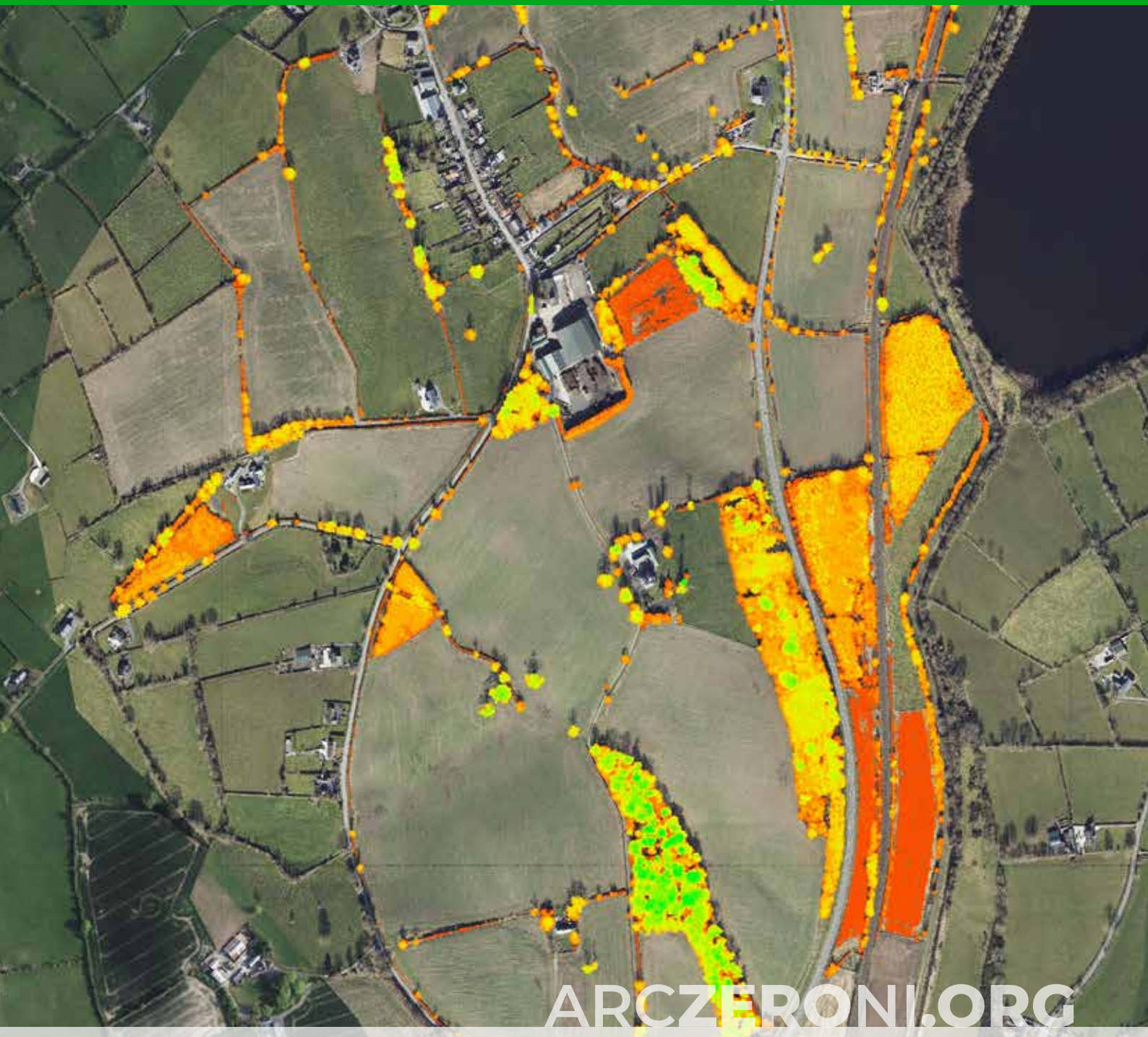
ARCZero

ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

THE ROAD TOWARDS NET ZERO FARM WALK SERIES

#2 - Best Farm, Acton, Co. Armagh - 17.05.22



ARCZERONI.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

