ARCZero

ACCELERATING FARMING TOWARDS CARBON NEUTRALITY

THE ROAD TOWARDS NET ZERO & ANIMAL HEALTH FARM WALK

McClelland Farm, Loughbrickland, Co. Down

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 greenhouse gases are emitted on farm, but just as importantly how farms capture carbon too, ensuring a balanced future for the current and next generation.

The recently implemented 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)

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

Professor John Gilliland with members of the ArcZero project

ArcZero Update

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 Queens University Belfast , alongside six other N. Ireland farms. Partners include Agrisearch, Birnie Consultancy, Devenish and Queen's University Belfast,

supported by AFBI, CAFRE, NRM, RPS and SRUC

ARCZero is designed to accelerate the pathway to Net zero farming by measuring and managing carbon flows at individual farm level, and empowering farmers with more detailed information, allowing them to make more positive change. The project aims to deliver actual individual

net farm GHG footprints, carbon stocks and highlight the potential for further annual carbon sequestration. It also has used twice, whole farm and enterprise specific life-cycle analysis (LCA) calculators, and a whole farm carbon asset register through the precise measurement of the on-farm carbon stocks within soils, trees

and hedges. The project is designed to enable participating farmers to better informed, make better quality of decisions which change practice and accelerates their farm's progress to net zero, through a science driving process of integrity and transparency, from the bottom up

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 30cm with information on Bulk Density, Inorganic 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, an aerial LiDAR survey was conducted when leaves were off the trees, from which carbon stocks of all the trees and hedgerows on each from was calculated. The same LiDAR data was subsequently used, alongside the soil fertility survey to create unique "run off risk" maps to aid the improvement of water quality in the neighbouring streams and rivers .

Keep up to date with ARCZero

arczeroni.org

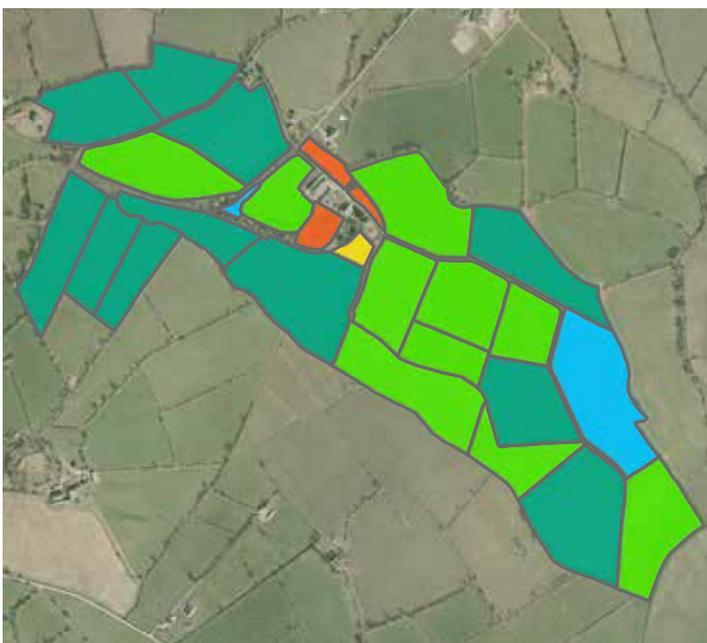facebook.com/ARCZeroNI

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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*

