted soils
- places carbon deeper into the soil
- improves soil organic matter

Multi-Species Swards – Learning by Doing

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

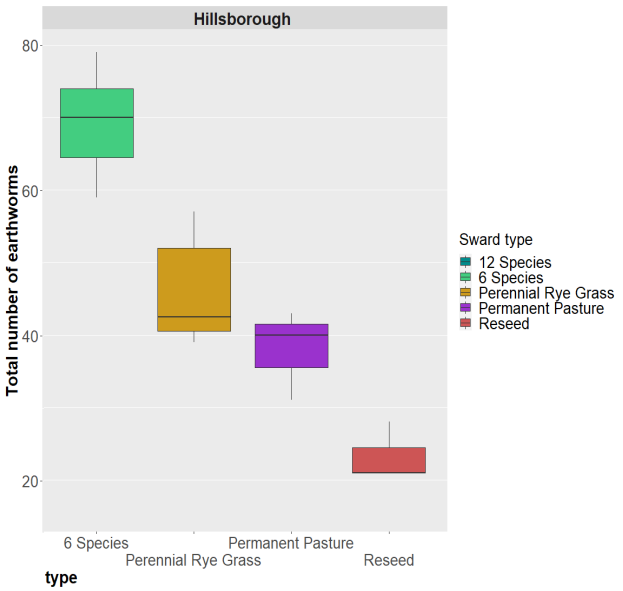
Chris Boughton QUB

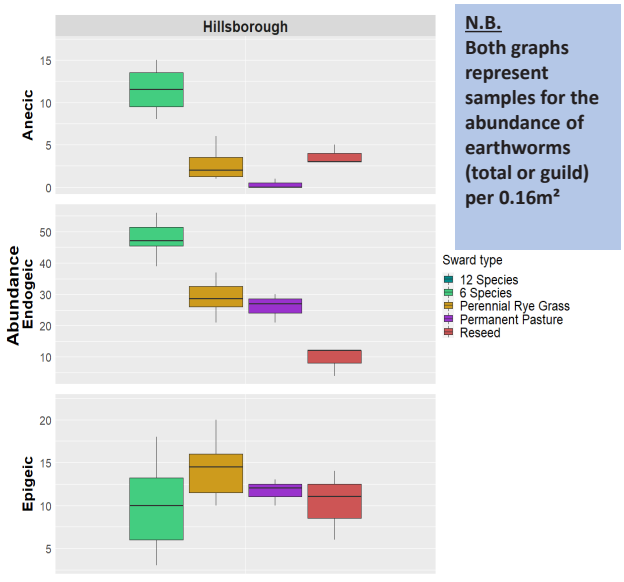
Visibly fewer earthworms from the left sample (PRG) compared to the right (MS).

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).

Multi-Species Swards – Learning by Doing

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

Multi-Species Swards – Learning by Doing

On-farm production data (2021 EcoSward)

FARM	Livestock	Mix A (Grass / Clover)		Mix B (Multi-Species)	
		Utilized yield (kg/DM/ha)	Fertilizer (kg N/ha)	Utilized yield (kg/DM/ha)	Fertilizer (kg N/ha)
A	Sheep	**9723**	87	9174	56
D	Sheep	**3785**	53	3513	53
D	Sheep	3132	25	**4690**	25
B	Beef	6900	32	**6950**	32
C	Dairy	7085	135	**8155**	135
C	Dairy	5304	96	**6052**	96

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

SUPER-G SUSTAINABLE PERMANENT GRASSLAND

Multi-Species Swards – Learning by Doing

Take Home Messages

- **Multi-Species Swards have the potential to:**
  - Reduce fertiliser use
  - Improve soil health and biodiversity
  - Reduce GHG emissions and improve carbon sequestration
  - Improve drought resilience
  - Maintain/enhance animal performance
  - Reduce anthelmintic use
- **BUT**
  - More challenging to establish and manage
  - Weed control and persistence of herbs can be an issue
  - Need to be vigilant for bloat
  - Better to establish a reasonable area to avoid animals switching sward types

Knowledge gaps remain – further research needed

Acknowledgements

- Paul & Frank Turley for hosting us
- EIP Group Members
  - Farmers: Roger & Hilary Bell, Sam Chesney, Andrew Clarke & Wayne Acheson Crosby Cleland, Dale Orr, Paul & Frank Turley
  - AFBI & Queen's University
- CAFRE
- SUPER-G Project
- DAERA & EAFRD for funding the project

- Keep up-to-date with the project via the AgriSearch website and social media channels
- Further events are planned

DETAILED SEED MIXTURES

STOP 1 - Stable 1
1.6ha/4ac – Field No. 3/107/112/8A
Sowing date 05/04/2021, 14kg/acre
DLF – Herbal Ley 6 Species - 'UCD Mix'
15% perennial ryegrass (Nifty)
20% perennial ryegrass (Kerry)
20% perennial ryegrass (Xenon)
10% timothy (Winnetou)
10% chicory (Choice)
10% plantain (Tonic)
07% red clover (Callisto)
02% white clover (Buddy)
06% white clover (Coolfin)

