Multispecies Leys

Welcome ☺ We will start at 11.30

Please note this meeting will be recorded

Add questions in the chat

@agricology @agritecchie @rothamsted

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Agenda

- **11.30: Welcome and introduction:** *Katie Bliss (Agricology) and Becky Hughes (CFE)*
- **11.35: Introduction to Multispecies Leys -** *Hannah Jones (Duchy College)*
- **11.50: Establishment and Management –** *Deb Beaumont (Rothamsted Research)*
- **12.05: Species selection –** *Stephen Kettle (SW Seeds) /Hannah Jones (Duchy College)*
- **12.15: Soil health / Carbon -** *Becky Willson (Duchy College / FCCT)*
- **12.25: Stewardship options -** *Becky Hughes (CFE / FWAGSW)*
- **12.30: Audience photos / questions and discussion**

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Technical bit..

- Small chance of being ejected into cyberspace – log back in! ☺
- Chat box – comments and questions / personal messages
- Questions
  - Add in chat to 'everyone' or 'raise hand' (*9 on dial in)
  - Pick up some as we go and discussion at end
  - Muted automatically – will invite to unmute (microphone icon) or *6
  - Will do our best to address all the questions
- We are recording

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Sharing farmer experience

Demonstrating agroecology in practice on farm throughout the UK, including 40 profiled farmers

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Field Days

On farm walks with farmers and researchers – focusing on key agroecological practices

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Engaging farmers and researchers in conversation at Field Events such as Groundswell and Cereals and on social media @agricology

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Game & Wildlife CONSERVATION TRUST
The Allerton Project

ORGANIC RESEARCH CENTRE
ELM FARM

COLLABORATION

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Game & Wildlife CONSERVATION TRUST The Allerton Project
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VIRTUAL EVENTS

Virtual Field Day: Multispecies Leys

21 May 2020
Online Event - Webinar
FIELD DAY

Virtual Field Day: Multispecies Leys part 2

4 June 2020
FIELD DAY

Cereals Live: Practical Discussion Sessions with NIAB

10 June 2020
Online Event - Webinar
FIELD DAY

Virtual Field Day (LEAF) Integrated Pest Management in Arable

23 June 2020
Online Event - Webinar
FIELD DAY

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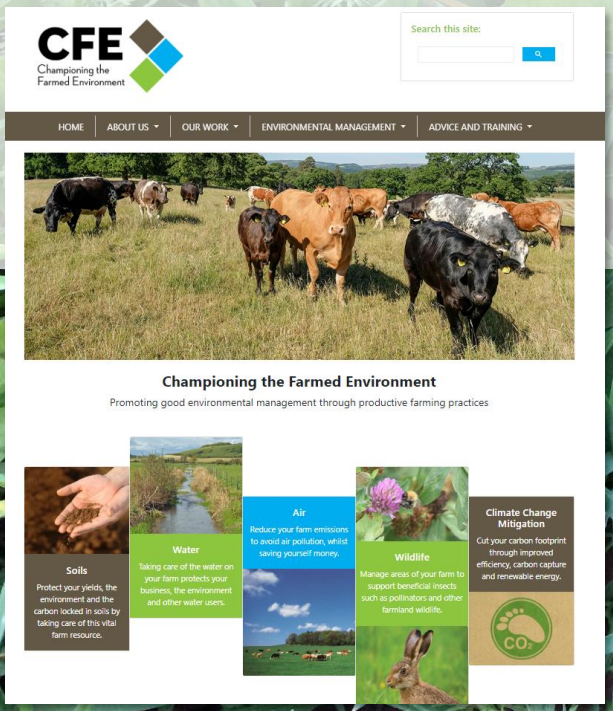
ORGANIC RESEARCH CENTRE

LEAF
LINKING ENVIRONMENT AND FARMING

CFE
Championing the Farmed Environment

Promoting good environmental management through productive farming practices



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Introduction

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TOMS
Toolbox of Multi-species Swards

Gemma Eales, Hannah Jones, Bethan Stagg, Stephen Roderick

ANIMAL VETS

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SWS South West Seeds

The Wildlife Trusts

SC Nutrition

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High yields
Italian ryegrass

Grazing
Perennial ryegrass

Persistence
Timothy

Drought tolerance
Cocksfoot

Increasingly variable environment (Climate + soils + management)

Fertiliser

Subsoilers

Wormers

herbicides

Concentrates & nutritional supplements

Of 77 studies on herbal leys across a range of environments and systems….

Did diverse forages have a higher Dry Matter Yield than the control?

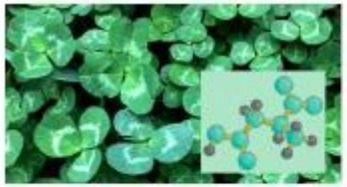
Out of 47 studies...

Did diverse forages have a higher Digestibility than the control?

Out of 16 studies...

Did diverse forages have a lower Neutral Detergent Fibre level than the control?

Out of 22 studies...



Did diverse forages have a higher Crude Protein level than the control?

Out of 21 studies...

Note:
Percentages do not add up to a hundred because some studies compared multiple swards.

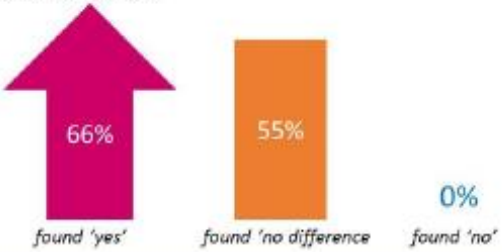
Livestock – main findings

Did cows grazing on diverse swards produce a higher Milk Yield than on the control?

Out of 10 studies...