Londonderry
Antrim
Tyrone
Fermanagh

Welcome to Creevy House Farm

pH
<= 5.0
5.1 - 5.4
5.5 - 5.7
5.8 - 6.0
6.1 - 6.3
6.4 - 6.6
6.7 - 7.0
7.1 - 7.6

- **52 hectare farm run by Ian McClelland**
- **96 Autumn calving cows**
  - 9,817 litres sold/cow.
  - 3,290kgs concentrate/cow.
  - Average feed rate 0.34kg/litre
  - 3.87% fat, 3.29% protein (702kgs milk solids)
  - SCC 109, Batco 11
  - Rolling 36 month replacement rate 23%
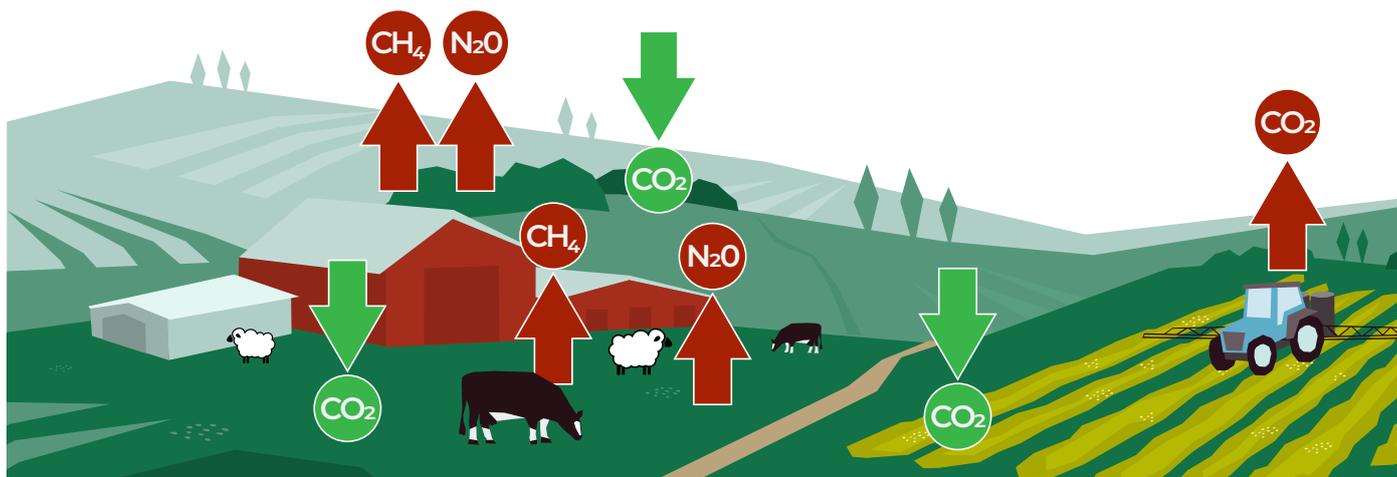 - Stocking rate 2.5CE/ha

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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
Creevy 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, CO_2e"
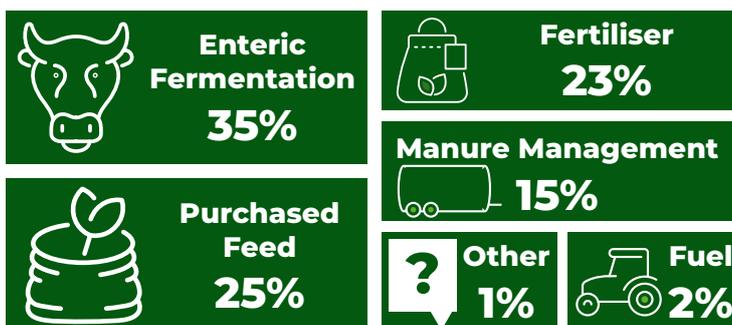*Carbon Trust*

Farm: 1.30
kg/CO2e/kg FPC milk

Average 1.19
kg/CO2e/kg FPC milk

Why is it important?
> Understanding of GHG emissions
> Farm business sustainability
> Market food products
> Slow the rate of climate change

Sources of Emissions by %

Enteric Fermentation
35%

Fertiliser
23%

Manure Management
15%

Purchased Feed
25%

Other
1%

Fuel
2%

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Creevy House Farm Moving Towards Net Zero
Mitigation tools

Genomics & Genetic Selection

Feed Additives

Slurry Additives & Amendments

Renewable Energy

Alternative Fuel Vehicles

Why are genetics important?