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

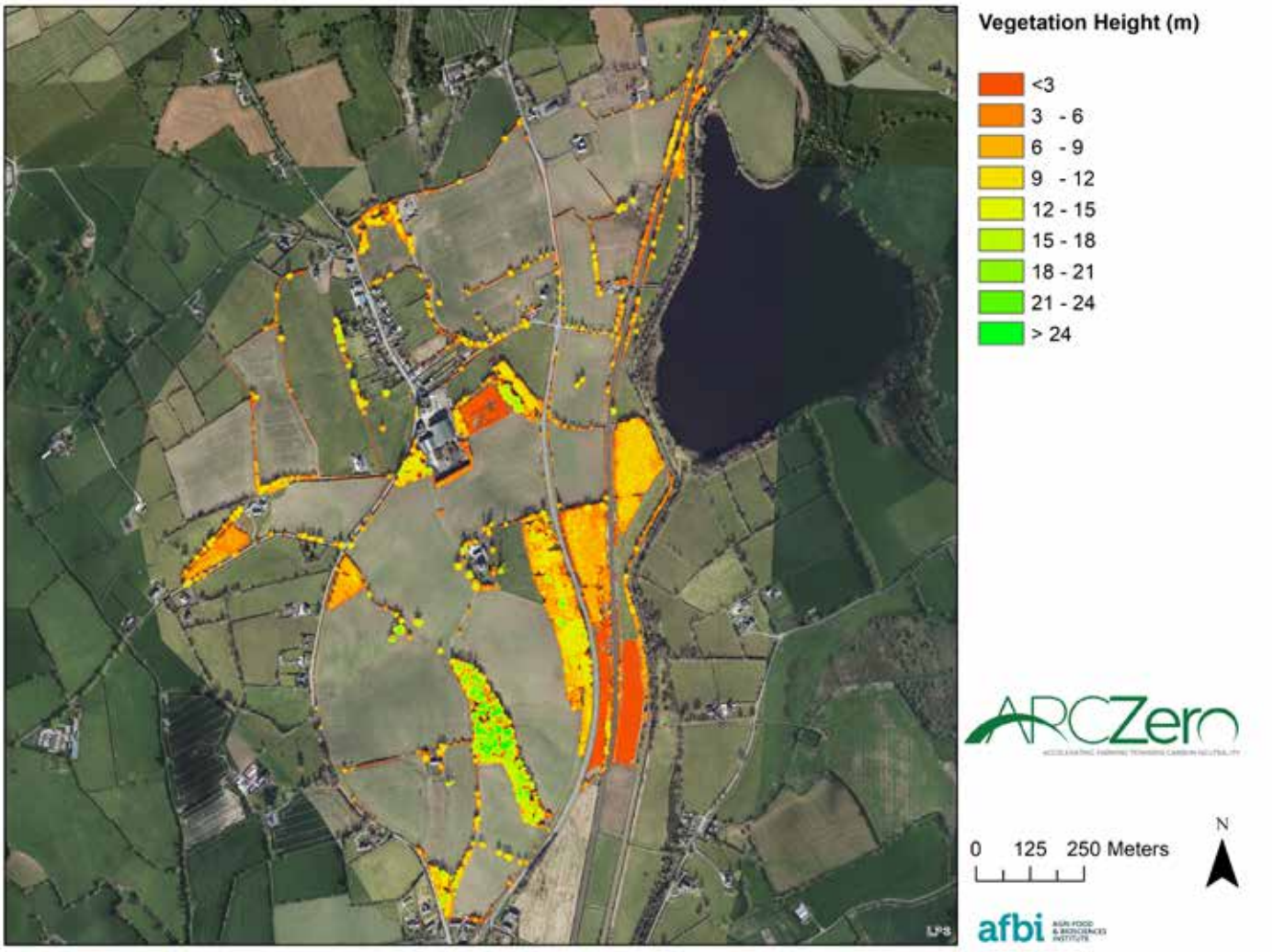
ARCZero: the journey so far

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 Acton house 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.