Were lambs grazing on diverse swards heavier than on the control?

Out of 9 studies...



Environment – main findings

Were diverse swards better at suppressing weeds than the control?

Out of 19 studies...

Did diverse swards reduce Nitrogen Leaching more than the control?

Out of 9 studies...

Note:
Percentages do not add up to a hundred because some studies compared multiple swards.

Which species to grow?

	Red clover	White clover	Alsike clover	Lucerne	Timothy	Cocksfoot	Chicory	Plantain
Fertility building								
Drought resistance								
Water-logging resistance								
Persistent								
Anthelmintic								
Deep rooting								
High mineral content								

Which species to grow?

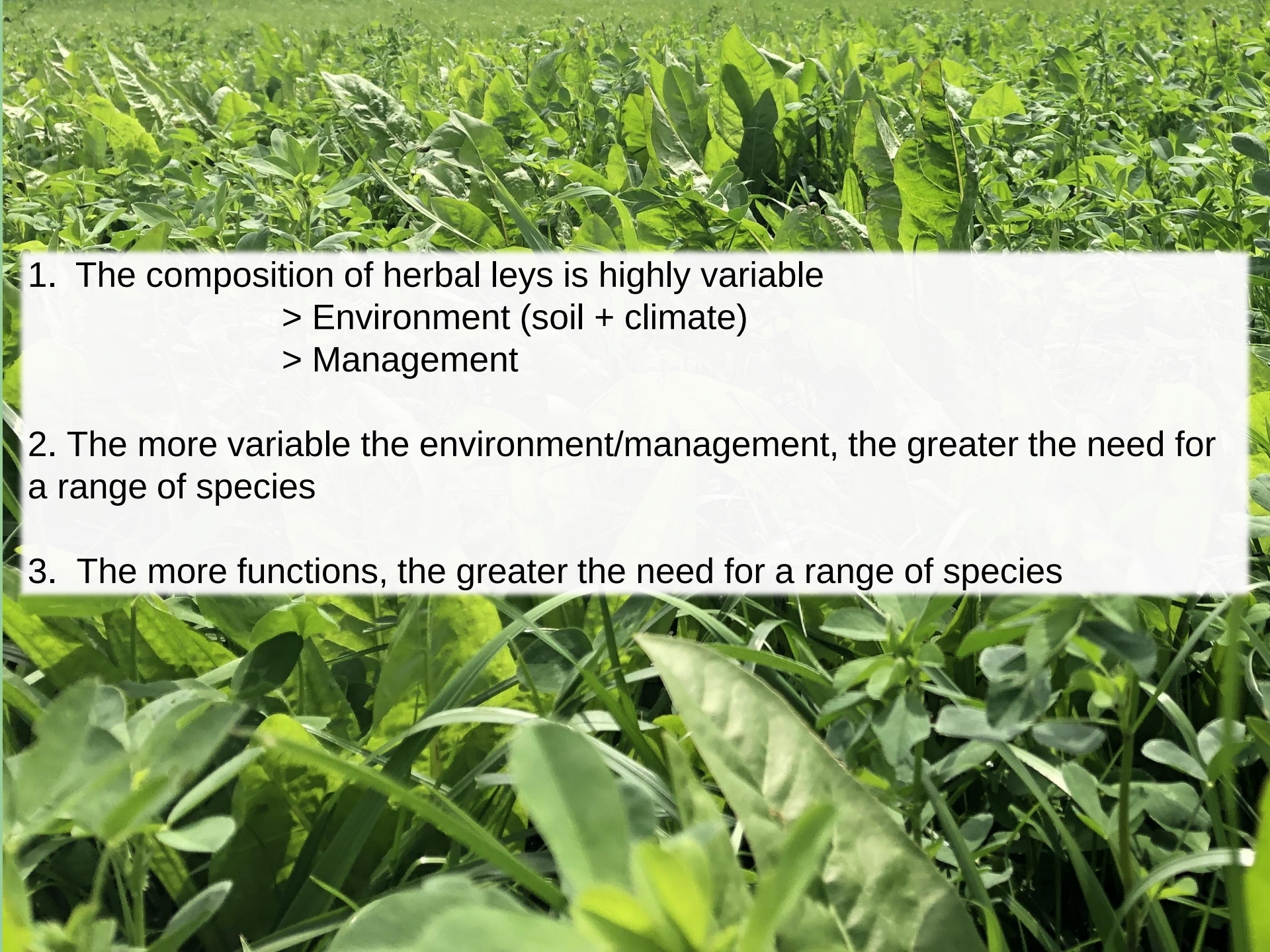
	Red clover	White clover	Alsike clover	Lucerne	Timothy	Cocksfoot	Chicory	Plantain
Fertility building	X	X	X	X				
Drought resistance			X	X		X	X	X
Water-logging resistance		X	X		X	X		
Persistent		X			X			X
Anthelmintic							X	X
Deep rooting				X		X	X	
High mineral content							X	X

Which species to grow?
Acidic soils

	Red clover	White clover	Alsike clover	Lucerne	Timothy	Cocksfoot	Chicory	Plantain
Fertility building		X	X					
Drought resistance			X			X		X
Water-logging resistance		X	X		X	X		
Persistent		X			X			X
Anthelmintic								X
Deep rooting						X		
High mineral content								X

Which species to grow? Alkaline soils

	Red clover	White clover	Alsike clover	Lucerne	Timothy	Cocksfoot	Chicory	Plantain
Fertility building			X	X				
Drought resistance			X	X		X	X	X
Water-logging resistance			X		X	X		
Persistent					X			X
Anthelmintic							X	X
Deep rooting				X		X	X	
High mineral content							X	X



