

DEVENISH™

Beyond Nutrition

Innovative Livestock Solutions, for Human & Environmental Health

Dr John Gilliland OBE
Director of Agriculture & Sustainability



Devenish – A Northern Irish, Knowledge based, Global Company

Delivering Innovative Solutions to Improve
Animal, Human & Environmental Health, Simultaneously

Animal, Human & Environmental Health, Simultaneously

North America,
Manufacturing &
Research Facilities

UK & Ireland, Home,
Market, Manufacturing
& Research Facilities

Devenish Nutrition
International, Markets

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What makes Devenish unique

- **Investment in People** - 36 PhD Graduates aiding the Innovation Engine
- **Industry Knowledge** - Most employees have Industry background
- **Evidence Based Science** - 20% of Turnover invested in R&D, validated though Devenish's unique "**Performance House**" Concept System
- **Partnerships** - Delivering Sustained Innovation & Performance Improvement along the Supply Chain

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Devenish's Global Outreach on a Weekly Basis

94 million → 375 million

200,000 → 100 million



“One Health”

Population &
Environmental
Health



Retailer

Consumer

Processor

Producer

....From Soil to Society

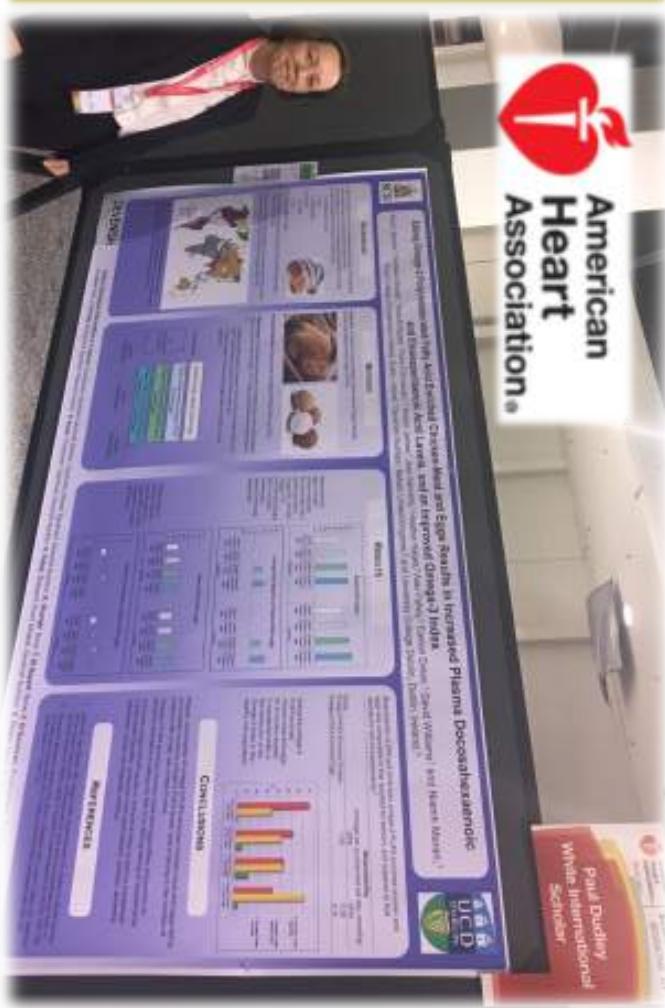


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“One Health” from Soil to Society

E.g. Improving Human Health with Chicken, enriched with “Marine” Omega 3



Adding Value “Pre Farm Gate,” with unique Human “Bio Availability,” delivering rapid Human Health Improvement (within the 1st week!!!)

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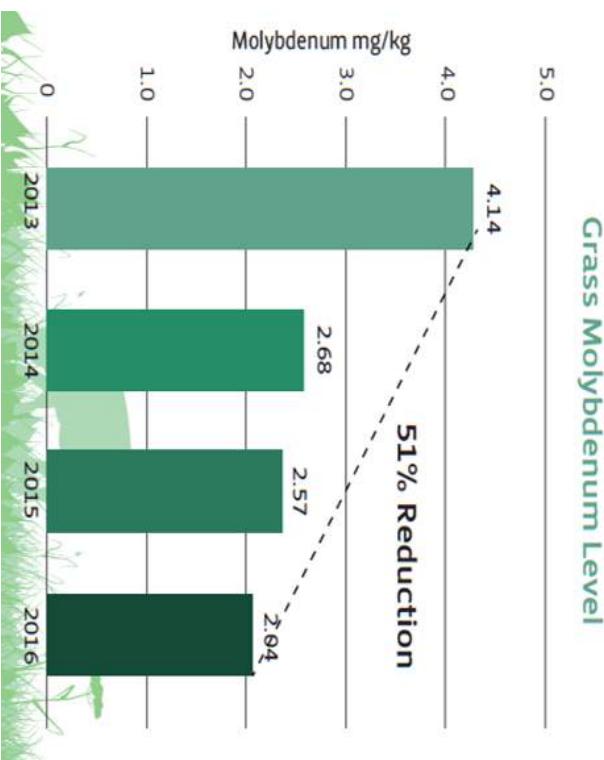
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You are **what you eat**, Eats!!!

HEALTH
FROM SOIL TO SOCIETY
— DEVENISH —
KUWAIT, KSA, UAE, YEMEN

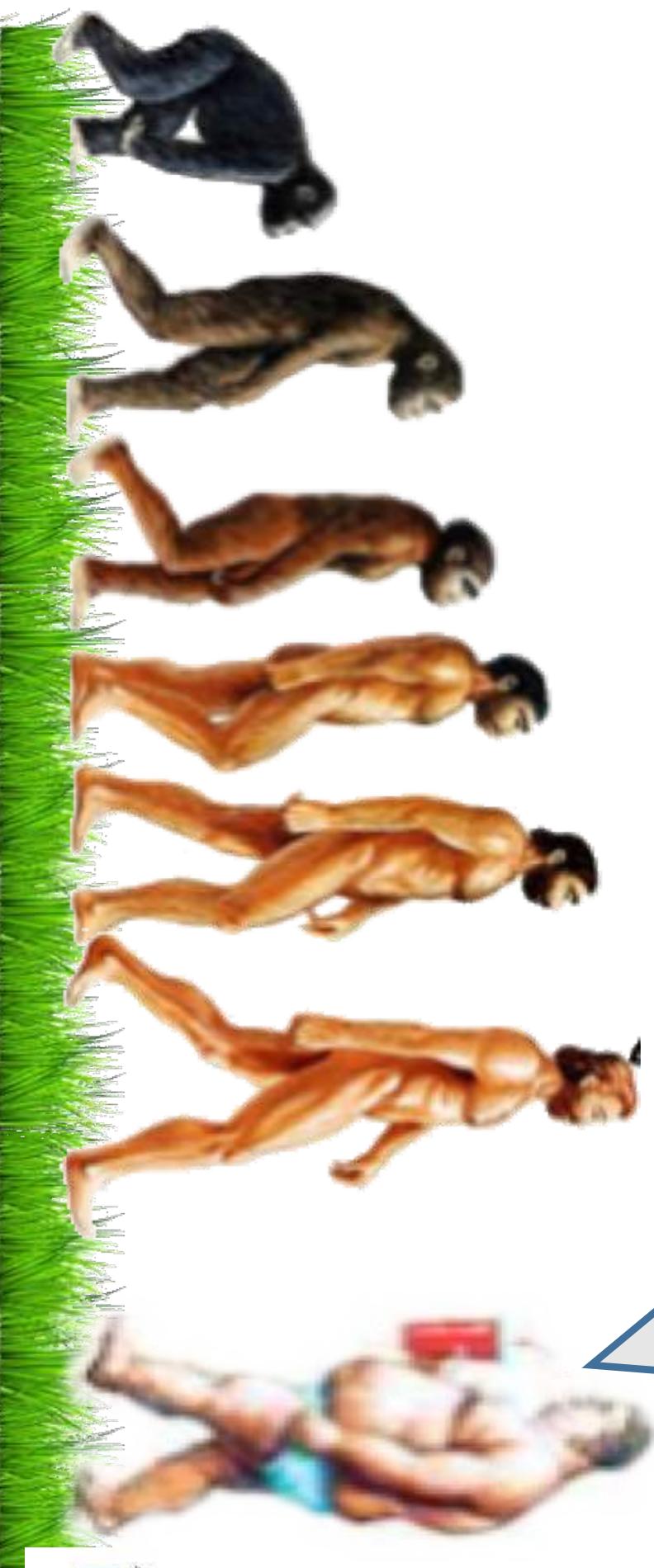
One Health.... from Soil to Society

E.g. Improving Cow Welfare & Environment, through Improving Soils



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One
HEALTH
FROM SOIL TO SOCIETY
— DEVENISH —
KIRKLEES, ENGLAND



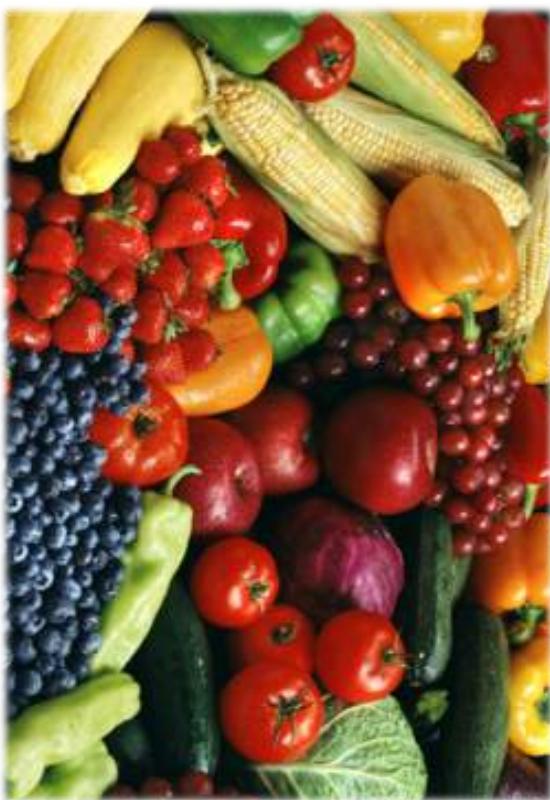
**Food today
is not always as Nutritious it could be
& diet-related Diseases are Increasing**