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

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
BIRNIE CONSULTANCY
DEVENISH Beyond Nutrition
QUEEN'S UNIVERSITY BELFAST

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

Welcome to Acton House Farm

- **1200 acres of predominantly arable land, as well as an Aberdeen Angus beef herd**
- **Run by Simon Best along with his father John and brother Rory**
- **Involved in agri-environment schemes for over 20 years**
- **Simon was awarded UK Arable Farmer of the Year 2021 by the Farmers Weekly**

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

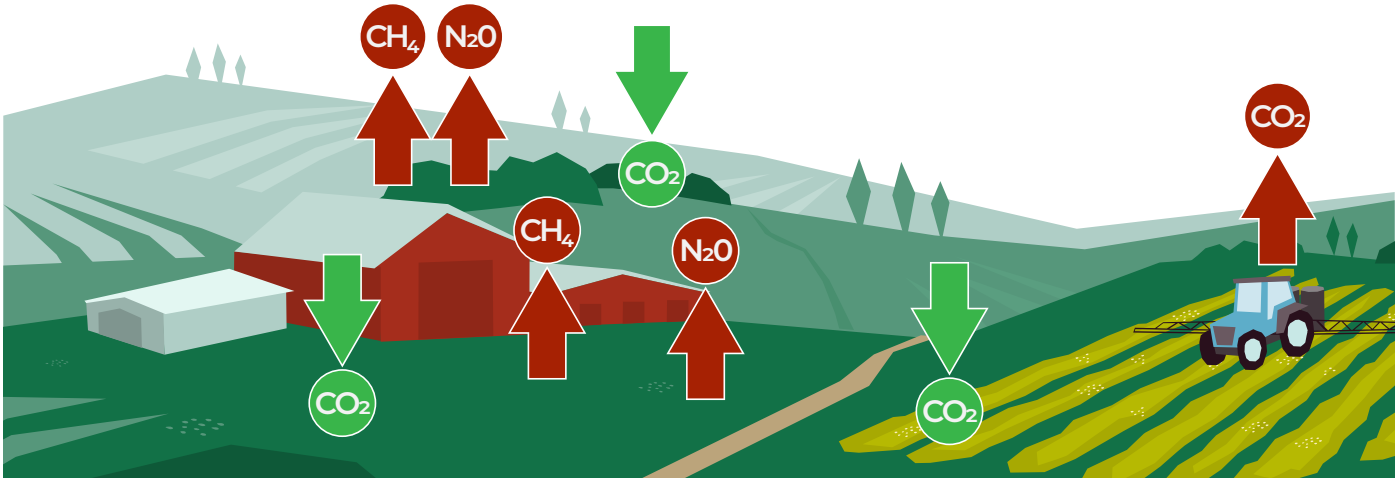
rural Development Programme

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



ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

Carbon Footprinting as a management tool

Acton House 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

Emissions contributed by enterprise

Arable 66%

Beef 34%

Sources of Emissions by %

Fertiliser 56%

Enteric Fermentation 16%

Fuel 18%

Other 5%

Manure Management 5%

cafre
College of Agriculture, Food & Rural Enterprise

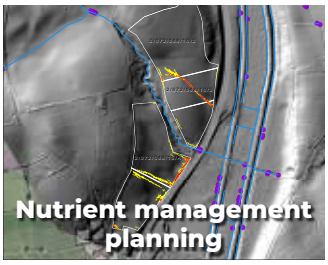
ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

A tillage farm moving Towards Net Zero



cafre
College of Agriculture, Food & Rural Enterprise

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

Measuring Carbon in Soils

On Site Soil Sampling


Marking GPS Position


Auguring to 30cm


Collecting the Soil Sample

Lab Measurement

SOC + Bulk Density + Texture

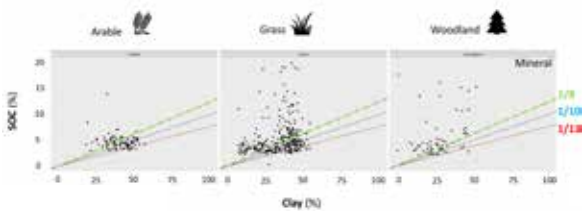
TOC = TC - TIC OM = TO C/0.58

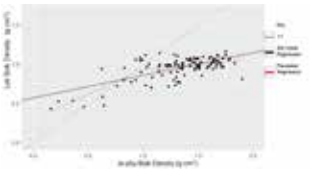
C. Stock

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

*Stock = SOC * Depth * Bulk Density*

SOC/clay





Benefits

QUEEN'S UNIVERSITY BELFAST

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

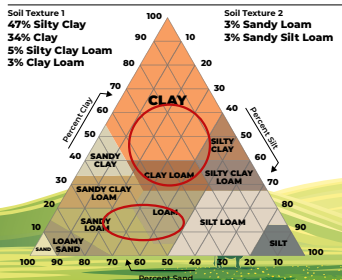
The European Agricultural Fund for Rural Development: Europe investing in rural areas