1. The composition of herbal leys is highly variable
   > Environment (soil + climate)
   > Management

2. The more variable the environment/management, the greater the need for a range of species

3. The more functions, the greater the need for a range of species

Acknowledgments

Patrick McCotter

Stephen Kettle

Jan Dinsdale

Steve Chapman

Bruce Knight

Sophie Rapson
James Coumbe

Stephen Bone
Andy & James Dunn
Neil Jeffery
Ian & Ben Jelbert
Matt Marshall
Andrew Redwood
Jake Roskilly

Deb Beaumont
Kate LeCocq
Karen Saunders

Multispecies Leys: Establishment and management

21st May 2020

Deborah Beaumont

ROTHAMSTED RESEARCH

Establishment

North Wyke, WEB Project:
Defra BD1466/5208
2008-2012

TOMS seed bed preparation at North Wyke

Power harrow

Disc harrow

Plough

TOMS seed mixes at North Wyke

TOMS
Toolbox of Multi-species Swards

Binary Control

PRG
White Clover

Mix A

PRG
Timothy
White Clover
Bird's-foot Trefoil
Chicory
Ribwort

Mix B

PRG
Timothy
Cocksfoot
Festulolium
White Clover
Bird's-foot Trefoil
Lucerne
Red Clover
Chicory
Ribwort
Sheeps Parsley
Yarrow

TOMS mix

PRG
Timothy
Cocksfoot
Festulolium
Meadow Fescue
Meadow Foxtail
White Clover
Bird's-foot Trefoil
Lucerne
Alsike clover
Red Clover
Sainfoin
Chicory
Ribwort
Sheeps Burnet
Sheeps Parsley
Selfheal
Yarrow

Two sowing rates:

Conventional	14 kg/acre
Plus 50%	21 kg/acre

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TOMS North Wyke first year results (2019)

- Tillage depth had no overall impact on annual DM yield.
- Abundance of sown species was higher and weeds generally lower under ploughing.
- No yield penalty from growing herbal leys in comparison to a PRG and white clover mix.
- Complex seed mixes reduced weed invasion compared with a binary mix.
- No benefit of sowing at a higher rate in terms of yield or weed suppression in the first growing season.

Other things to consider

- Sowing time
- Species selection
- Sowing method
- Rolling
- Weed Control
- Early management

Management

Rotational grazing:

'graze and rest' system

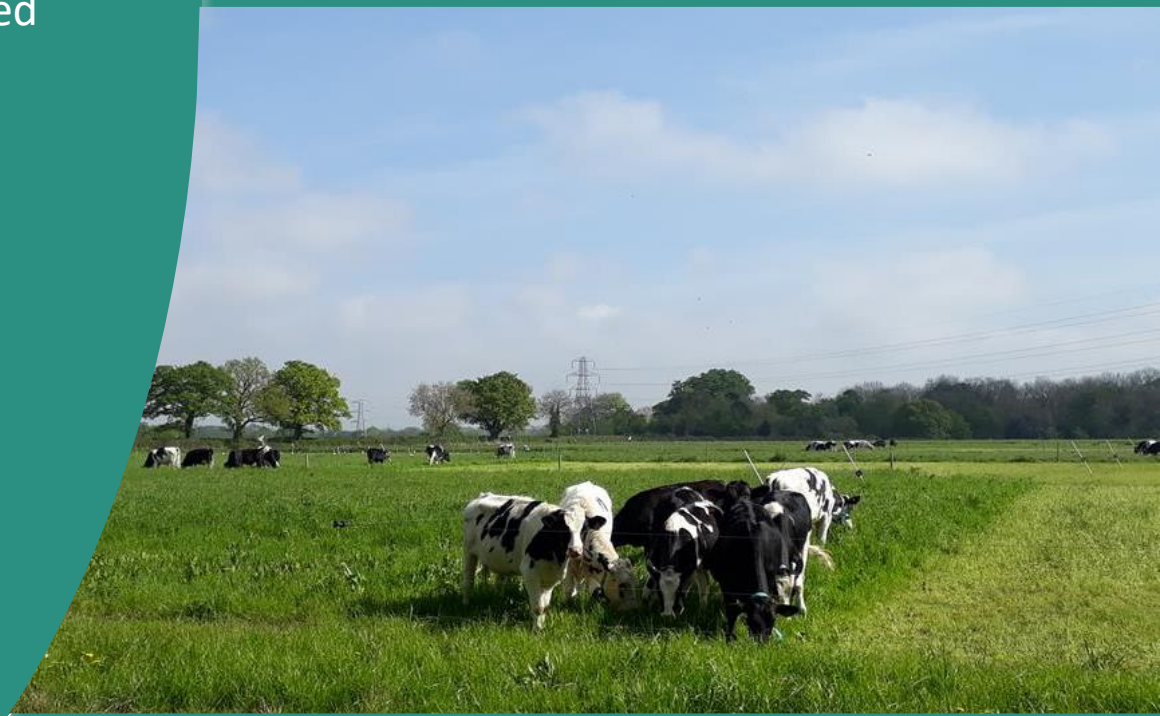
Maximising the production of a grazing animal

Mob grazing

- Evenly grazed pastures & distributed manure for soil improvement.
- Prevents 'cherry picking' species.
- Extended grazing season

Requires:

- Infrastructure: Fences, water trough
- Frequent movement



Management

Silage/hay

- Cut any surplus from grazing system
- Cut frequently to optimise silage quality
- Consider using ‘simple’ diverse mixes

Clovers

‘Homegrown’ protein and no/reduced application of artificial Nitrogen but need to consider:

- Bloat
- Red clover: risk of infertility in breeding ewes

Clover dominance: Apply N to stimulate grass growth to out-compete the clover.

