ARCZero

ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

THE ROAD TOWARDS NET ZERO FARM WALK SERIES

#3 - Egerton Farm, Roslea, Co. Fermanagh - 21.05.22

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JOIN US AT OUR NEXT FARM WALK!

Hugh Harbison, Aghadowey

Thursday 1st September 2022

To book your place or find our more information go to

arczeroni.org

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The journey towards Net Zero

John Gilliland
ARCZero Chair

Whether these are your first tentitive steps, or part of an ongoing journey towards NetZero I want to thank you for taking some valuable time out to join us at this ARCZero Farm walk.

With the Climate Change bill now law, it's essential that we understand not only what carbon is emitted on farm, but just as importantly how farms capture it too, ensuring a bright future for the next generation.

The recently announced Soil Health & Nutrient Scheme will provide some of the information you'll see here today and will be an essential tool to help every farmer in the country to improve both their environmental and production efficiency. We hope today will help you understand just how powerful having such detailed information at your fingertips can be.

I would like to take this opportunity to thank the speakers from Queen's University and CAFRE who have given up their time to be a part of today's walk. Expertise such as theirs has been invaluable during this project.

ARCZero is a farmer-led European Innovation Project co-funded by the European Agricultural Fund for Rural Development (EAFRD) and the Department of Agriculture, Environment and Rural Affairs (DAERA).