> Production efficiency improvement

> Herd fertility, calving profile and replacement rate

> Milk output, both litres and solids

**Creevy House Farm
9,817 litres @ 3.87% fat
& 3.29% protein
(702kg milk solids)
3,290kgs concentrate**

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Food & Rural Enterprise

Grassland Management

- Weekly grass measurement

- Use of Agrinet grass budgeting tool

- Pre grazing cover: 3,000 – 3,200 kg DM/ha

- Post grazing cover: 1,700 – 1,800 kg DM/ha

- Grass allocation: 17 - 18 kg DM/cow/day

- Total grass grown 2022: 10.4 T DM/ha

- Pre-mowing every other rotation

Grazing Infrastructure

- Grazing lanes + spur roads

- Multiple access points

- Easy access to water troughs

- Grazing platform: 18.2ha (45ac) – extending to 30ha (74ac) after 2nd cut

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Clover Establishment

2022   Full reseed: 7ac (August)
       Soil fertility: pH 6.7, P 2-, K 3
       Stitching clover: 16ac (spring) Einbock, 2kg/ac

2023   Full reseed: 4ac (June), Stitching clover: 15ac (spring)

Aim: Reduce Nitrogen from 250 to 200 kg N/ha/year

<u>Full reseed mix;</u>
AberZeus	4kg	– Intermediate diploid.
AberBann	3kg	– Late diploid.
AberChoice	3kg	– Late diploid.
AberGain	3kg	– Late tetraploid.
AberDai	0.5kg	– Medium leaf.
AberHerald	0.5kg	– Medium leaf.

<u>Stitching clover (one variety)</u>
AberDai   Medium leaf

Targeted selective treatment for parasites in ruminant livestock

Determine the feasibility and practicality of implementing targeted selective treatment (TST) of helminths on NI farms

1. Determine suitable TST approaches for each participant farm

2. Implement TST approaches on each participant farm

3. Assess the impact of implementing a TST approach
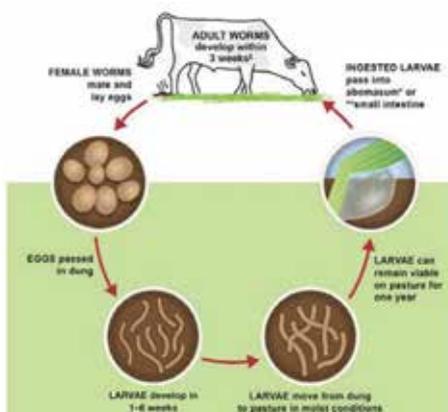
TT/TST options
- Benefits of strategy
- Suggested actions
- Possible risks
- Reducing risks

Project outcomes

Link to ARCZero EIP - Soil and water <u>biodiversity</u> vs anthelmintic treatments (AHs)

Targeted selective treatment for parasites in ruminant livestock

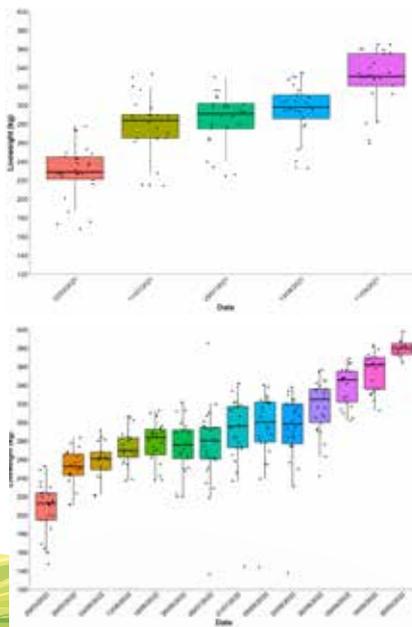**Year 1**

Two batches tracked under rotational grazing

- 5 time points (kg Measurements)
- 13 FECPAK[G2] submissions (FECs)
- FGS calves – 2 treatments (AH treatments)