North Wyke: First growing season 2019; 1st, 2nd & 3rd cuts

Thank you!

With thanks to everyone who has worked on these projects

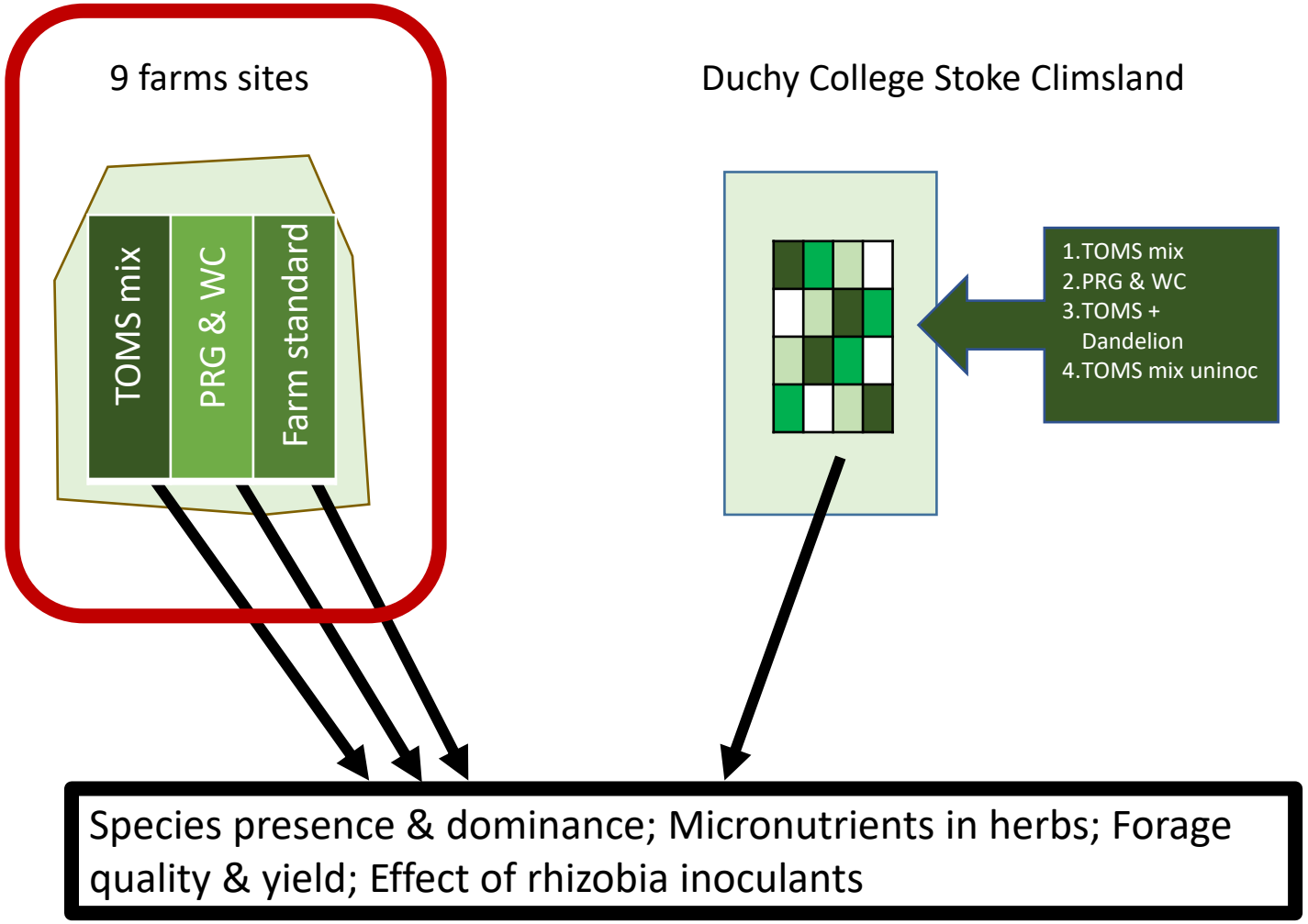
TOMS

Toolbox of Multi-species Swards

Gemma Eales, Hannah Jones, Bethan Stagg, Stephen Roderick

Agri-tech Cornwall & the Isles of Scilly is a £11.8m project to increase Research Development and Innovation in the Agri-tech sector across Cornwall and the Isles of Scilly. Running to June 2021, it is part-funded by the European Regional Development

Legumes	Grasses	Forbs/herbs
White clover	Perennial ryegrass	Chicory
Red clover	Timothy	Plantain
Alsike clover	Festulolium	Salad burnet
Lucerne	Meadow fescue	Yarrow
Sainfoin	Meadow foxtail	Sheeps Parsley
Birdsfoot trefoil	Cocksfoot	Selfheal