ARCZero Farmers

Roger & Hilary Bell
Co. Antrim

Simon Best
Co. Armagh

Patrick Casement
Co. Antrim

John Egerton
Co. Fermanagh

John Gilliland
Co. Londonderry

Hugh Harbison
Co. Londonderry

Ian McClelland
Co. Down

The ARCZero Team

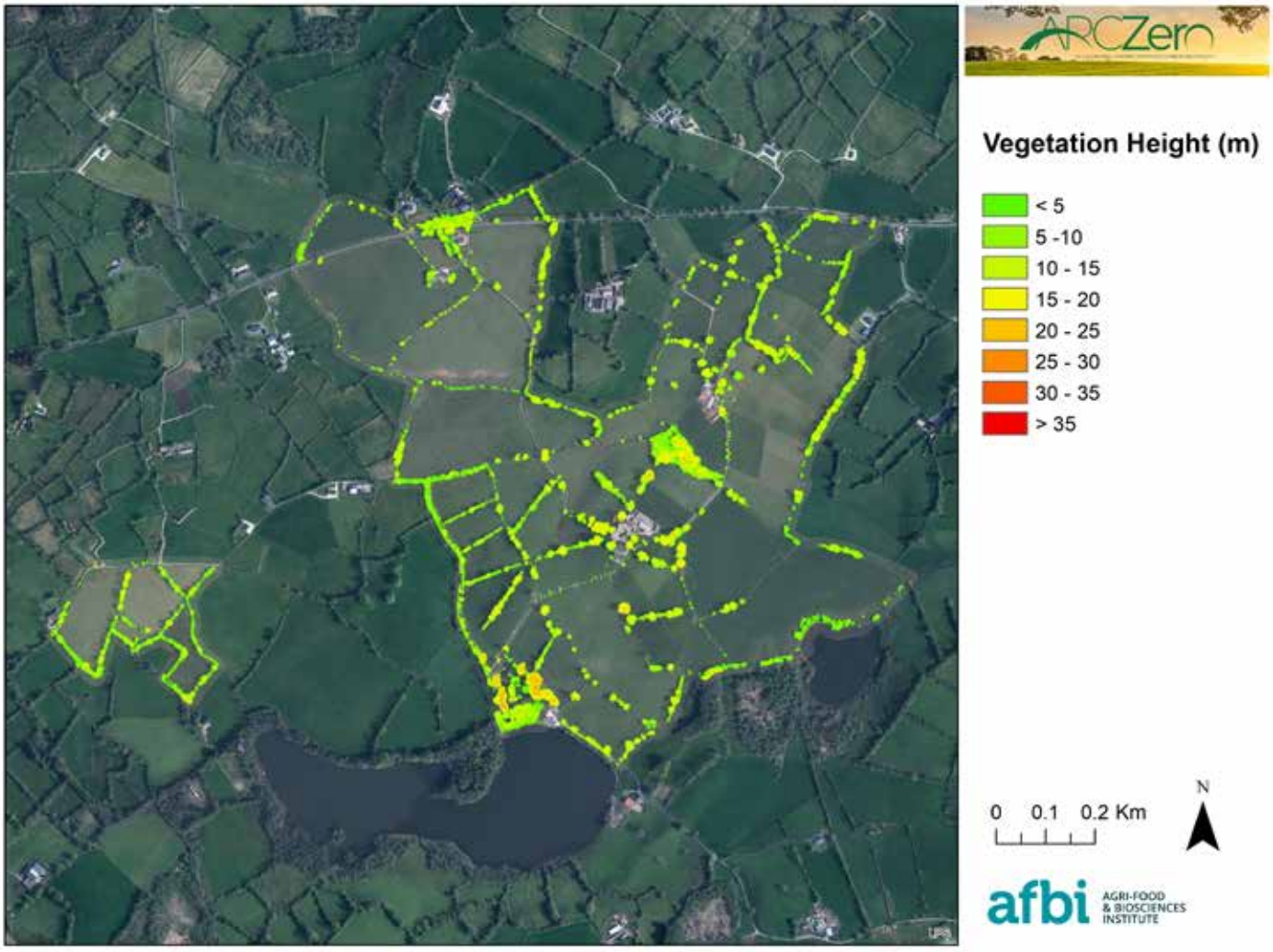
ARCZero: the journey so far

Accelerating Ruminant Carbon Zero (ARCZero) is a farmer led European Innovation Partnership project.

The project is led by John Gilliland of Brook Hall Estate and of Devenish Nutrition, alongside six other N. Ireland farms. Partners include Agrisearch, Birnie Consultants, Devenish and Queens University Belfast, supported by AFBI, CAFRE, NRM, RPS and SRUC

ARCZero is designed to accelerate the pathway to carbon zero farming by measuring and managing carbon flows at individual farm level, and empowering farmers to make positive change.

The project aims to deliver actual individual net farm GHG footprints, carbon stocks and their potential for annual carbon sequestration, enterprise specific life-cycle analysis (LCA) calculators, and a whole farm carbon balance sheet through the precise measurement of the on-farm carbon



Aerial Lidar coverage of Lisnavoe Farm.

stocks within soils, trees and hedges. The project is designed to enable participating farmers to change practice to accelerate their farm's progress to carbon zero by bringing transparency to their current footprint.

To date, the project has conducted two sets of soil sampling for each farm, the first to obtain information on pH (in water, 1:2.5 volume ratio of soil to water), Phosphorus (Olsen) (1:20 volume ratio of soil to sodium bicarbonate), Potassium (1:5 volume ratio of soil to ammonium acetate or ammonium nitrate), Magnesium (1:5 volume ratio of soil to ammonium acetate or ammonium nitrate) and Organic Matter by Loss on Ignition (LOI).

The second sampling was a Soil Carbon Audit, sampled to 10cm with information on Bulk Density, Inoragic Carbon, Total Carbon, Total Nitrogen, C:N Ratio, Organic Matter, Soil Organic Carbon, Active Carbon (mg/kg) and Active Carbon (% of SOC). Alongside soil sampling, a full LiDAR survey was conduted with leaf off the trees, from which carbon stocks of all the trees and hedgerows on each from was calculated. Using SRUC's 'AgReCalc' tool, this allowed a full carbon balance sheet for each farm to be divised from both the inputs and outputs.

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Accelerating 7 NI Farms towards Net Zero

Roger & Hilary Bell *Sheep*
Simon Best *Arable & Beef*
Patrick Casement *Sheep & Dry Stock*
John Egerton *Suckler Beef*
John Gilliland *Willow & Dry Stock*
Hugh Harbison *Dairy*
Ian McClelland *Dairy*