**Turn Around Fellas,
We Got it All Wrong!!**

Changes in Nutrient Content of Vegetables & Fruit over time

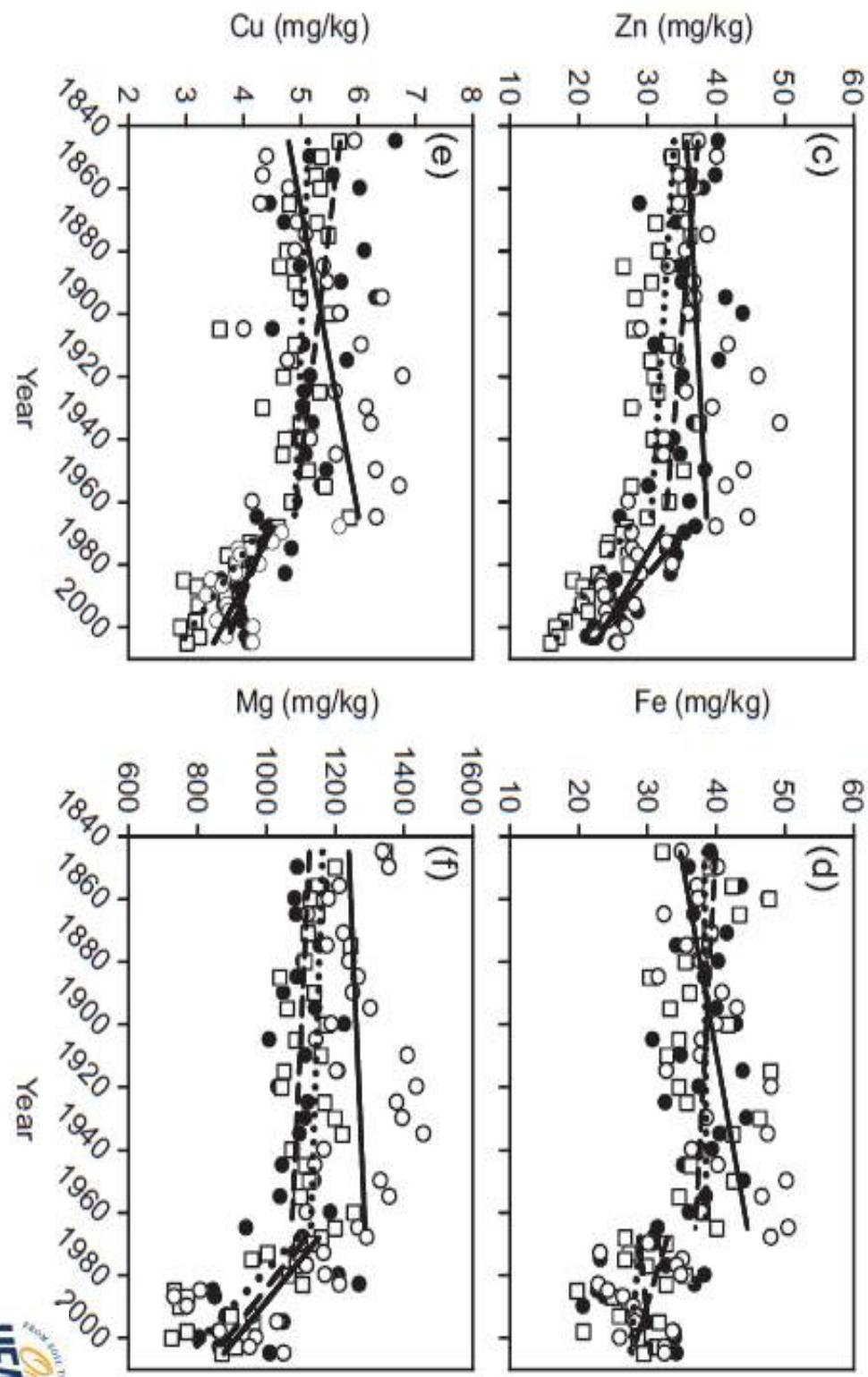
US study of nutritional data from both 1950 & 1999 for 43 different vegetables & fruits, found statistically significant declines in the amount of:

- Protein 6%
- Calcium 16%
- Phosphorus 16%
- Iron 15%
- Riboflavin 38%
- Vitamin C 20%

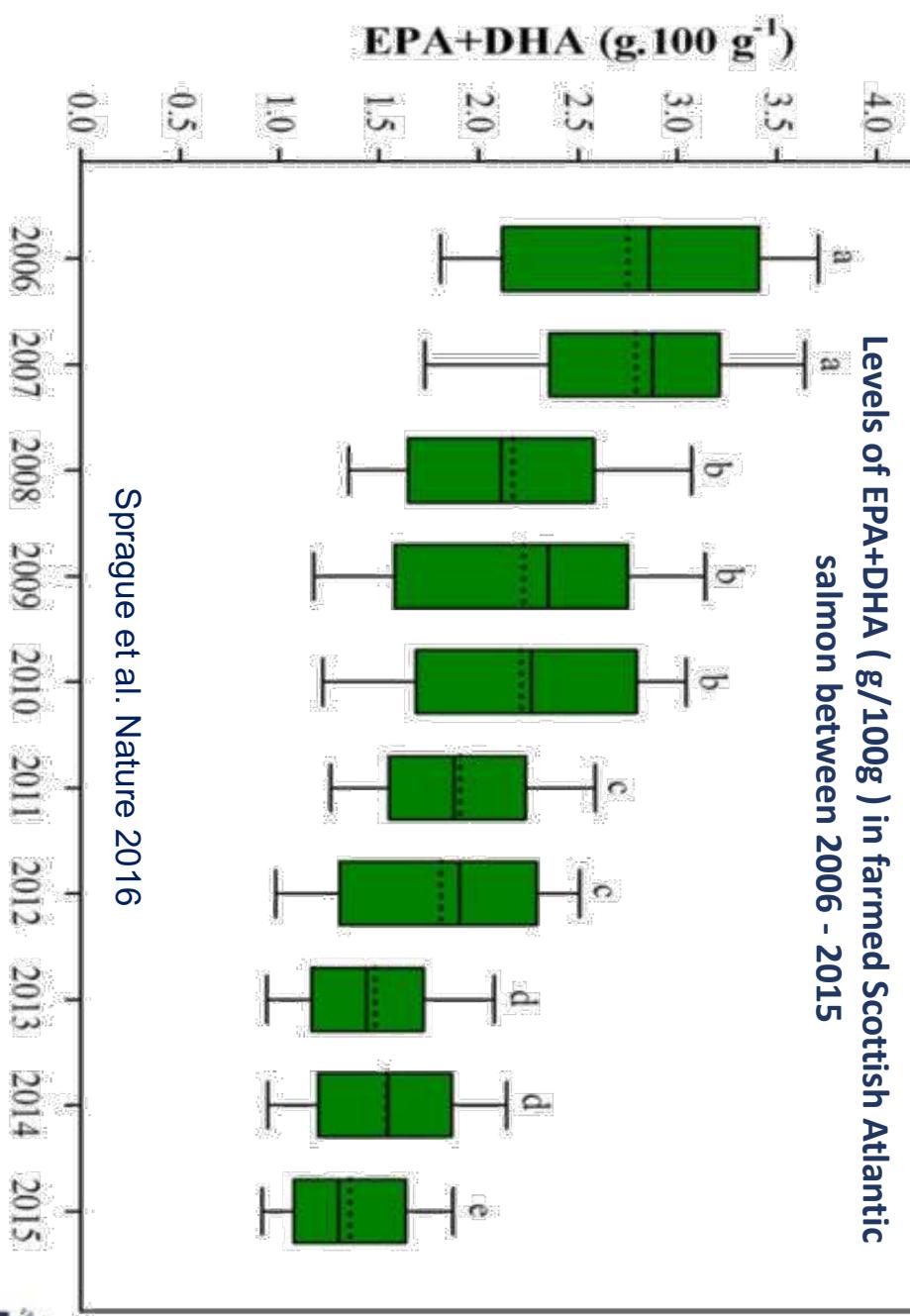


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Changes in Nutrient content of Wheat over last 160 years