- AH treatments reduced and delayed
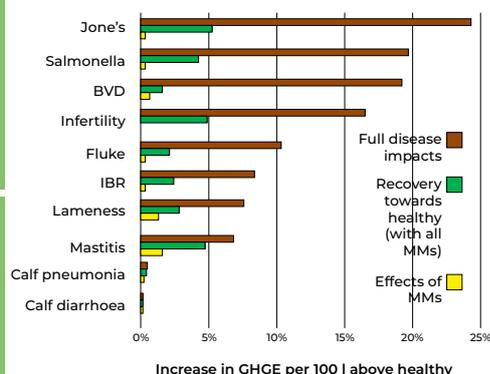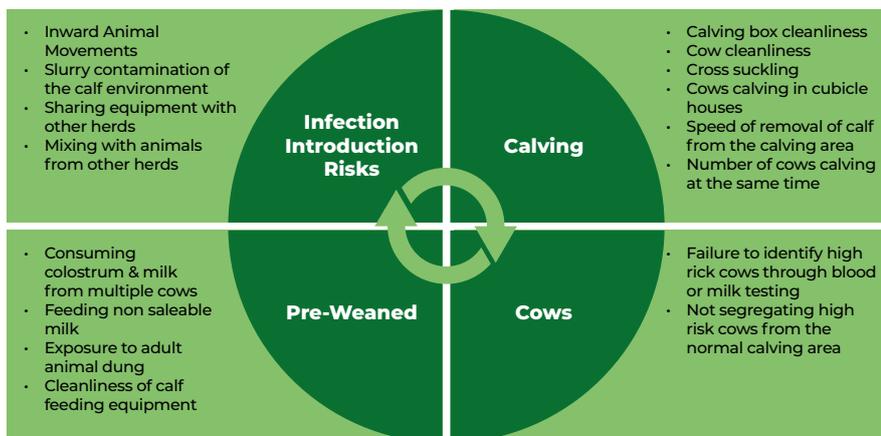- *Previous regime:* 5 weeks post turnout, 4–5-week interval thereafter

Year 2

- 14 time points (kg Measurements)
- 18 FECPAK[G2] submissions (FECs)
- FGS calves – 3 treatments (AH treatments)

- FGS FEC **360 EPG 22/05/2022** – treatment to reduce pasture contamination
- Treatments guided by FEC and liveweight
- SGS low FEC – 1 treatment prior to calving

Johne's Disease

Infection Introduction Risks
- Inward Animal Movements
- Slurry contamination of the calf environment
- Sharing equipment with other herds
- Mixing with animals from other herds

Calving
- Calving box cleanliness
- Cow cleanliness
- Cross suckling
- Cows calving in cubicle houses
- Speed of removal of calf from the calving area
- Number of cows calving at the same time

Pre-Weaned
- Consuming colostrum & milk from multiple cows
- Feeding non saleable milk
- Exposure to adult animal dung
- Cleanliness of calf feeding equipment

Cows
- Failure to identify high rick cows through blood or milk testing
- Not segregating high risk cows from the normal calving area

Increase in GHGE per 100 l above healthy

Graph Source: ADAS 2014

A. Only low risk purchases
B. Identify risky cows - probably infected - isolate at calving or cull
C. Minimise calf exposure to adult dung

Total Farm Carbon Stocks
Working out Total of Soil Carbon, per land category
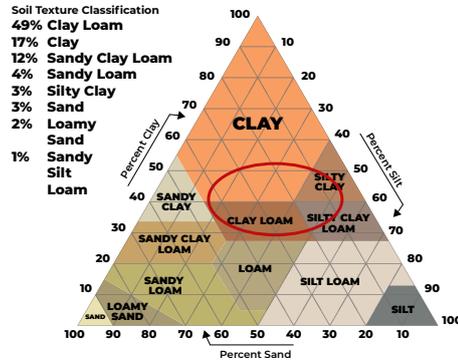
On Site Soil Sampling

Marking GPS Position

Auguring to 30cm

Collecting the Soil Sample

Lab Measurement

SOC + Bulk Density + Texture

$TOC = TC - TIC \quad OM = TO\ C/0.58$

C. Stock

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

$Stock = SOC * Depth * Bulk\ Density$

Soil Texture Classification

- 49% Clay Loam
- 17% Clay
- 12% Sandy Clay Loam
- 4% Sandy Loam
- 3% Silty Clay
- 3% Sand
- 2% Loamy Sand
- 1% Sandy Silt Loam

Benefits

Ian'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

Vegetation Height (m)