AgriSearch NI Driving Excellence & Innovation

BIRNIE CONSULTANCY

DEVENISH Beyond Nutrition

QUEEN'S UNIVERSITY BELFAST

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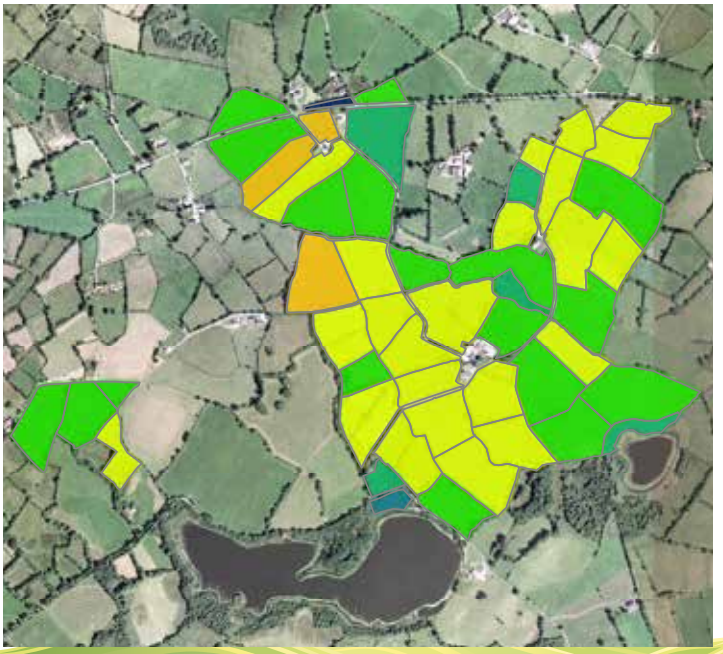
Welcome to the Egerton Farm



- **74 hectare farm run by John Egerton along with his wife and sons**
- **90 Simmental, Limousin and Saler cows on an autumn-spring calving system**
- **Flock of 200 ewes**
- **Blade calf-rearing unit of 500 calves in partnership with ABP**
- **Ulster Grassland Farmer of the Year, 2018**

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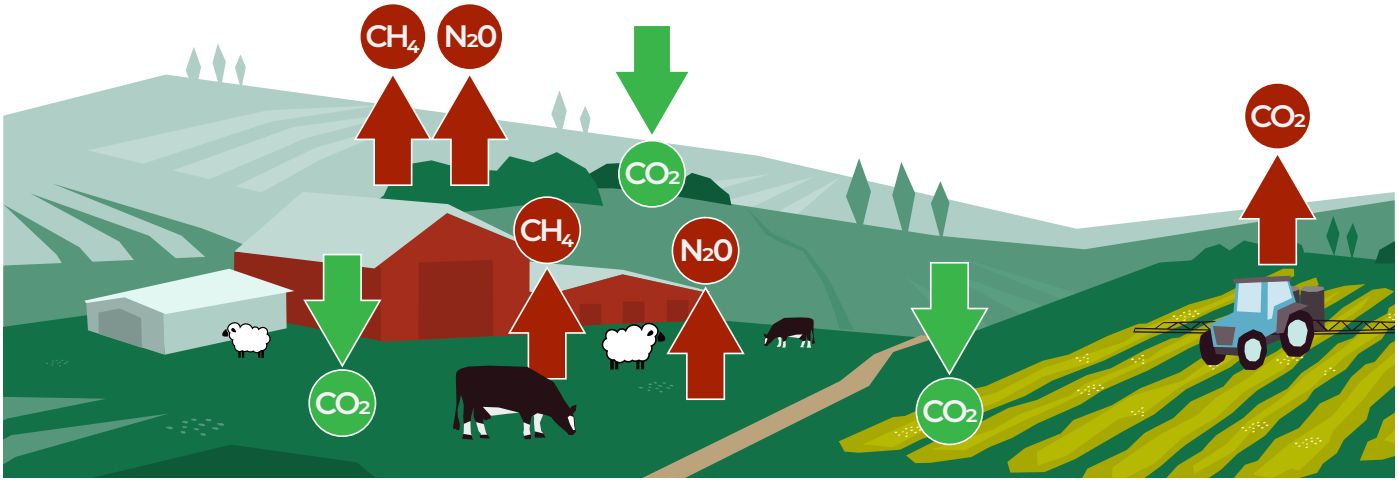
Carbon Farming

If you can't measure, how can you manage?

Gross Annual GHG Emissions
Less **Gross Annual Carbon Sequestration**
= Net Farm Carbon

Using "Net" not "Gross" Emissions to get a complete picture of carbon footprint



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Carbon Footprinting as a management tool

Lisnavoe Farm Case Study

" A Carbon Footprint is the total greenhouse gas emissions caused by an individual, organisation, service or product, within a given year, expressed as carbon dioxide equivalent, $C0_2e$"
Carbon Trust

Why is it important?