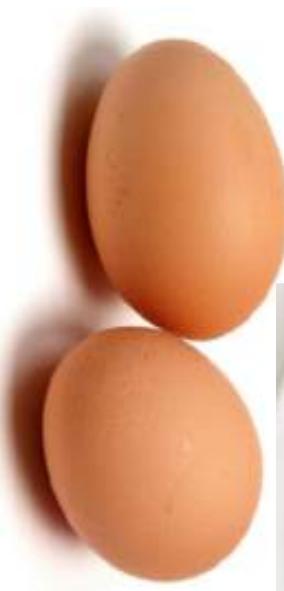
Changes in the Nutrient Content of Oily Fish in the last ten Years



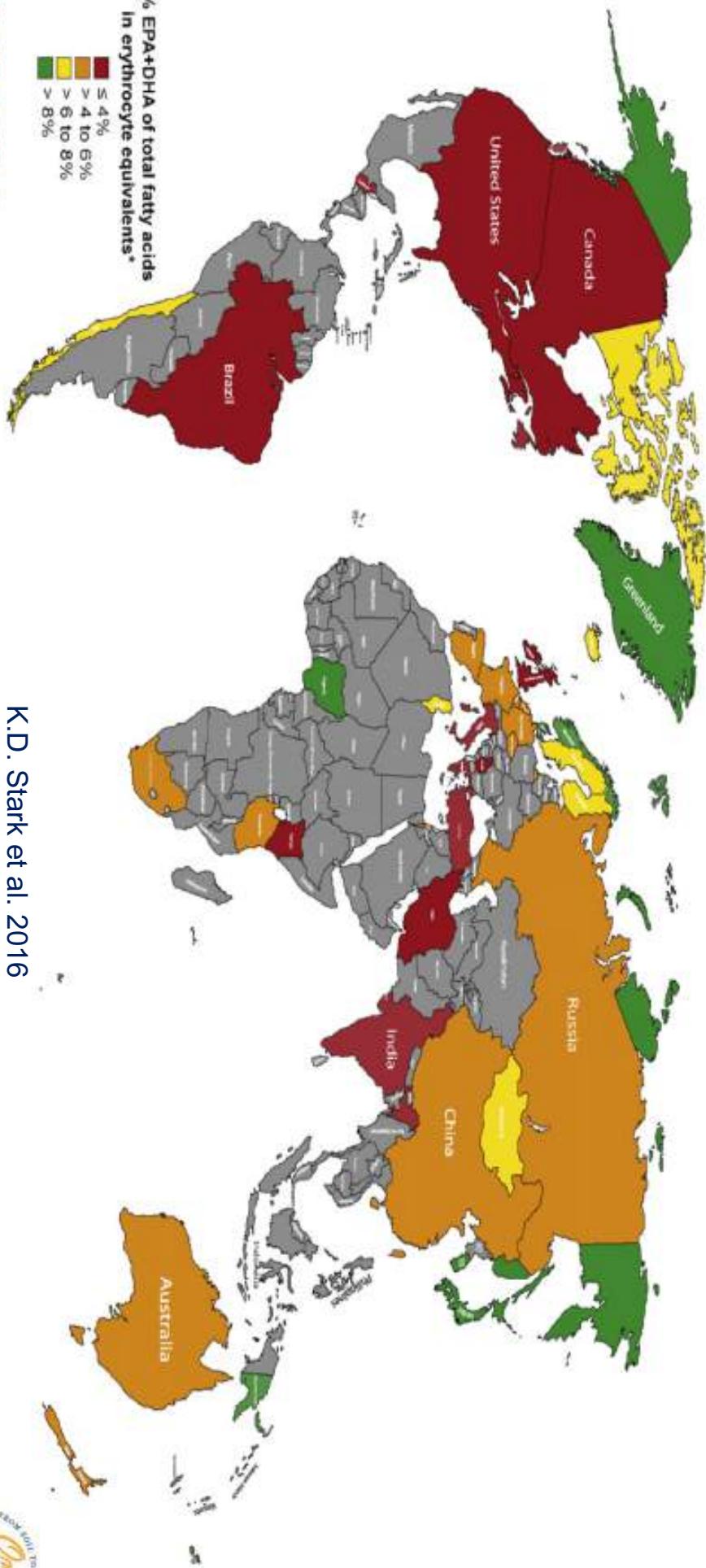
Sprague et al. Nature 2016

Challenges in Developing Bio-enriched Food, via Livestock Feed

- Required levels of enrichment in food, after cooking
- Source of nutrient & inclusion level in feed
- Timing of inclusion
- Within flock/ herd variability
- Portion variability
- Eating quality & shelf life
- Animal performance & welfare



Choosing an Enrichment Global Blood Levels of EPA & DHA Omega 3 fatty acids, in Adults



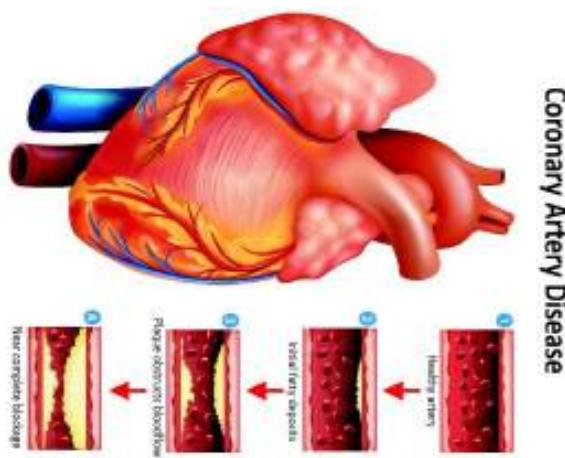
K.D. Stark et al. 2016

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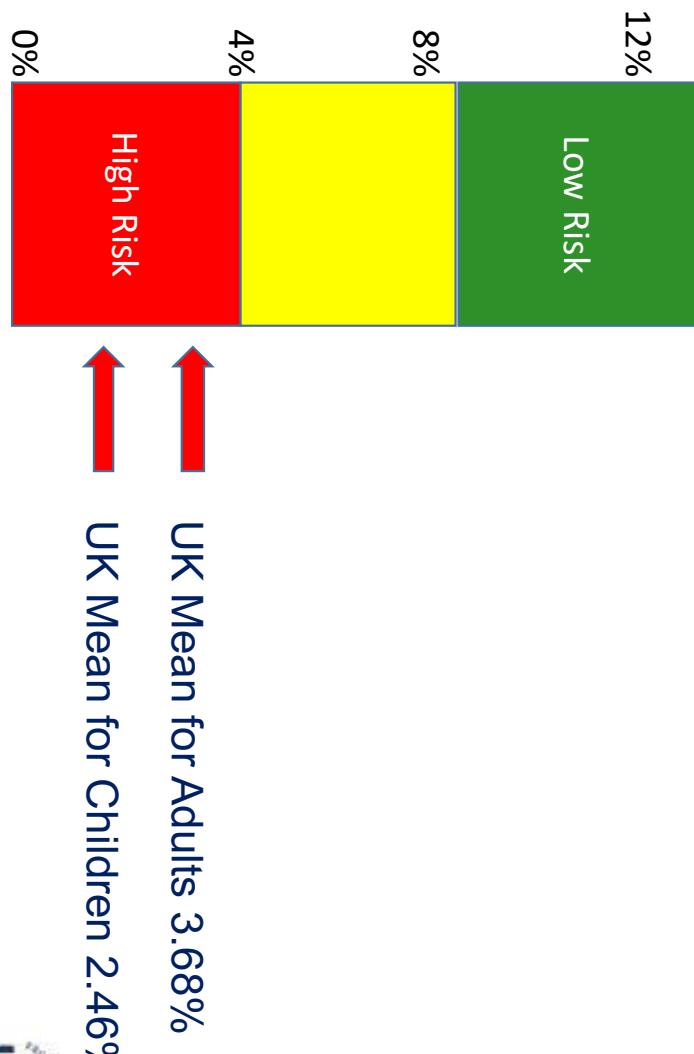
HEALTH
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From Sea to Source

Being able to Quantify the Scale of the Positive Impact

Omega 3 Index – An Internationally recognised Index of Cardiovascular Disease Risk



Omega 3 Index
(EPA and DHA IN RBC)



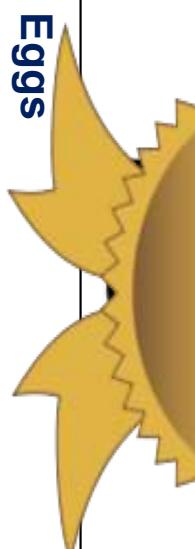
Being able to Validate the Positive Impact Credibly

Randomised Double Blind Control Human Trial

Effects of 6 months of eating on 160 people:-

- Omega-3 enriched chicken-meat *versus* control chicken meat.
- Omega-3 enriched eggs *versus* control eggs.