- <3
- 3-6
- 6-9
- 9-12
- 12-15
- 15-18
- 18-21
- 21-24
- >24
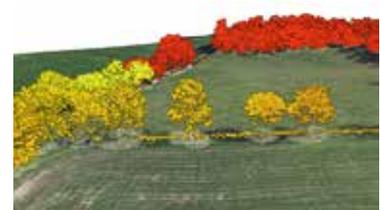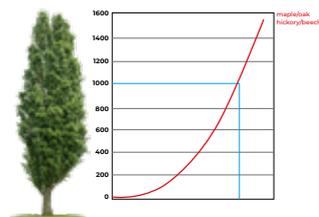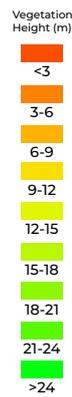
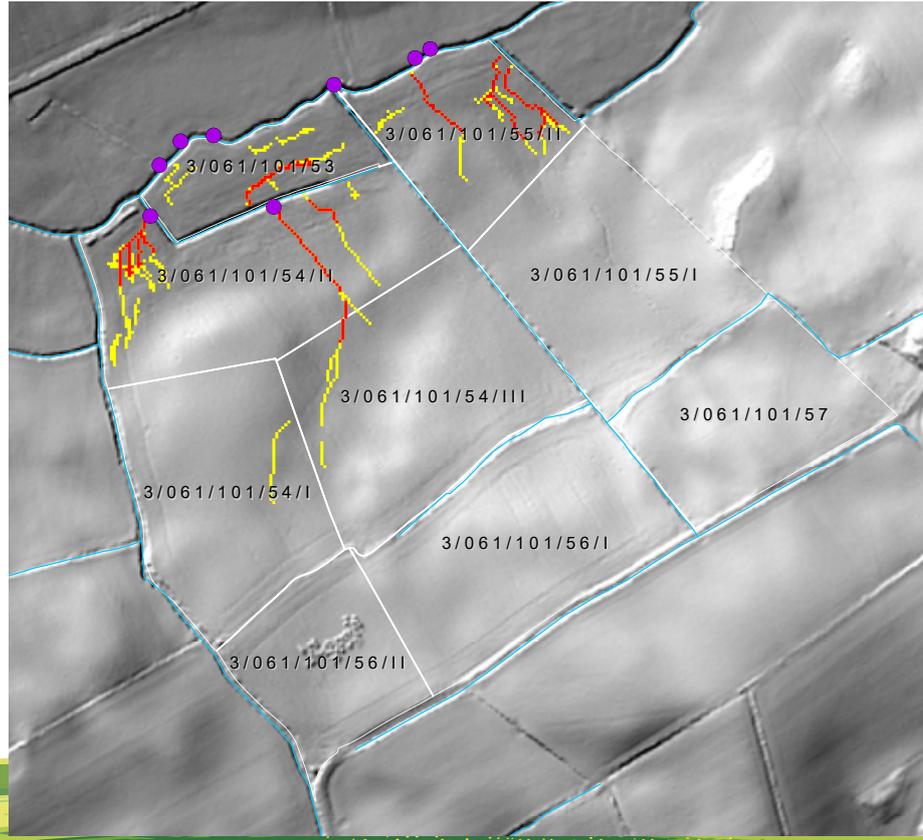**Ian's Total Above Ground Carbon Stocks**

Hedges:

Trees:

Total:

(Alex Higgins, 2021)

Improving Water Quality
Run off risk maps, McClelland Farm

3/061/101/55/II

3/061/101/53

3/061/101/54/II

3/061/101/55/I

3/061/101/54/III

3/061/101/57

3/061/101/54/I

3/061/101/56/I

3/061/101/56/II

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

Sustainable Farming
Delivering Multiple Solutions - Not Single Agendas
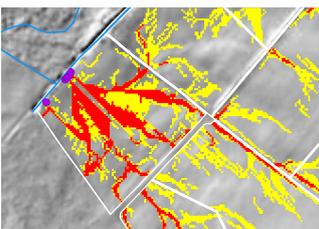

Producing Nutritious Food & Tackling Malnutrition

Delivering Soil Improvement Both Fertility & Health

Accelerating Carbon Sequestration, Both Above & Below Ground

Improving Water Quality by Reducing Over Land Flow

Optimising Biodiversity, Especially Below Ground

Generating Profits

FORTHCOMING EIP EVENTS

24th May 2023
ArcZero Farm Walk
Casement Farm, Ballycastle

20th June 2023
ArcZero Farm Walk
Gilliland Farm, Derry/Londonderry

26th June 2023
Parasite Control:
A whole farm apparoach
John Martin's Farm, Greyabbey

28th June 2023
Multi-Species Swards for Beef & Sheep
- Final Conference & Farm Walk
Glenavon House Hotel, Cookstown
& Wayne Acheson's Farm, Sandholes