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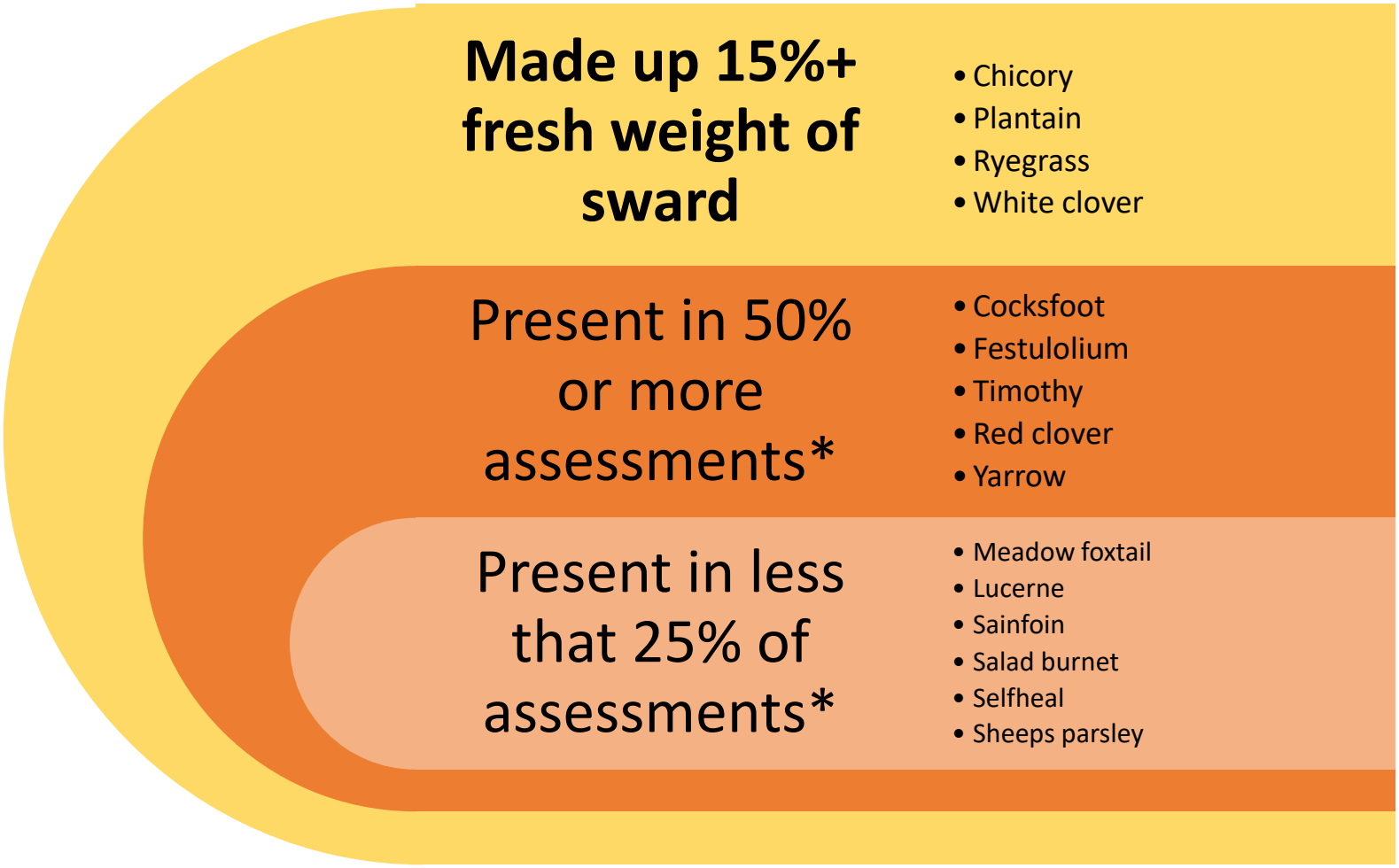
Year 1
TOMS herbal ley mix



* 135 assessed quadrats = 5 quadrats per sward x 3 visits per season x 9 farms

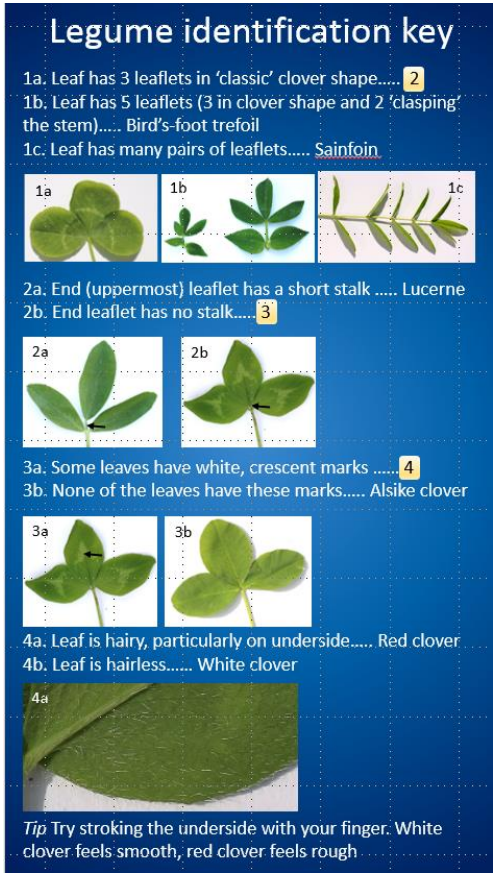
1. Succession within a year
2. Succession in subsequent years
3. Percentage of each species with a mix

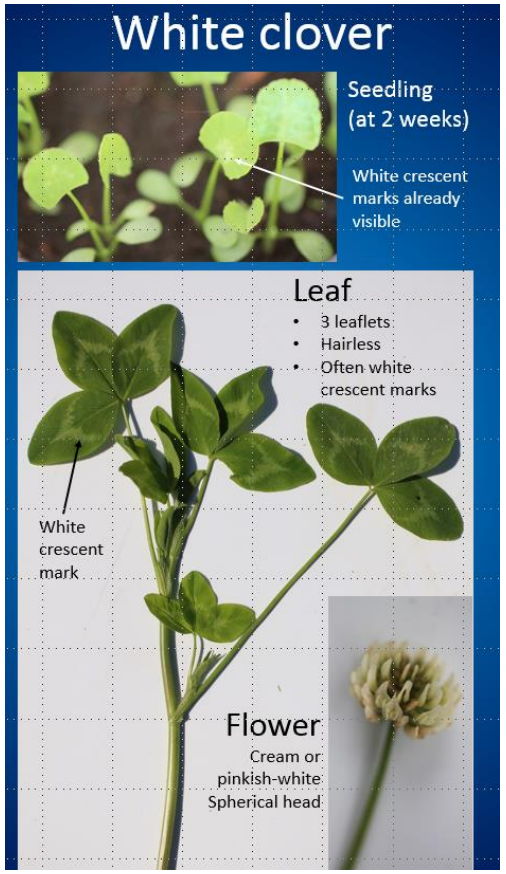
Percentage of seed in a mix…

In two farms in 2019, which grew the GS4 mix, red clover made up 45 and 72% of the FW of the sward