Gold
Standard

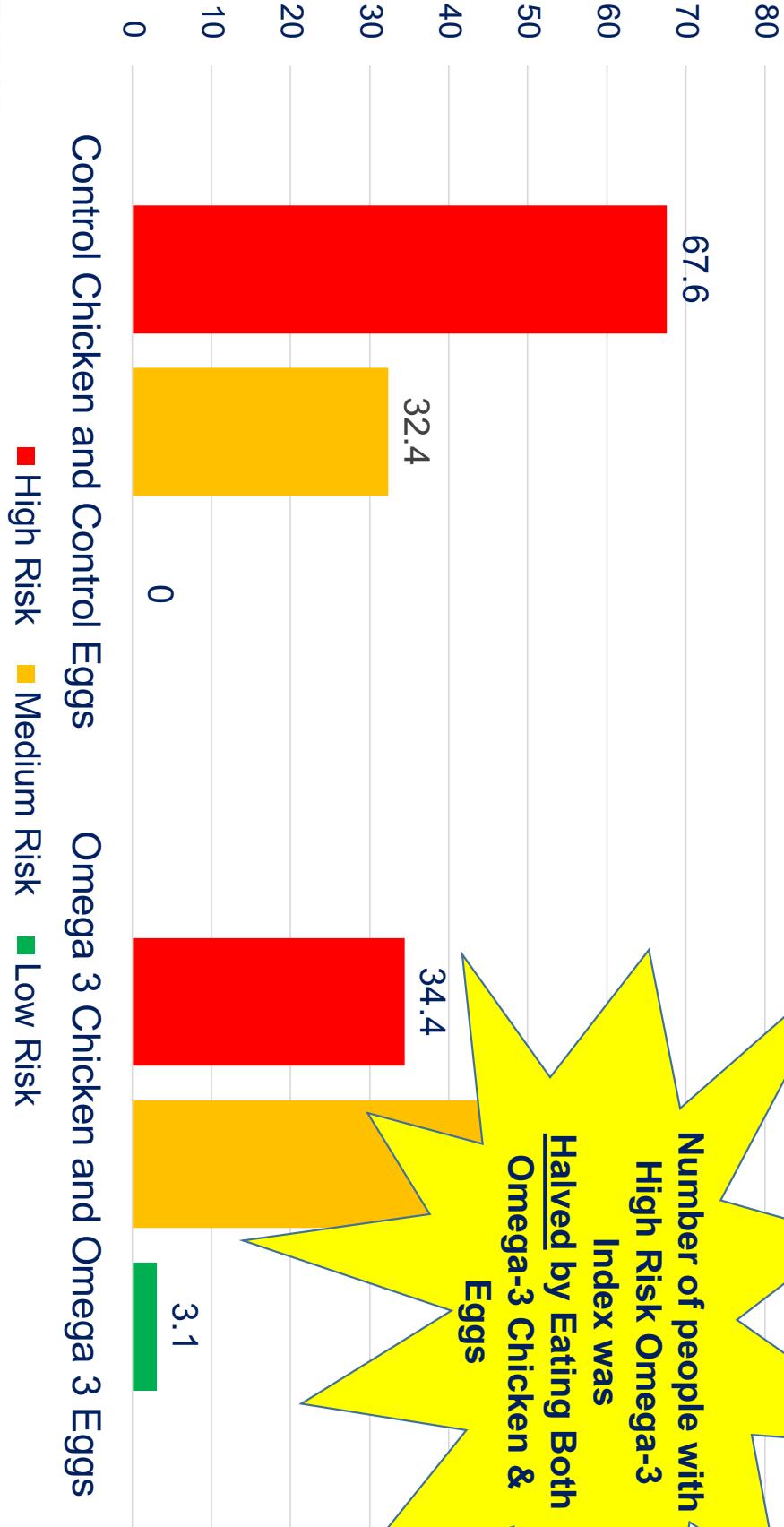


Chicken-meat	Eggs
≥3 Portions Control Chicken-meat/Week (n=80)	≥3 Control Eggs/Week (n=40)
≥3 Portions Omega-3-PUFA Enriched Chicken-meat/Week (n=80)	≥3 Omega-3-PUFA Enriched Eggs/Week (n=40) ≥3 Control Eggs/Week (n=40) ≥3 Omega-3-PUFA Enriched Eggs/Week (n=40)

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HEALTH
From Soil to Skin
© Devenish International Ltd 2009

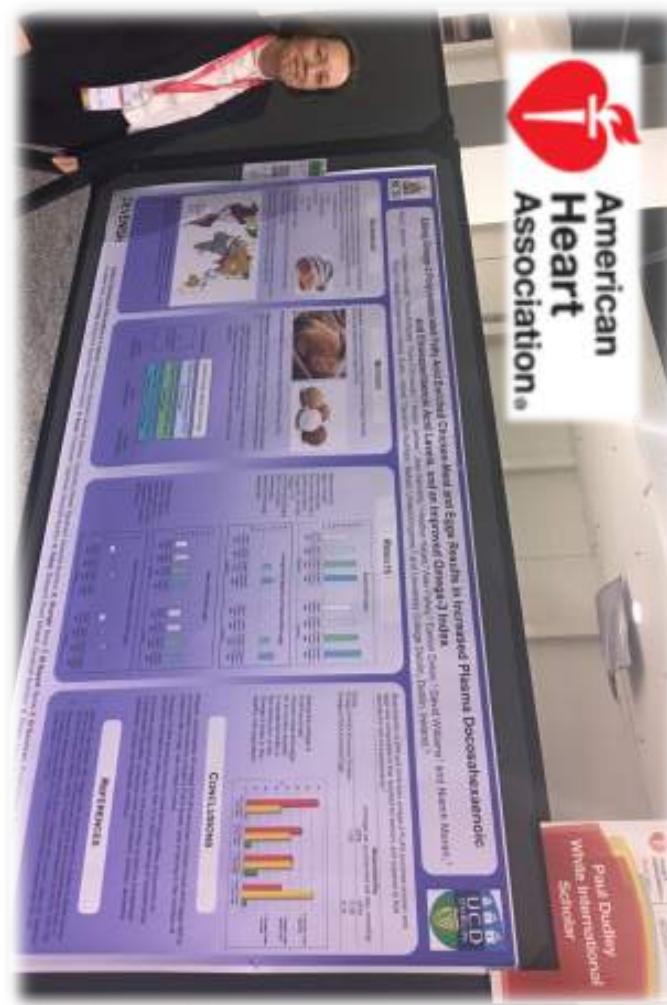
Explaining the Results using the Omega 3 Index



As a Result....

June 2016, Waitrose launches World's first, Naturally enriched Chicken Meat

The screenshot shows the Waitrose website homepage. The main headline is 'Waitrose'. Below it, a navigation bar includes 'Check availability in your area', 'Waitrose Picklist', 'Check', and 'Sign in/Register'. The 'Waitrose Shop' section is highlighted. A search bar and a 'Home' link are also present. The main content area features a large image of a white chicken. The text reads: 'Waitrose launches World's first, Naturally enriched Chicken Meat'. Below this, a sub-section titled 'Chicken with omega 3 from an enriched diet' is shown. It includes a small image of two chicken breasts and the text: 'We are introducing UK's first chicken meat sourced from chickens fed on a legume-based diet, helping to reduce heart disease risk by 30%'. A small note at the bottom left says 'Great taste & high welfare'.



Nov 2017, American Heart Association awards Research, best International Paper

You are what you eat, Eats!!!

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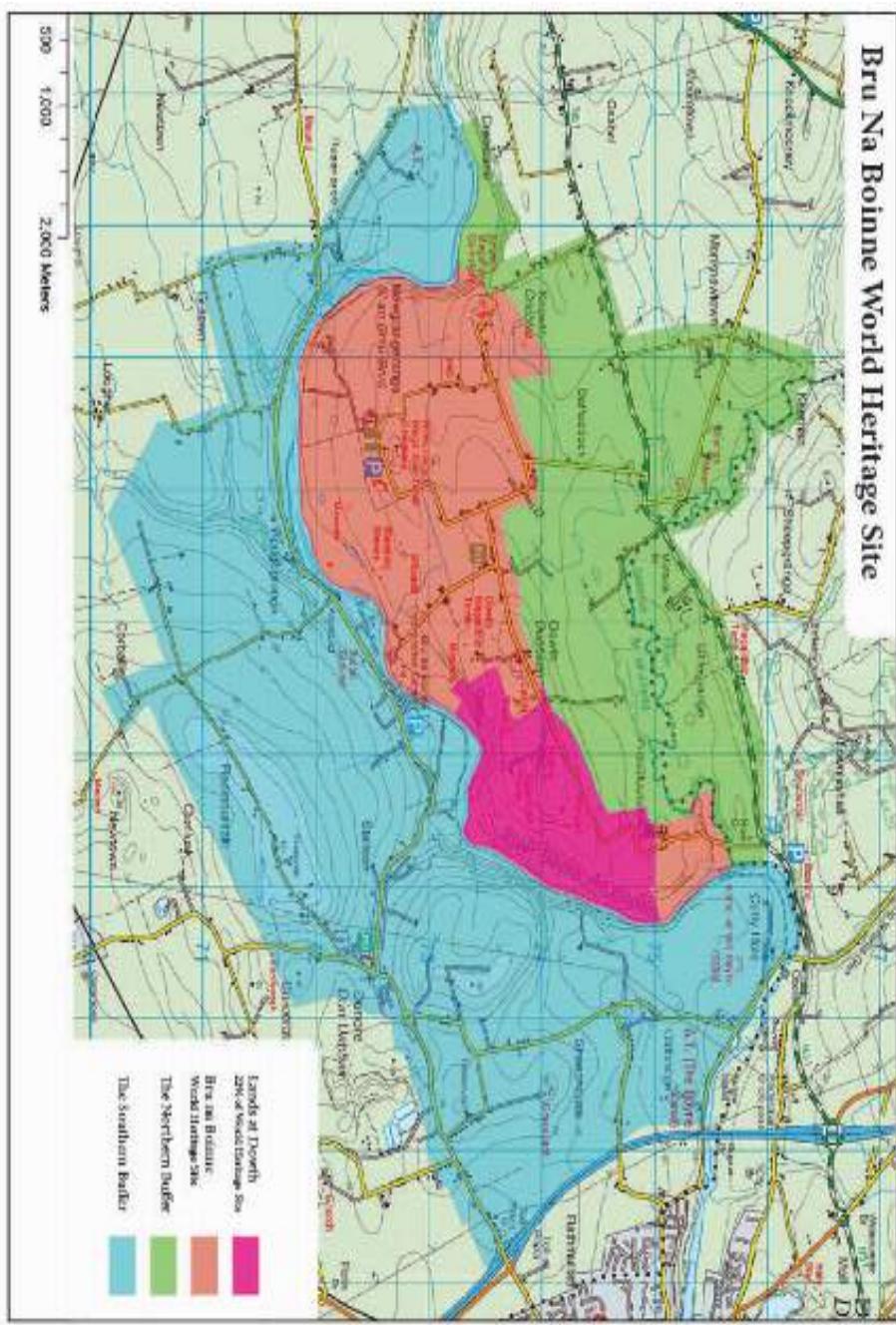
So What about Environmental Health? - The Devenish Lands at Dowth