> Understanding of GHG emissions
> Farm business sustainability
> Market food products
> Slow the rate of climate change

Farm: 33.60
kg/C02e/kg DW

Average 34.90
kg/C02e/kg DW

Sources of Emissions by %

- **Enteric Fermentation 46%**
- **Purchased Feed 15%**
- **Fertiliser 12%**
- **Manure Management 21%**
- **Other 3%**
- **Fuel 3%**

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Lisnavoe Carbon Mitigations

Future mitigation options

- Genomics & Genetic Selection
- Feed Additives
- Slurry Additives & Amendments
- Renewable Energy
- Alternative Fuel Vehicles

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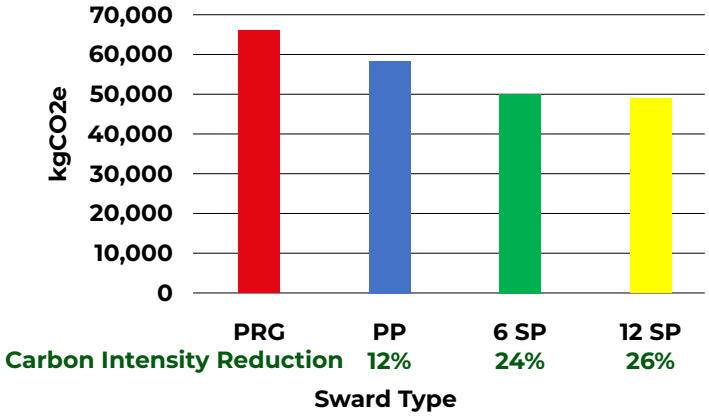
Delivering Multiple Goods

by switching to Multispecies Swards

Carbon Intensity of Beef & Lamp per Sward Type



Carbon Intensity Reduction	PP	6 SP	12 SP
	12%	24%	26%

Sward Type

HEARTLAND

- 65% Reduction in Nitrogen
- 20% Improvement in ADWG
- 300% Increase in earthworms
- 14 times faster water infiltration of soil

A 26% reduction in GHG intensity per kg of meat, without recognition of increases in soil carbon...

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Cutting Costs with Clover

and reducing the need for artificial fertiliser

- Fields with clover have been targeted with slurry
- Fields without clover have been eaten very tight with clover seed direct drilled into the sward
- This won't mitigate fertiliser costs this year, but should make a difference in 2023 and beyond

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Measuring Carbon in Soils

On Site Soil Sampling

Lab Measurement

SOC + Bulk Density + Texture

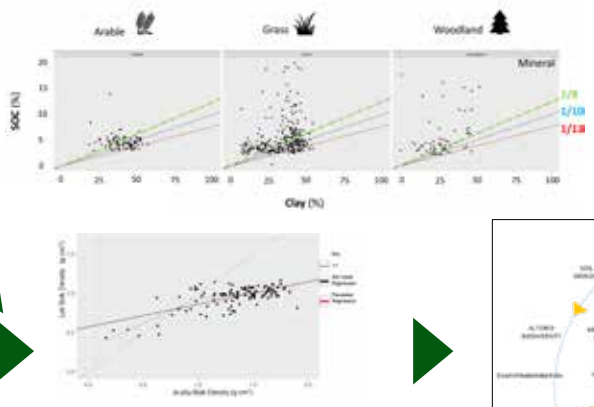
TOC = TC - TIC OM = TO C/0.58

C. Stock

$$BD = \frac{\text{Dry Matter Weight of Soil Core}}{\text{Volume of Core}}$$

*Stock = SOC * Depth * Bulk Density*

SOC/clay



Benefits

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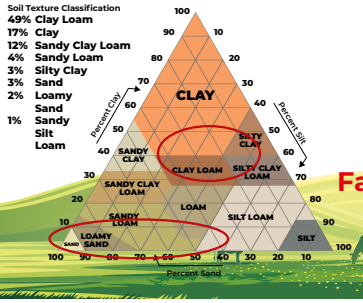
Total Farm Carbon Stocks