Crop Trumps

- Aim: app and card set to help farmers design ley mixtures and to identify species
- Same species as TOMS mix
- Suite of scored functional traits
- ‘Designer: FoAM – Kernow
- Android ‘beta version’ - Dec 2020
- Keys and species pages to help with identification, after sowing





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Clovers

Countryside Stewardship- Becky Hughes, CFE

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Multi Species Leys:
Public Goods & Countryside Stewardship

- **Multi species swards can boost soil health, support pollinating insects, reduce emissions and nitrogen leaching, help improve soil structure and flood resilience, improve livestock health and reduce medicine use**
- **Can be a central part of transition to regenerative system**
- **Options in Mid Tier to support legume & herb-rich swards – GS4 (£309/ha) and OP4 (£115/ha)**
- **Prescriptive management vs flexibility and adaptability?**

Soil Health – Becky Willson, Duchy College

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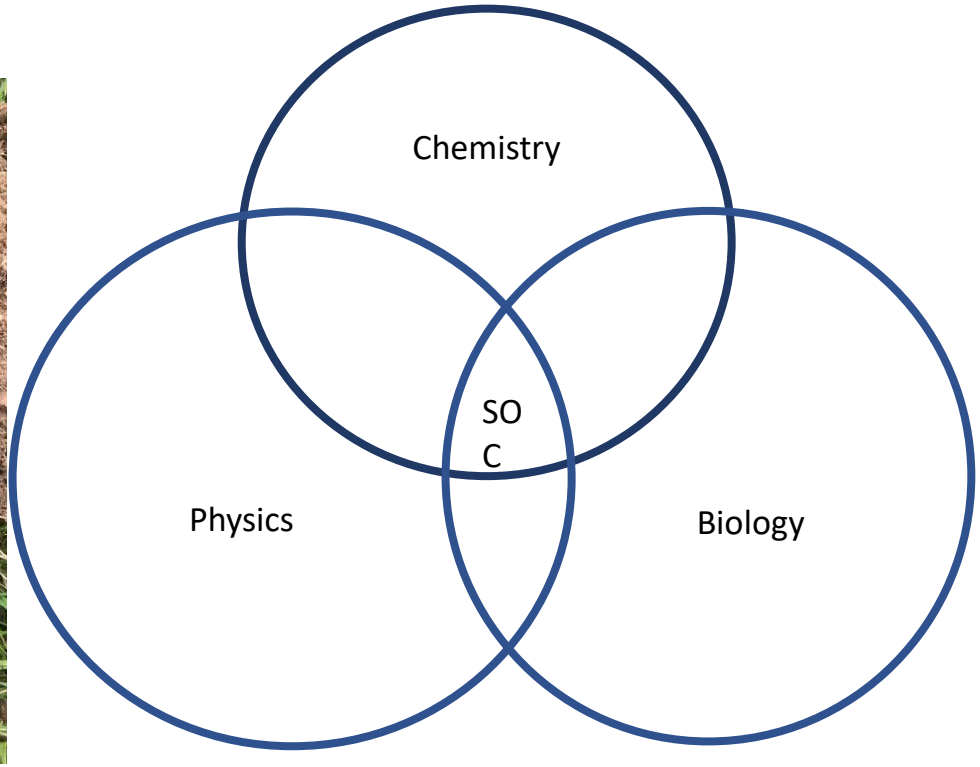
What drives a healthy soil?



Reported soil benefits of multispecies swards

- Improved soil structure
- Improved organic matter levels (leading to improved soil carbon sequestration)
- Improved soil microbial activity leading to improved nutrient cycling
- Improved resilience (drought tolerance etc)

- Benefits arising from inclusion of deep rooting species and the diversity of plant species present.


THE SOIL CARBON PROJECT
AGRITECH CORNWALL
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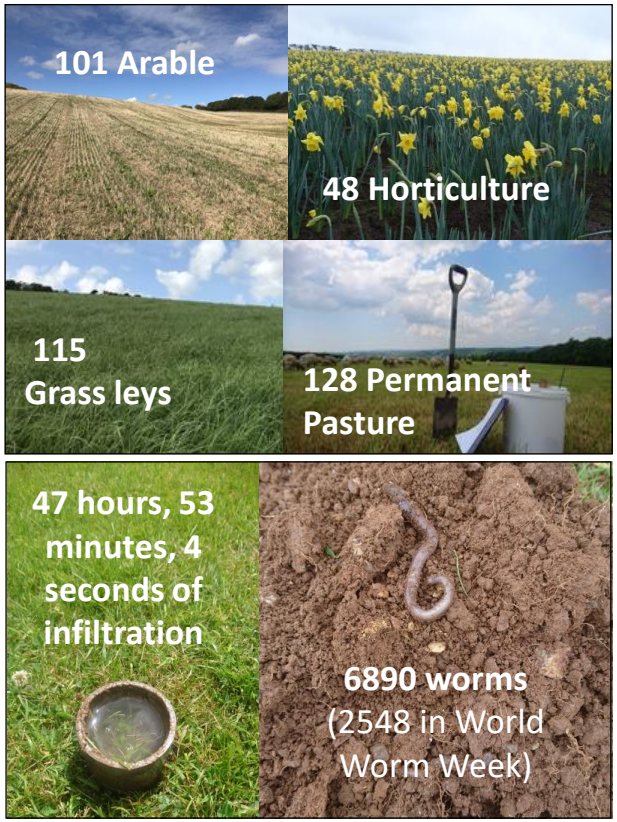
European Regional Development Fund
30-50
Duchy College
RURAL BUSINESS SCHOOL
ROTHAMSTED RESEARCH
UNIVERSITY OF PLYMOUTH