170 ha Grass & Woodland Farm
A Ruminant Landscape Performance House

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Lands at Dowth, Bru na Boinne, UNESCO World Heritage Site



DEVENISH™ Lands of Dowth - 22% of World Heritage Site
13 Monuments – 6 with Statutory Protection



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The Lands at Dowth

A Science Based Approach to Exploration & Discovery



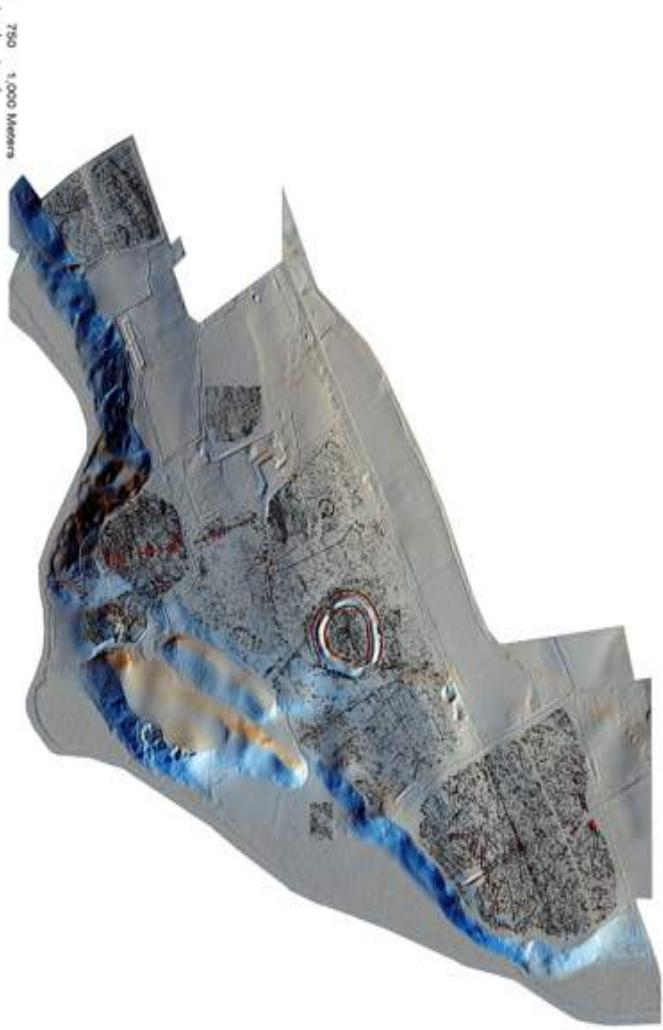
Surveys carried out since 2014

Aerial LiDAR, Geophysics by the Romano Germanic Commission, GPS Soil Analysis, overseen by the School of Archaeology, UCD & Devenish



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The Lands at Dowth – LiDAR Surveying



Initially, Using LiDAR to find new Archaeological Landscape features

Subsequently, to aid Credible Land Management Decisions

(S. Davis, UCD. 2014)

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The Lands at Dowth – GPS Soil Analysis



Initially, using GPS Soil Sampling to aid Phosphate Management

Subsequently, to find Archaeology

(P. Ward 2014)

The Lands at Dowth – Geophysical Surveying

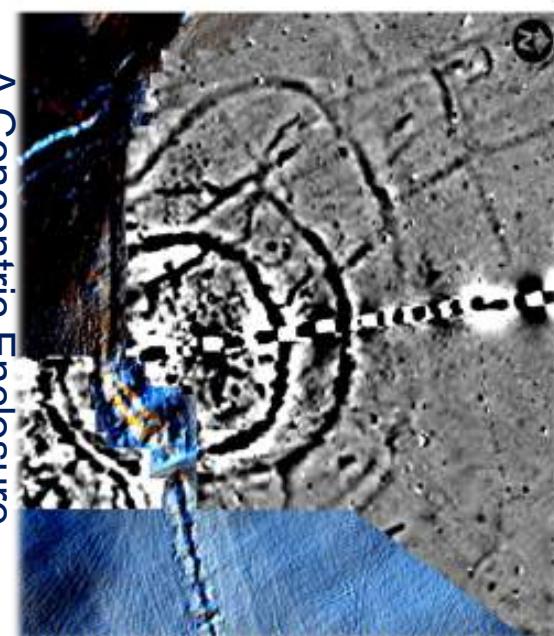


Scale of Surveying to Date



The Henge & Shadow Henge

(S. Davis, UCD. 2015)

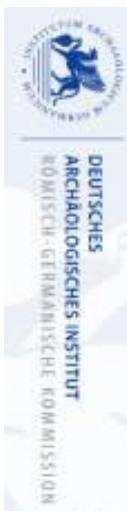


A Concentric Enclosure

**Initially, using Geophysics to find our Archaeology
Subsequently, to aid Credible Land Management Decisions**

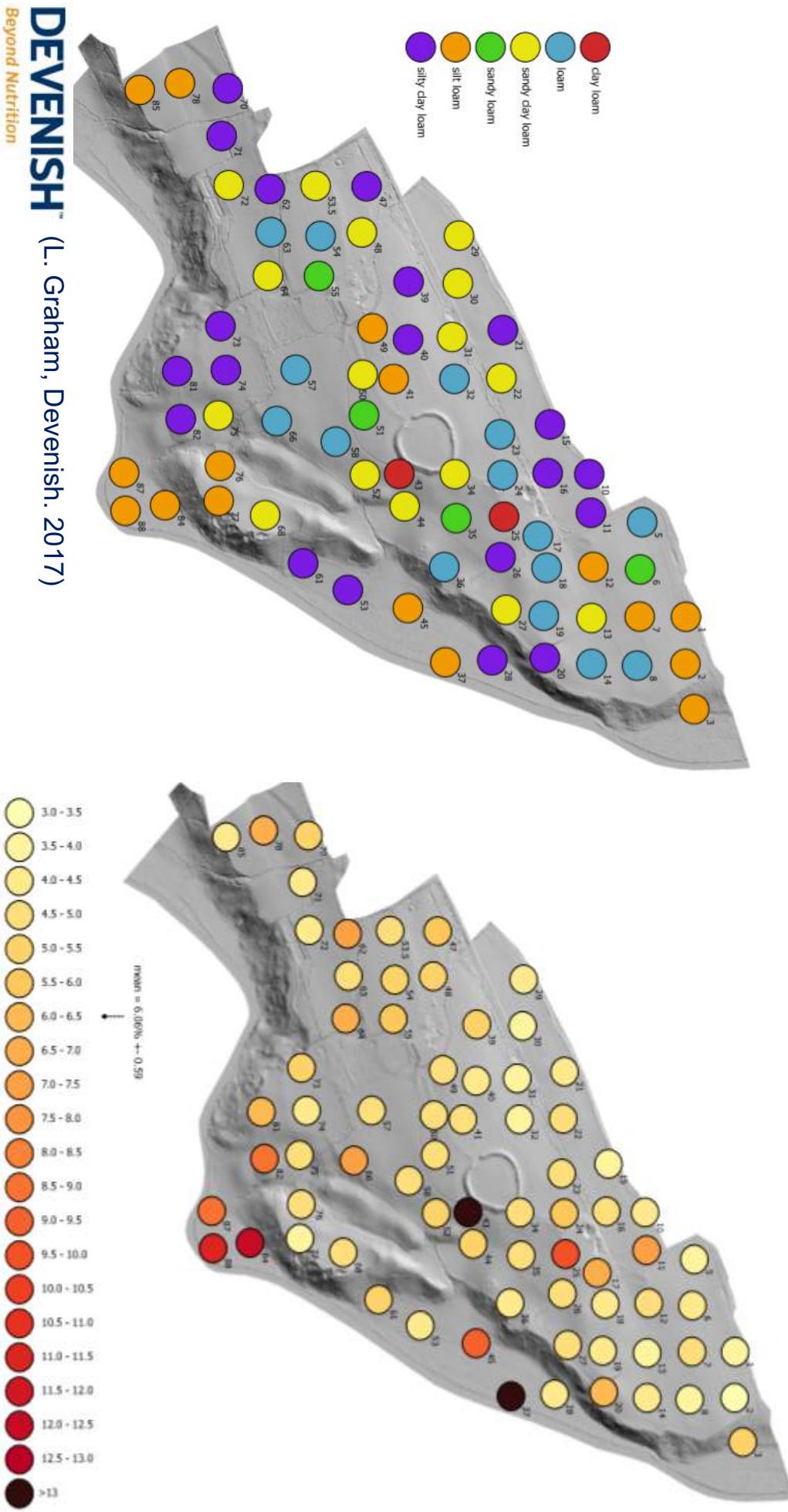
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The Lands at Dowth – Soil Texture & Organic Matter Variations