Working out Total of Soil Carbon, per land category

Land Category	Total ha	Av. LOI/SOM	Av. Soil pH	Av. C. 0- l0cm	Av. C. 0-30cm	Av. C/ha	Av. C/Category
<10% Soil Org. Matter, Permanent Grass, Slurry, Only Grazed	0.87ha	8.60%	6		2.83%	86.7t	75.4t
<10% Soil Org. Matter, Permanent Grass, Only Grazed	3.37ha	8.85%	6.1	5.04%	3.32%	l0lt	340.4t
<10% Soil Org. Matter, Rotational Grass, Slurry/FYM, Only Grazed	5.lha	9.17%	5.8	4.16%	3.96%	110.8t	565.lt
<10% Soil Org. Matter, Permanent Grass, Slurry, Cut & Grazed	l0ha	9.65%	5.9	4.77%	3.23%	95.8t	958t
<10% Soil Org. Matter, Rotational Grass, Slurry/FYM, Only Cut	1.3ha	9.80%	5.8	5.27%	3%	89t	115.7t
10 - 20% Soil Org. Matter, Rotational Grass, Slurry, Only Grazed	3.96ha	10.20%	6.2	6.30%	3.60%	104.4t	413.4t
10 - 20% Soil Org. Matter, Rotational Grass, Slurry/FYM, Cut & Grazed	0.74ha	10.60%	6.4	5.03%	2.97%	88t	65.lt
10 - 20% Soil Org. Matter, Rotational Grass, Slu~ry, Cut & Grazed	1.2ha	11%	6.2	5.97%	3.90%	l15t	138t
10 - 20% Soil Org. Matter, Permanent Grass, Slurry, Cut & Grazed	9.56ha	11.70%	6	4.23%	4.13%	103.3t	987.5t
10 - 20% Soil Org. Matter, Permanent Grass, Only Grazed	7.18ha	11.90%	5.8	5.18%	3.48%	101.2t	726.6t
10 - 20% Soil Org. Matter, Permane nt Grass, Slurry, Only Grazed	14.7ha	13%	5.9	5.50%	3.62%	103.3t	1,518.5t
10 - 20% Soil Org. Matter, Rotational Grass, Slurry/FYM, Only Grazed	1.04ha	13%	6.1	4.77%	3.17%	96.7t	100.6t
10 - 20% Soil Org. Matter, Permanent Grass, Slurry/FYM, Cut & Grazed	3.67ha	13.35%	6	4.16%	3.52%	103.8t	380.9t
10 - 20% Soil Org. Matter, Permanent Grass, FYM/Compost, Only Grazed	4.09ha	13.45%	5.7	6.58%	3.58%	107.8t	440.9t
10 - 20% Soil Org. Matter, Decideous Woodland	1.26ha	13.80%	6.5	4.45%	5.37%	131.3t	165.4t
20 - 30% Soil Org. Matter, Rotational Grass, Slurry/FYM, Cut & Grazed	2.15ha	20.50%	6.6	8.42%	12.90%	262t	563.3t
20 - 30% Soil Org. Matter, Permanent Grass, Slurry/FYM, Cut & Grazed	4.89ha	27.90%	6.1	14.40%	8.10%	176.4t	862.6t
20 - 30% Soil Org. Matter, Marsh, Not Grazed	0.62ha	29.20%			22.20%	185.7t	115.lt
>30% Soil Org. Matter, Decideous Woodland	0.24ha	35%	6.8		21.50%	259.7t	62.3t
>30% Soil Org. Matter, Permanent Grass, Only Grazed	0.5ha	35.70%	6.1	16.40%	9%	201. 7t	100.9t



John's Total Carbon Stocks

Top 30cm of soil	8,692t
In trees & hedges	358t
Total Farm CO2e Stocks	9050t of C = 33,123t of CO2e

Farmers are Custodians of the Nation's Carbon

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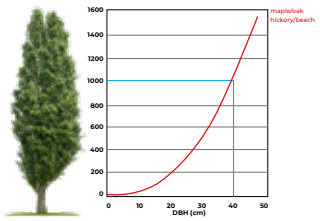
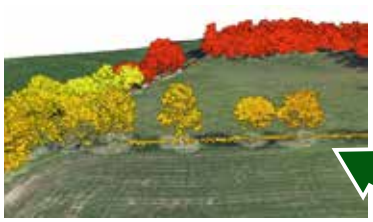
Measuring On-Farm Biomass Carbon Stock