STOP 1A - Charlie's Field
0.6ha/1.5ac – Split from field 8A
Sowing date 05/04/2021, 5kg/acre
Plantain – Red Clover – White Clover, 8:2:2 ratio
66% plantain (Tonic)
17% red clover (Lemmon)
17% white clover (Aberherald)

STOP 2 - Stable 2
1.14ha/2.8ac – Field No. 3/107/112/10
Sowing date 05/04/2021, 10kg/acre
Cotswold Seeds – Legume and herb rich sward
11.1% cocksfoot (Amba)
11.1% tetraploid perennial ryegrass (Calibra)
04.6% perennial ryegrass (Boyne)
10.1% timothy (Anjo)
04.6% meadow fescue (Pardus)
03.7% tall fescue (Fawn)
01.4% alsike clover (Dawn)
04.6% red clover (Global)
03.7% commercial sweet clover
18.5% commercial sainfoin
02.8% birdsfoot trefoil (Toro)
04.2% chicory (Puna II)
06.5% burnet forage herb
00.9% yarrow forage herb
03.7% sheeps parsley forage herb
00.9% ribgrass forage herb
00.1% lesser knapweed wildflower
07.4% Mycorrhizal Fungi inoculant concentrate

STOP 3 - Stable 3
0.74ha/1.8ac – Field No. 3/107/112/27
Sowing date 05/04/2021, 2.75kg/acre
Pure Chicory stand
100% Chicory (Puna II)

STOP 4 - Stable 4
2.86ha/7.1ac – Field No. 3/107/112/25
Sowing date 05/04/2021, 14kg/acre
DLF - Red Clover Silage Mix
29% late perennial ryegrass (Aspect)
21% late perennial ryegrass (Solas)
50% red clover blend

STOP 5 - Winter Field (EIP Multi Species Sward for Beef and Sheep)
2.2ha/5.4ac – Field No. 3/107/112/12A
Sowing date 17/04/2021, 13.5kg/acre (including kale nurse crop)
Dale's drought tolerant mix (+ a few leftovers)
39.0% cocksfoot (Baraula)
13.0% meadow fescue (Cosmonaut)
05.7% timothy (Comer)
03.6% perennial ryegrass
08.9% red clover (Lemmon)
12.0% white clover (Aberherald)
08.8% plantain (Tonic)
04.7% chicory (Puma II)
00.3% yarrow
01.3% sanfoin
01.4% sheeps burnet
01.4% sheeps parsley
+ 0.667 kg / acre kale nurse crop (Maris kestrel)

Small section below rough area in same field, approx. 0.5ac:
Sowing date 17/04/2021, 5kg/acre
Plantain – Red Clover – White Clover – Chicory, 4:4:3:3 ratio
29% plantain (Tonic)
29% red clover (Lemmon)
21% white clover (Aberherald)
21% chicory (Puna II)

Long field
1.09ha/2.7ac – Field No. 3/107/112/7
Sowing date 10/04/2021, 13.5kg/acre (including kale nurse crop)