2017 Sampling of A Horizon of Soil, to 30cm

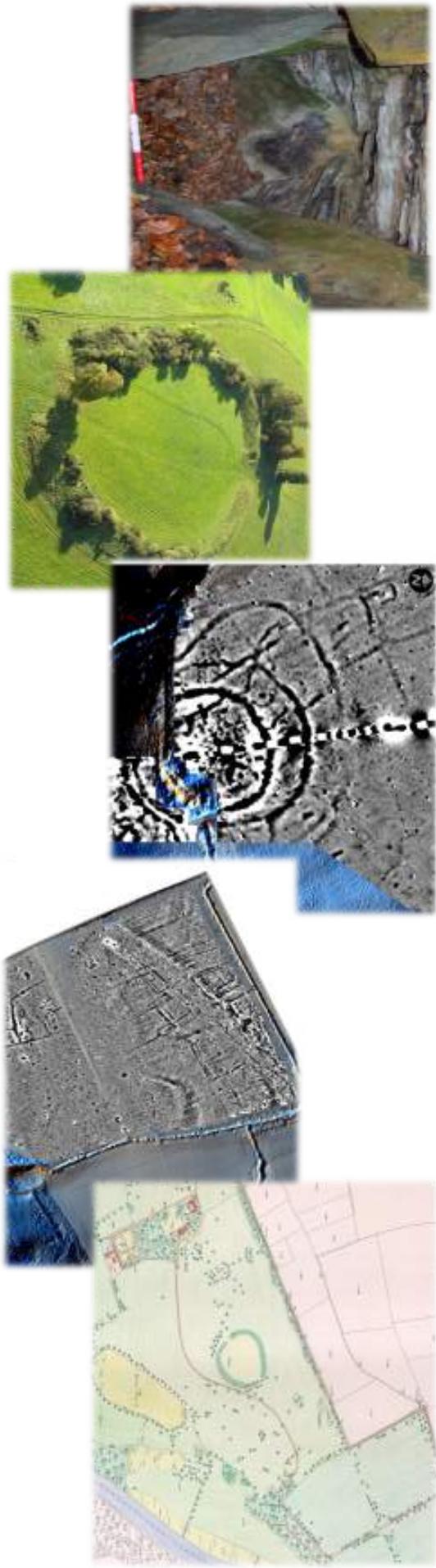


DEVENISH™ (L. Graham, Devenish, 2017)

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The Emerging Conclusion – 6,000 yrs of Food Production Innovation

Demonstrated uniquely, by the presence of five Heritage Landscapes



1. **The Passage Tombs, Middle Neolithic, c. 5,500 years old**
2. **The Henge, Late Neolithic, c. 4,500 years old**
3. **The Concentric Enclosures, Early Medieval, c. 1,400 years old**
4. **The Rectangular Enclosures, Late Medieval, c. 1,000 years old**
5. **The Demesne Landscape, c. 300 years old**

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 **Dowth**
The Lands at

Role of Dowth in Idea Generation for NI Land Management Strategy

Validating GPS Soil Sampling & its Role in aiding Farmers improve Soil Fertility



pH Improvement in just 2 years, with 2 ha soil sampling & 5t/ha of lime, Sept 14

Grass Utilisation as a “Measurable” is fundamental for both the Economics & the Environment

Top 5% NI Farmers - 16t DM/ha/yr; N. Ireland Average (& Dowth initially) – 5.1t/ha/yr

Only 2% of Soils analysed per Year & only 18% of NI soils at optimal fertility!!

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HEALTH
YARD SOIL TO SOIL
— DEVENISH —
KNOCKANAGA, DROG

Role of Downt in Idea Generation for NI Land Management Strategy

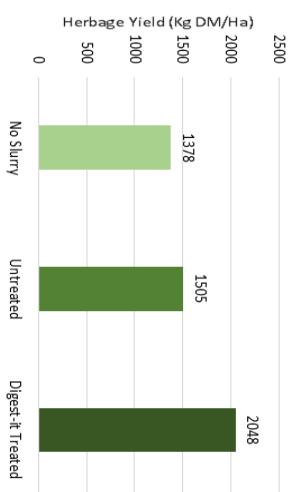
Improving Grass Yields, by validating 3 Step, Soil Improvement Programme



By Aerating Soils, Precision Soil Analysis

Pig Slurry Trials 2014

Herbage Yield Per Plot



Applying Aerobically Treated Slurry & magnesium/calcium Lime

Delivering 10 - 22% Increase in Grass Yields, 36% Reduction in Ammonia

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From Soil to Society
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SUSTAINABLE FEEDS

Validating the Economics of Soil Improvement Programme

In Partnership with Thomson & Joseph

	Mean of 3 Monitor Farms
Grass Utilised on Grazing Platform (tonnes DM/ha)	
2013/2014	8.37
2015/2016	9.37
Change	+ 1.00 t/ha
Net Value (€/ha)	€173
Net Value/Farm (€)	+ €6,264/farm
 Milk Solids Yield (kg/ha)	
2013/2014	1,276
2015/2016	1,478
Change	+ 202 kg/ha
Gross Value (€/ha)	€909
Grass Value/Farm (€)	+ €32,915/farm



Healthy Soils

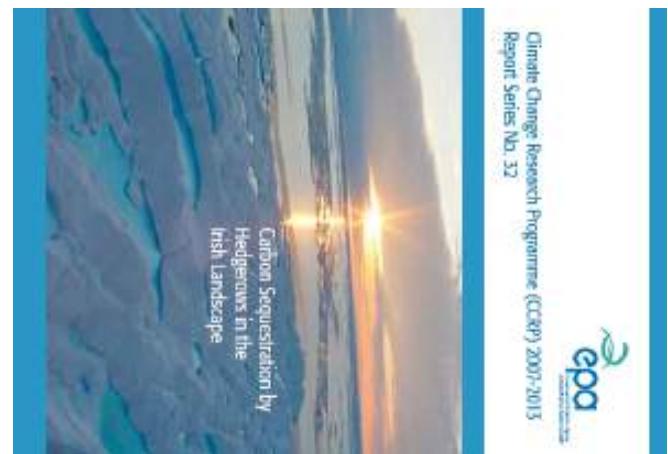
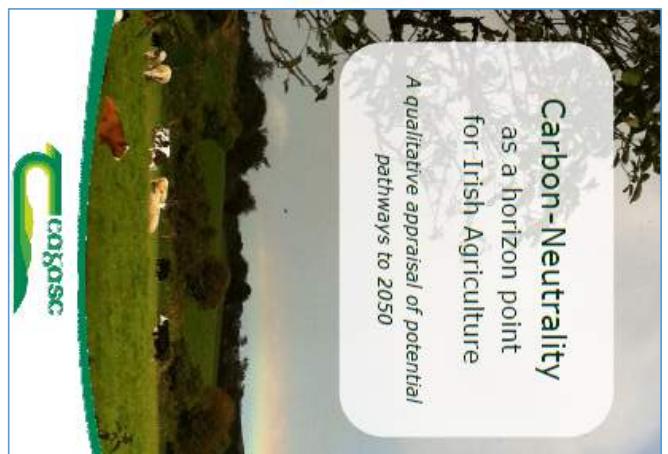
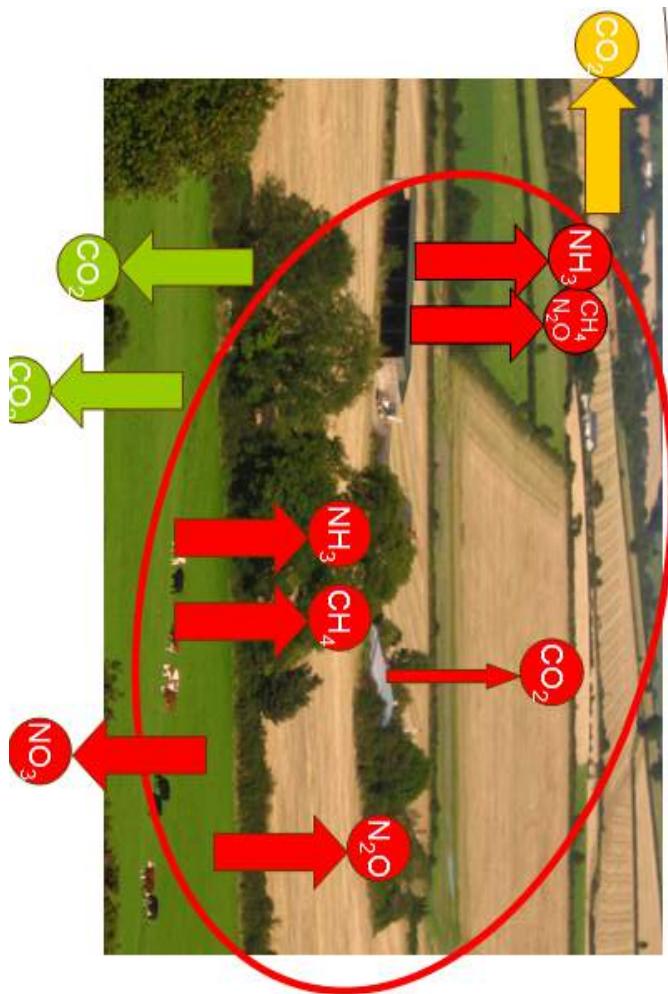
Healthy Grass

Healthy Livestock

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Role of Downtime in Idea Generation for NI Land Management Strategy

Evaluating Trees & Hedges as an “On Farm” Sequester of Livestock Emissions?!