rural Development Programme

Total Farm Carbon Stocks

Working out Total of Soil Carbon, per land category

Land Category	Total ha	Av. LOI/SOM	No of Soil Cores	No of Samples	Av. C. 0-10cm	Av. C. 0-30cm	C.0-30cm Variation	Av.C/ha	Av. C/Category
10-20%, Grass, Permanent, Only Grazed	1.2	13.4	15	3	4.8	4.1		127.0	148.6
10-20%, Grass, Slurry, Permanent, Cut and Grazed	5.8	12.2	25	5	6.2	4.6		141.0	820.9
10-20%, Grass, Slurry, Permanent, Only Grazed	11.1	11.3	30	6	5.3	4.4	3.8 -4.7	133.5	1483.5
10-20%, Grass, Slurry, Rotat ional, Cut and Grazed	4.8	13.4	25	5	5.9	4.1	3.0-4.7	123.5	590.0
<10%, Grass, Permanent, Only Cut	3.6	8.6	25	5	4.6	3.8	3.1 - 4.6	111.7	396.6
<10%, Grass, Permanent, Only Grazed	0.9	9.3	15	3	4.7	3.3		105.0	89.5
<10%, Grass, FYM/Compost, Permanent, Only Cut	1.8	8.9	15	3	5.4	4.9	4.5 - 5.2	143.5	258.3
<10%, Grass, Slurry, Permanent, Only Grazed	4.0	7.6	25	5	4.7	3.4		124.0	496.0
<10%, Grass, Slurry, Rotational, Only Cut	8.1	8.7	25	5	4.6	3.8	2.8 -4.5	122.0	990.8
<10%, Grass, Slurry, Rotational, Cut and grazed	7.7	9.4	25	5	5.2	3.3	2.9 - 3.5	112.3	870.1
10-20%, Arable, FYM/Compost	115.4	11.4	145	29	5.9	5.6	3.7 - 14.0	157.5	18177.6
<10%, Arable, FYM/Compost	297.6	8.7	370	74	4.5	4.3	2.9 - 8.5	131.5	39123.2
10-20%, Woodland,Coppice	2.7	11.9	25	5	12.8	9.6	4.4 - 14.7	321.0	860.9
>30%, Woodland, Coppice	1.8	32.9	15	3	10.1	10.9		145.0	254.8
<10%, Woodland, Deciduous	2.0	8.8	15	3	5.1	3.7	2.8-4.5	159.7	315.7
<10%, Woodland, Coppice	1.2	7.9	15	3	3.9	3.0	2.6 - 3.4	104.7	127.5
TOTALS	**49.6**		**810**	**162**					**65003.9**
									Ac. C. 138.4t/ha



Farmers are Custodians of a lot of Carbon

Acton House Farm's Carbon

In top 30cm of Soil 65,004t - In Trees & Hedges 1,774t

Total: 66,778t of Carbon, or 244,407t of CO2e

DEVENISH
Beyond Nutrition

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

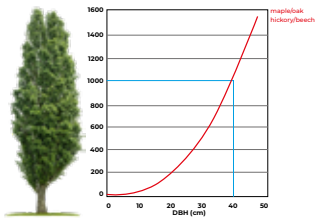
Department of Agriculture, Environment and Rural Affairs

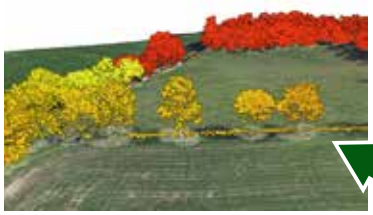
The European Agricultural Fund for Rural Development: Europe investing in rural areas

rural Development Programme

Measuring On-Farm Biomass Carbon Stock

Trees, Hedges & Woodlands





Vegetation Height (m)
<3
3-6
6-9
9-12
12-15
15-18
18-21
21-24
>24

Vegetation Type	Hedge Length (km)	AGB (t)	C (t)	BGB* (t)	C(t)	Total C (t)
Hedge 0-4m	41.10	632.08	301.4	121.36	57.0	358.5
Hedge 4-7m	10.50	198.68	94.8	38.15	17.9	112.7
Hedge 7-10m	8.42	344.58	164.3	66.16	31.1	195.4
Hedge >10m	8.30	697.68	332.7	133.95	63.0	395.7
Total Hedges	**68.33**	**1873.02**	**893.2**	**359.6**	**169.0**	**1,062.3**
	Canopy Area (ha)					
Single Trees	1.56	159.33	76.0	30.59	14.4	90.4
Deciduous Woodland	18.68	1064.36	507.6	204.36	96.0	603.6
Biomass	2.66	30.95	14.8	5.94	2.8	17.6
Total	**22.9**	**3,127.66**	**1,491.6**	**600.5**	**282.2**	**1,773.8**