Trees, Hedges & Woodlands





Vegetation Type	Hedge Length (km)	AGB (t)	C (t)	BGB* (t)	C(t)	Total C (t)
Hedge 0-4m	6.52	92.66	44.2	17.79	8.4	52.6
Hedge 4-7m	2.44	48.80	23.3	9.37	4.4	27.7
Hedge 7-10m	2.09	85.06	40.6	16.33	7.7	48.2
Hedge >10m	3.01	293.54	140.0	56.36	26.5	166.5
Total Hedges	**14.06**	**520.06**	**248.0**	**99.9**	**46.9**	**294.9**
	Canopy Area (ha)					
Single Trees	0.14	8.24	3.9	1.58	0.7	4.7
Deciduous Woodland	1.72	102.29	48.8	19.64	9.2	58.0
Coniferous Woodland	0	0.00	0.0	0.00	0.0	0.0
Total	**1.86**	**630.59**	**300.7**	**121.1**	**56.9**	**357.6**

(Alex Higgins, 2021)

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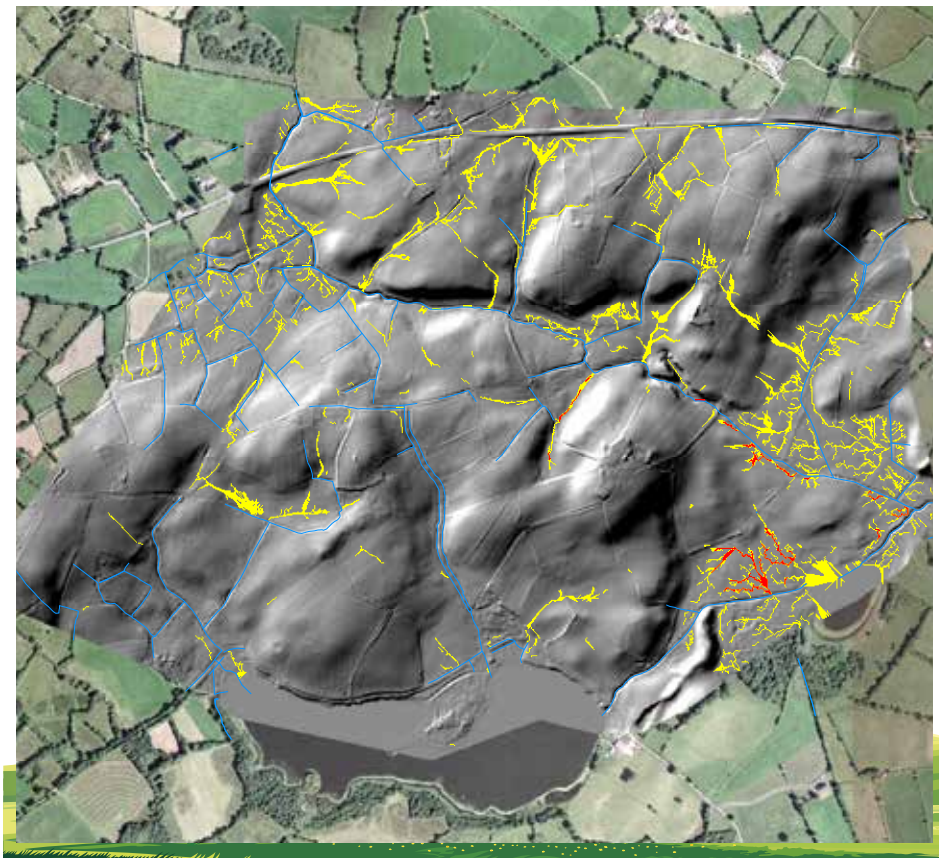

Improving Water Quality

Run off risk maps, Lisnavoe Farm

- Runoff discharges to waterbody
- Waterbody Lines
- Critical Source Areas - high soil Olsen P in these fields means these areas have elevated risk of P loss to water
- Hydrologically Sensitive Areas for runoff generation and loss of nutrients*, sediment and other applied substances.

** applied nutrients including slurry, manure and chemical fertiliser.*

Rachel Cassidy, 2021

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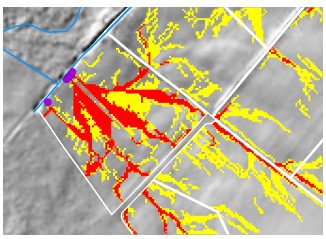
Sustainable Farming

Delivering Multiple Solutions - Not Single Agendas

Producing Nutritious Food & Tackling Malnutrition

Delivering Soil Improvement Both Fertility & Health

Accellerating Carbon Sequestration, Both Above & Below Ground



Improving Water Quality by Reducing Over Land Flow

Optimising Biodiverisity, Especially Below Ground

Generating Profits

Food Futures

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