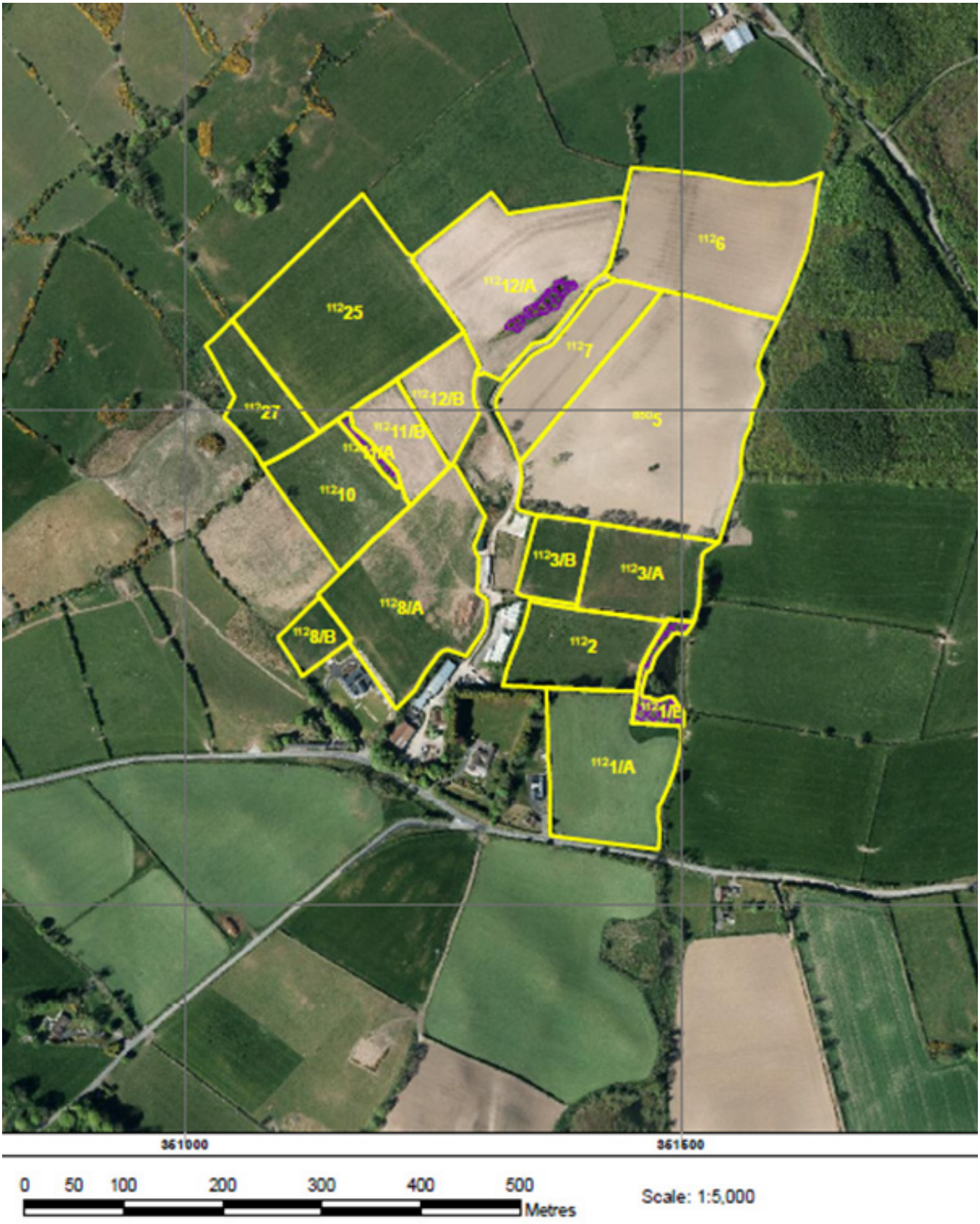
McMullan Field
2.4ha/5.9ac – Field No. 3/107/112/6
Sowing date 13/04/2021, 13.5kg/acre (including kale nurse crop)
Dale's drought tolerant mix (+ a few leftovers)

LHS Horse Paddock 1 & 2
0.6ha/1.5ac each – Field No's 3/107/112/11B & 3/107/112/12B
Sowing date 07/04/2021, 15.5kg/acre
Cotswold seeds - Worming paddock mix:
64.5% commercial sainfoin
04.5% chicory (Puna II)
08.4% birdsfoot trefoil (Toro)
03.2% ribgrass forage herb
12.9% meadow fescue (Pardus)
06.5% timothy (Anjo)

Horse Paddock Bottom – Buffer strip along river
Field No. 3/107/112/3A
Sowing date 05/04/2021, 10kg/acre
Cotswold seeds - Buffer strip grass margin:
05% common bent grass (Highland)
20% timothy (Anjo)
20% meadow fescue (Pardus)
25% red/chewings fescue (Capriccio)
10% cocksfoot (Amba)
20% smooth stalked meadow grass (Evora)

Fairythorn (Ecosward Project 2020)
4.2ha/10.4ac – Field No. 3/107/112/5
Half field without herbs: (14kg/acre)
29% late diploid perennial ryegrass (Glenarm)
29% late tetraploid perennial ryegrass (Ballintoy)
32% late tetraploid perennial ryegrass (Abergain)
10% white clover (Crusader)

Half field with herbs: (14kg/acre)
29% late diploid perennial ryegrass (Glenarm)
20% late tetraploid perennial ryegrass (Ballintoy)
32% late tetraploid perennial ryegrass (Abergain)
10% white clover (Crusader)
5.4% plantain (Tonic)
3.6% chicory (Commander)


112 6
112 12/A
112 25
112 7
112 27
112 12/B
112 11/B
112 5
112 10
112 3/B
112 3/A
112 8/A
112 8/B
112 2
112 1/B
112 1/A
361000
361500
0 50 100 200 300 400 500
Metres
Scale: 1:5,000

ARCZero

ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

FARM WALKS

Friday 17th June 2022
Simon Best
Poyntzpass, County Armagh

Tuesday 21st June 2022
John Egerton
Rosslea, County Fermanagh

Thursday 1st September 2022
Hugh Harbison
Aghadowey, County Londonderry

For further information visit:
www.arczeroni.org

AgriSearch NI

Driving Excellence & Innovation

Innovation Centre
Large Park
Hillsborough
County Down
Northern Ireland
BT26 6DR
T: 028 9268 1539
E: info@agrisearch.org
www.agrisearch.org