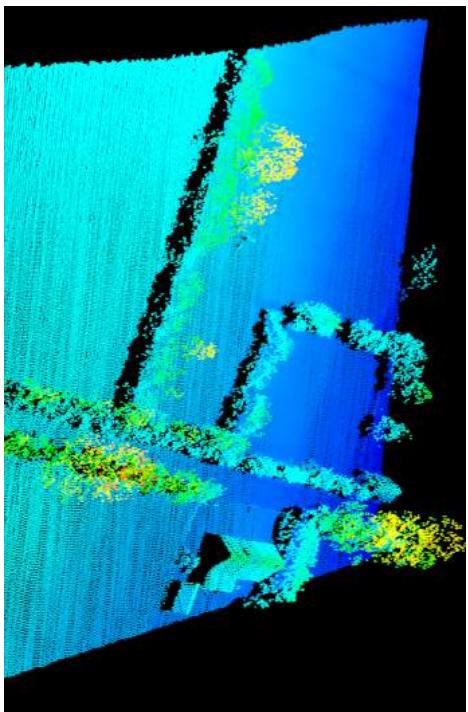
Recognition to the Principle of “on farm” Carbon Sequestration



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Role of Douth in Idea Generation for NI Land Management Strategy

Evaluating Trees & Hedges as an “On Farm” Sequester of Livestock Emissions?



	Woods	Hedges	Total
Biomass Density C/ha)	83	127	86
Total Biomass in Douth (t C)	3495	385	3880
Sequestration Potential for Douth (t C/Yr)	50	1.2	51

C Sequestration Renewable Total
(Above Ground) Heat

Current Trees	9.5%	3%	12.5%
Better Management	32%	3%	35%

S. Green, Teagasc, 2014

DairyCo. 2011

J. Gilliland, Devenish, 2014

**Dowth Carbon Sink Potential - 35% of GHGs 200 Dairy Cows, with Followers
(Before Considering Carbon sink of Soils!!)**

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The Devenish Lands at Dowth – Success to date

Influencing Decisions beyond our Shores



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Like 67

Posted on 28 April 2017

G+1 0

WWF-DRC completes its first national biomass map using LiDAR sampling

You Can Help

News & Stories

Success Stories

Publications & Factsheets

For Journalists

The Democratic Republic of Congo has become the first African country to build a national biomass map using LiDAR, furthering the scientific underpinning of their REDD+ processes.

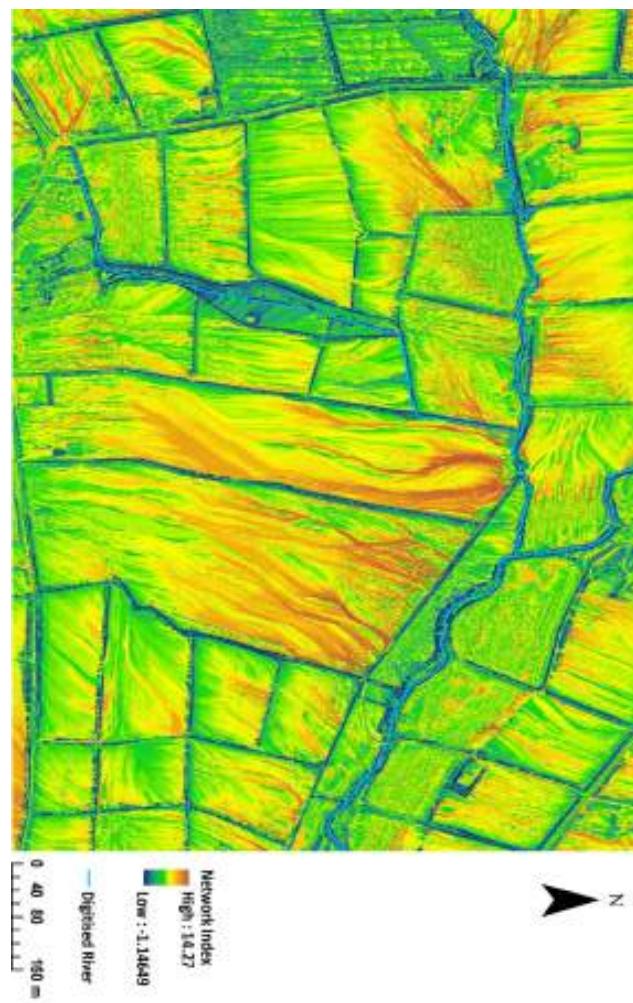
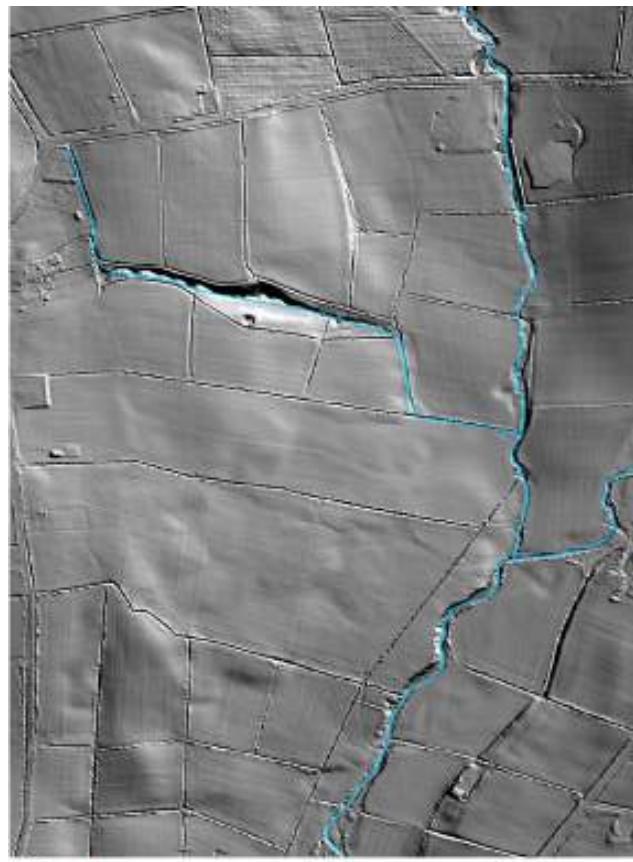
A photograph showing a steep, dark mountain peak covered in dense green forest. The sky above is a clear, pale blue with wispy white clouds.

DEVENISH® Securing Carbon Credits for 460,000 ha of Rain Forest in The Congo

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Role of Dowth in Idea Generation for NI Land Management Strategy

Next - Using LiDAR to position Riparian Strips to capture “Over Land Flow”



R. Cassidy, AFBI, 2016

**AFBI now evaluating LiDAR to position Riparian strips accurately.
80% of Phosphate in NI enters water course through “Over Land Flow!”**

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afbi
Agri-Food and
Biosciences Institute

Capturing “Overland Flow” of Dirty Water with Woody Strips

Improves Biological Quality of Water Courses & Carbon Sequestration



Planting “Over Land Flow” Pathways with Woody Strips catches Sediment & enhances Carbon Sequestration on farm.