(Alex Higgins, 2021)

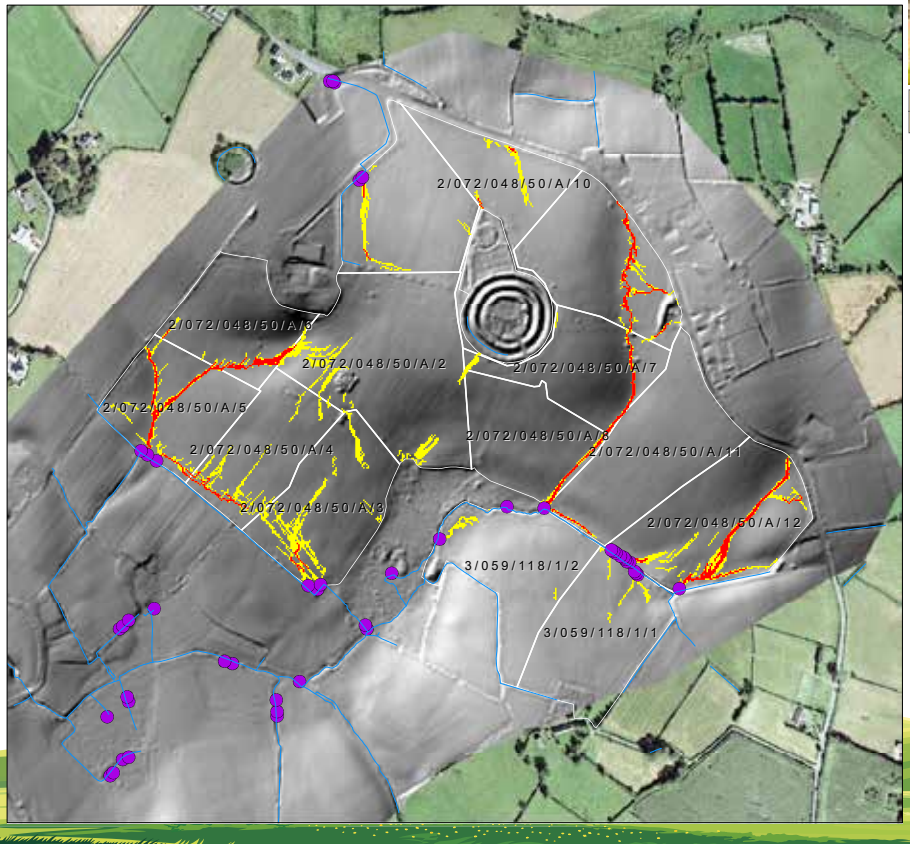
afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme



Improving Water Quality

Run off risk maps, Acton House 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

afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

ARCZero
ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

Department of Agriculture, Environment and Rural Affairs

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

rural Development Programme

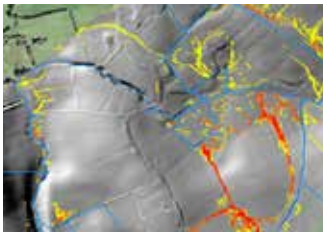
Sustainable Farming

Delivering Multiple Solutions - Not Single Agendas

Producing Nutritious Food & Tackling Malnutrition

Delivering Soil Improvement Both Fertility & Health

Accelerating Carbon Sequestration, Both Above & Below Ground



Improving Water Quality by Reducing Over Land Flow

Optimising Biodiversity, Both Above & Below Ground

Managing our Landscape Heritage

Business Profitability vital to ensure delivery on all levels

ARCZero

ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

JOIN US AT OUR NEXT FARM WALKS!

John Egerton, Rosslea

Tuesday 21st June 2022

Hugh Harbison, Aghadowey

Thursday 1st September 2022

To book your place or find our more information go to

arczeroni.org

Food Futures

DRIVING SUSTAINABILITY

A SMART PLATFORM DESIGNED TO ENHANCE THE SUSTAINABILITY OF THE NORTHERN IRELAND AGRI-FOOD SECTOR

Find out more at food-futures.org