Project overview

- Range of soils & farms
- ~15 samples per field, (0-10, 10-30, 30-50cm)
- Proxy measures:
  - soil structure,
  - infiltration,
  - worm numbers
  - aggregate stability
- Management, crop history

So far:

88 Farms
472 fields
(368 fields twice)
2,705 Ha



Improved soil structure

- Deep rooting species can break up compacted soils
- Also put carbon deeper into soil (less likely to be released)
- Improved SOM – improved water holding capacity / infiltrati

Soil carbon project findings (so far)

- Soil structure in diverse fields average VESS score of 2
- Average soil structure across non herbal ley fields 2.4

Aggregate stability

- Good proxy test for soil organic carbon content
- Diverse fields had an average aggregate score of 0.3 (score from 0-5)
- Average of rest of samples 0.8
- Care needed on establishment method – cultivation –ve impact on aggregation
-

Do they improve soil carbon levels?

3 farm examples with diverse mixes that have been established for 3+ years

	SOM 0-10	SOM 10-30	SOM 30-50
Farm 1 (yr 1) Clay loam	8.43%	7.54%	6.42%
Farm 1 (yr 2)	8.52%	8.34%	7.1%
Farm 2 (yr 1) Silty clay	9.65%	8.97%	8.08%
Farm 2 (yr 2)	10.71%	8.99%	8.43%
Farm 3 (yr 1) Clay	14.31%	11.04	8.62%
Farm 3 (yr 2)	15.58%	11.94%	8.75%

The impact of grazing

- Moving from set stocking to rotational (and / or mob grazing) seems to improve soil carbon levels (from 0.1 – 0.6% /ha/yr). Cautiously optimistic.
- Including deep rooting species can supercharge this process and increase carbon levels at depth with reduced decomposition.
- To maximise soil benefits swards need to be **managed**

Diversity and increased nutrient availability

- Work looking at the impact of sward diversity on nutrient availability.
- Comparing total nutrient levels in soil with crop available reserves
- Data currently being analysed (Plymouth University)

Putting it into context….

- A 0.1% increase in soil organic matter can sequester an additional 9 tonnes of carbon per hectare per year.
- Plus wider carbon footprint benefit of reduction in N2O emissions from fertiliser application – an additional win!
- New research showing that the addition of plantain can reduce the N2O losses from clovers in sward during denitrification.

Acknowledgements

And our fantastic soil carbon project farmers!

Your photos, questions and comments

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Anthony Slattery

How do you deal with more undesirable species like Ragwort, thistle hogweed etc?


Sam, Forty Hall Farm
At which point is the ley beneficial to the soil?