Harvesting Wood regularly, mines Phosphate out of Woody Strip, before using wood as Renewable fuel, displacing further fossil fuels; while creating a new Habitat

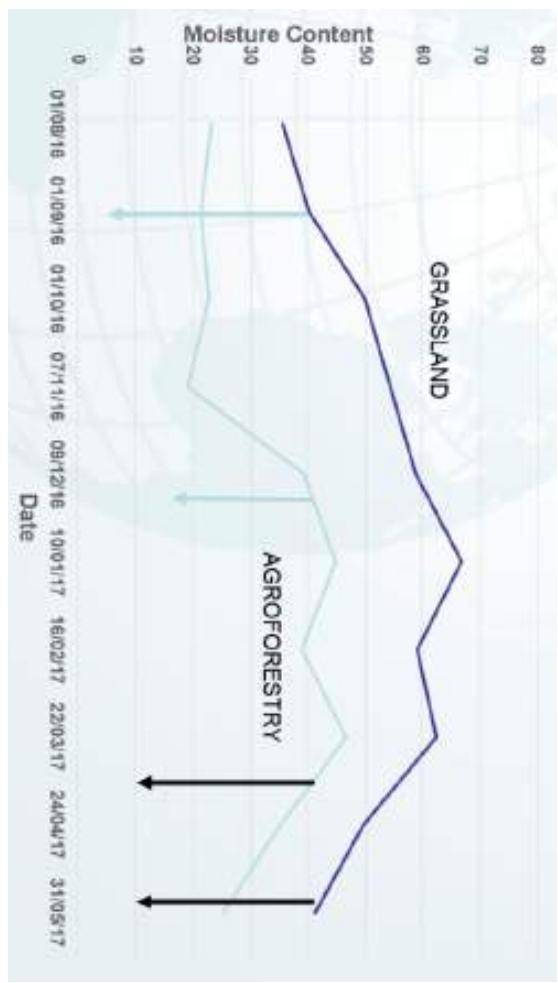
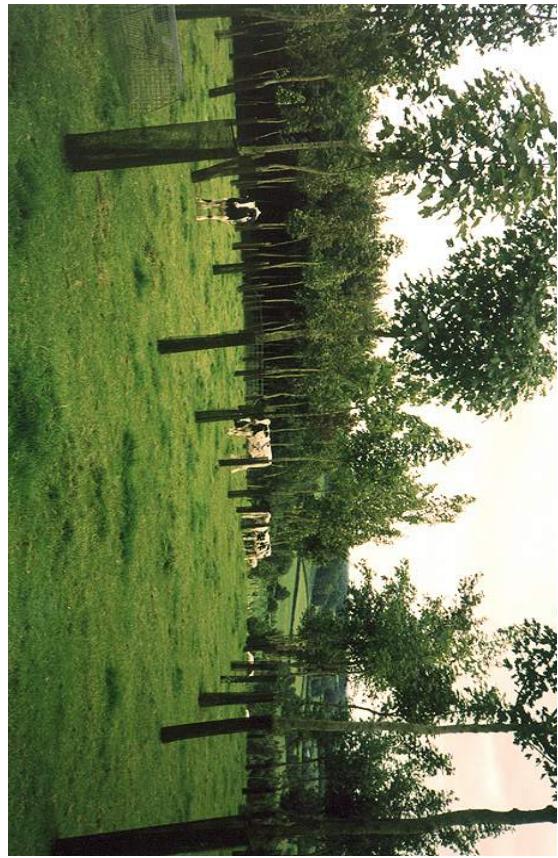
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J. Gilliland 2012

Maximising Sequestration, while extending Grazing Season

Agroforestry - Trebling Sequestration, while extending Grazing by 17 weeks!!



Land Use Practice	Species	tC/ha/yr
Silvopasture	Poplar (200/ha)	2.8
Pasture	Perennial ryegrass	1.0
Forest Plantation	Sitka spruce (yc 18)	3.8

J. McAdam, 2017
Gordon, 2007

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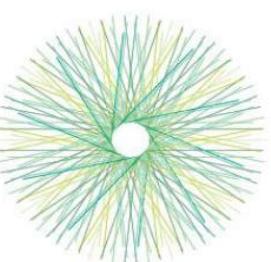
European Recognition of N.I. Sustainable Land Management Strategy

Worth £198m of Extra Farm Income, to N. Ireland, per Year



Inspirational Ideas

NEWSLETTER FEBRUARY 2017



Delivering Farm Profitability and Better Environmental Performance using multi-functional technologies: Ingredients for a Sustainable Agriculture Strategy for Northern Ireland

DG Ag/DG Env, Joint Workshop
Bratislava Oct 16

DG Agriculture, eip-agri Newsletter, Feb 17

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Multiple Benefits of Better Grass Utilisation & Grass Quality

N. Ireland, Sustainable Land Management Strategy, Oct 16

Dairy Sector	Current Average Non-Derogated Dairy Farm Performance	Current Average Farm, utilising 1 extra tonne of average quality Dry Matter of Grass, per hectare	Current Average Farm, utilising 1 extra tonne of good quality Dry Matter of Grass, per hectare
Whole Farm P. Balance (kg P/ha/year)	11.3	4.2	3.0
Change in N concentration in land drainage water	N/A	+ 2 mg nitrate-N/l	+ 3 mg nitrate-N/l
Net Change in Profit if Milk price is 18p per litre	N/A	+ £120 / ha / year	+ £270 / ha / year
Net Change in Profit if Milk price is 28p per litre	N/A	+ £45 / ha / year	+ £334 / ha / year

Strategy Objectives :-

- 1. Increasing Output**
- 2. Increasing Margins**
- 3. Reducing Environment Footprint**
- 4. Simultaneously!!**

Validated by AFBI 2016

Healthy Soils

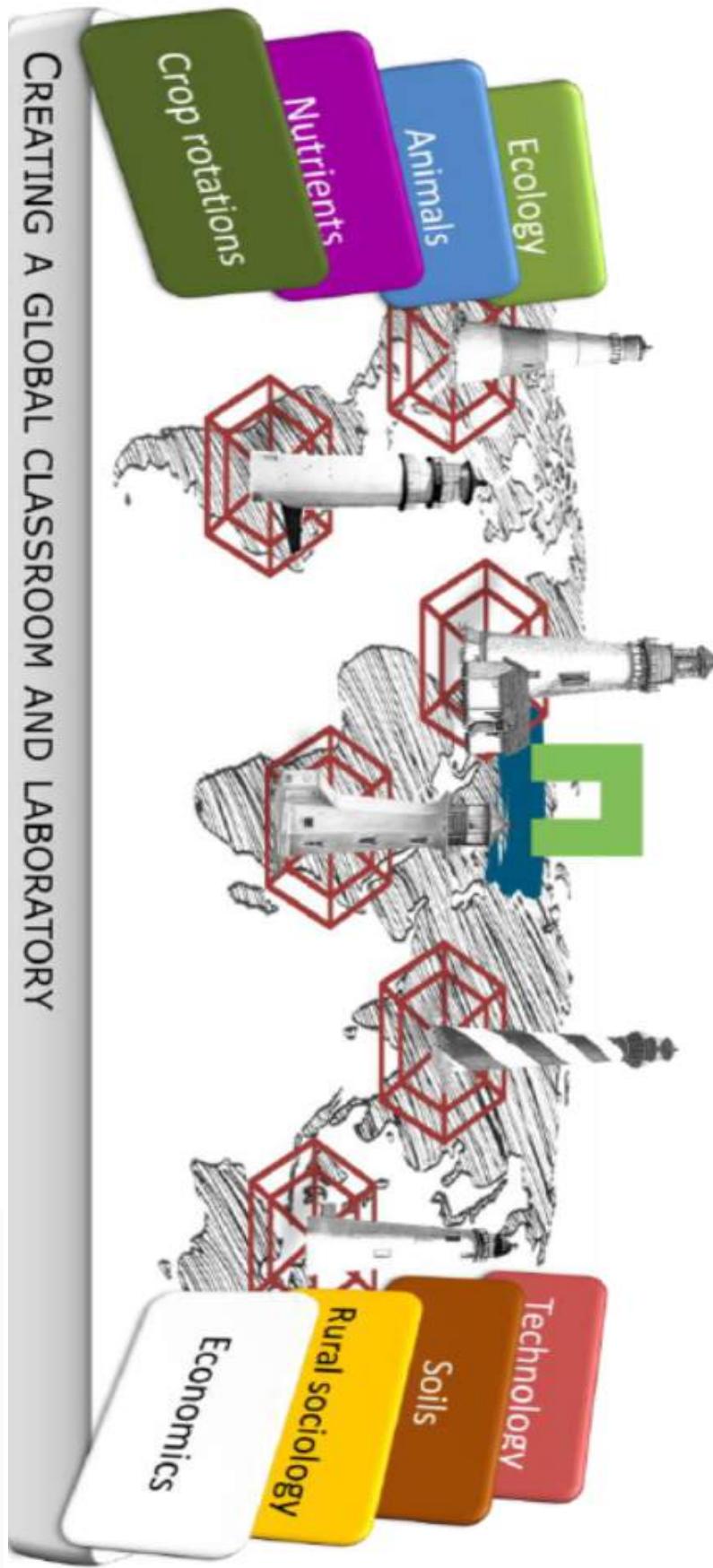
Healthy Grass

Healthy Livestock

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Our Future – One of Wageningen’s Six International Lighthouse Farms

A Multi Disciplined Farming Platform for International Research & Outreach



CREATING A GLOBAL CLASSROOM AND LABORATORY

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WAGENINGEN
UNIVERSITY & RESEARCH

Our Future - The Devenish Lands at Dowth

A Global Centre for Innovation, Research, Public Engagement & Outreach 11,000 People in Last Year

- EU Ag Commissioner
- USDA & FDA
- Ag. Policy Teams, ROI & NI
- Ministers of Ag. ROI & NI
- UCD, QUB
- Wageningen RC & INRA
- European Animal Science
- Waitrose Supermarkets
- Community Days
- Farm Africa
- Moy Park, Glanbia, ABP



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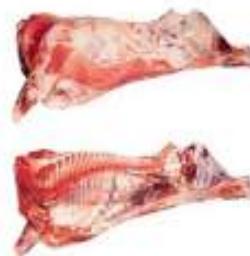

The Lands at
Dowth

Our Future – Proactively Delivering Innovative Farming & Food Systems

Improving Human & Environmental Health, through International Partnership

One Health

Human &
Environmental
Health



Consumer

Retailer

Processor



Producer

...From Soil to Society



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HEALTH
FROM SOIL TO SOCIETY
- DEVENISH -
TOKAIHALLA, KERALA