Productivity


RG vs MSS


Productivity and Longevity


Pollinators


Species selection

Grazed sward, August 2019

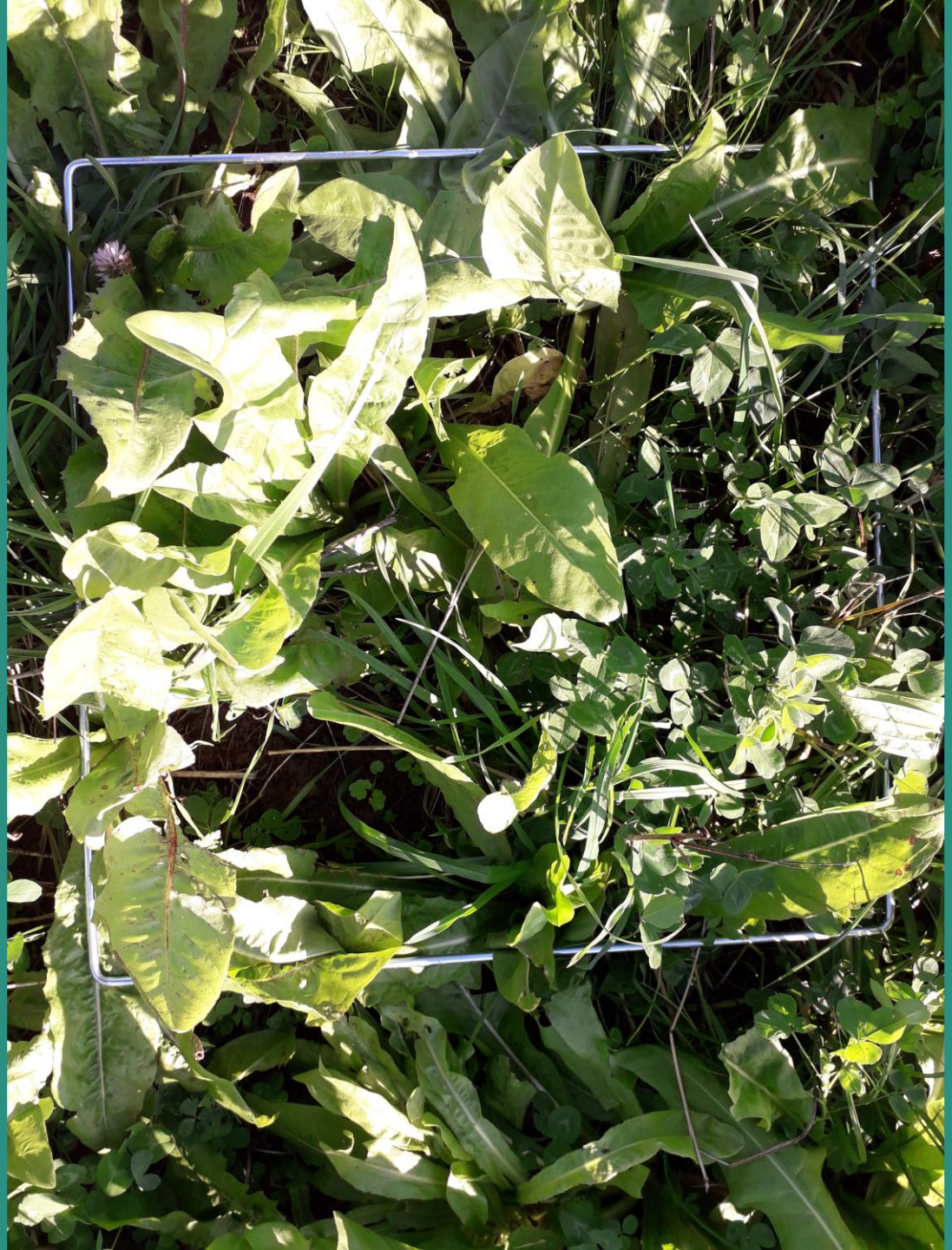

Gothelney, December 2018


Gothelney, December 2018

Herbal Sward, June 2018

Rothamsted,
June 2018

Manor Farm,
October 2019



Manor Farm,
October 2019


Manor Farm,
October 2019


Sunnyhill Dairy, Oct 2019

Sunnyhill Dairy, Oct 2019

FABulous Farmers

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- Measure the benefit of Functional Agro-Biodiverse (FAB) measures
- Benefit of reducing chemical use (pesticides, artificial fertilisers)
- Focuses on the economic benefit

- Increase implementation of FAB measures on farms
- Measure what tools are successful at influencing FAB uptake by farmers
- Engage with citizens and policy makers on the benefit of FAB

→

- Demonstration events
- Learning Networks
- Demonstration farms

FAB MEASURES:

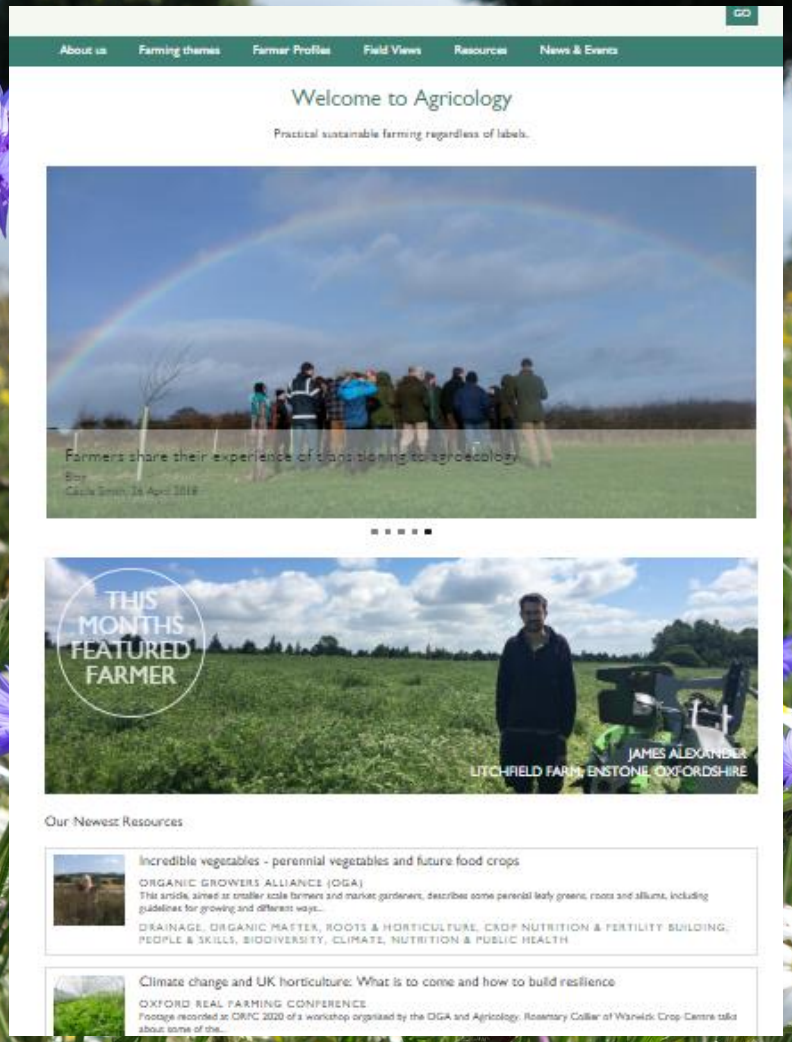
- Reduced tillage
- Mixed crops / rotation
- Cover crops
- Soil amendments
- Manure composting
- Agroforestry
- Hedgerow management
- Field margin management
- Reduction in the use of plant protection products
- Semi-natural landscape elements (habitat)

National Trust

Soil Association

kstill@soilassociation.org

www.fabulousfarmers.eu/en



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or contact us on enquiries@agricology.co.uk

Thank you! ☺

Stay safe and hope to see you on 4th June!

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