

DEVENISH™

Beyond Nutrition

“One Health.....from Soil to Society”

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



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 through Devenish's unique "**Performance House**" Concept System
-  **Partnerships** - Delivering Sustained Innovation & Performance Improvement along the Supply Chain



Devenish's Global Outreach on a Weekly Basis



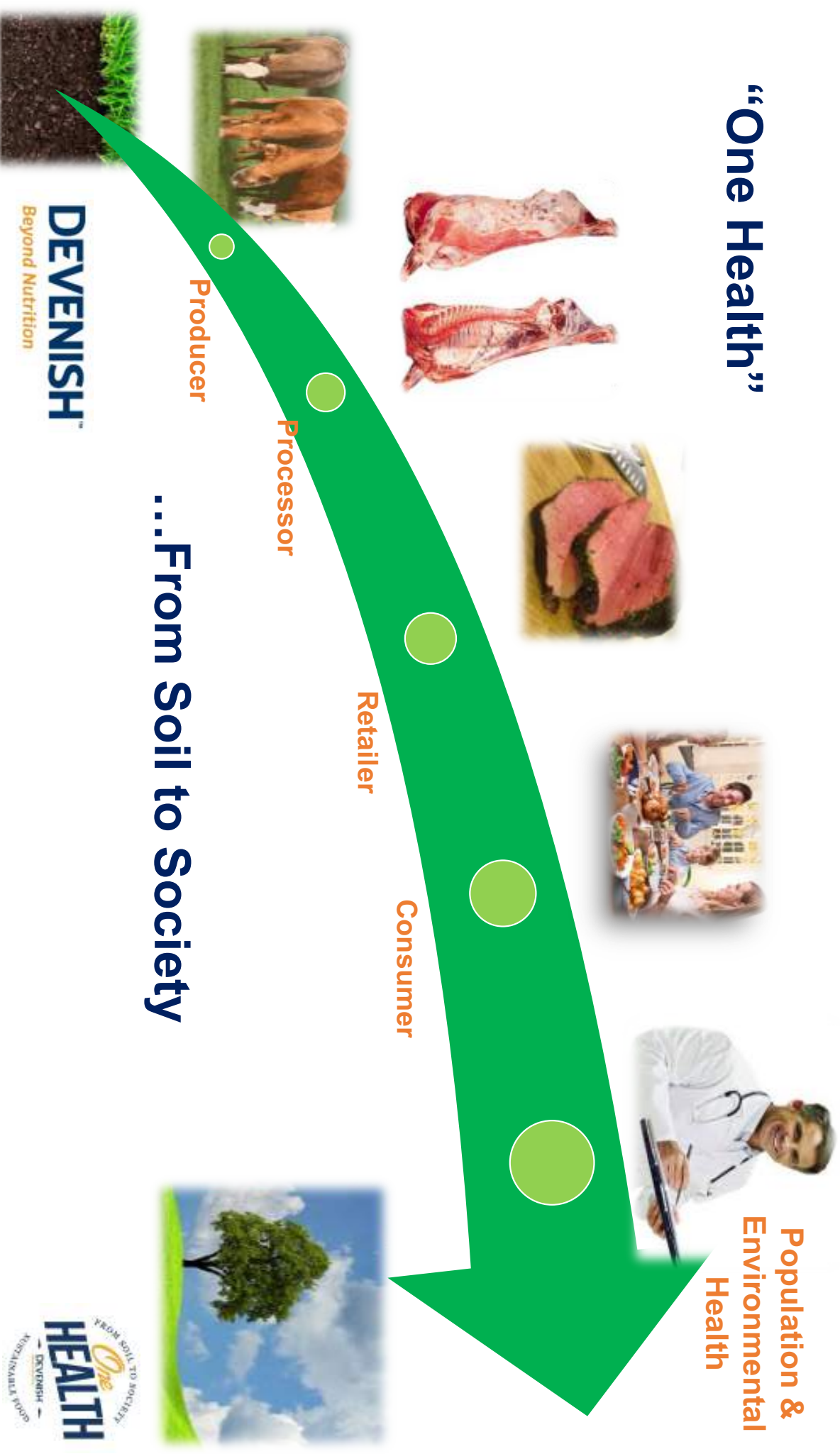
94 million → 375 million



200,000 → 100 million



“One Health”



“One Health” from Soil to Society

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

Chicken with omega 3
from an enriched diet

We are introducing UK's first chicken as a source of omega 3, which as a key part of a balanced diet, help maintain normal heart, brain and vision function.

a source of
omega 3 for heart,
brain & vision

HEART BRAIN VISION



American Heart Association

Paul Dudley White International Scholar

Long-term effects of feeding enriched chicken meat on eggs: Results in increased plasma Docosahexaenoic acid (DHA) and arachidonic acid (ARA) levels, and a reduced risk of heart disease.

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

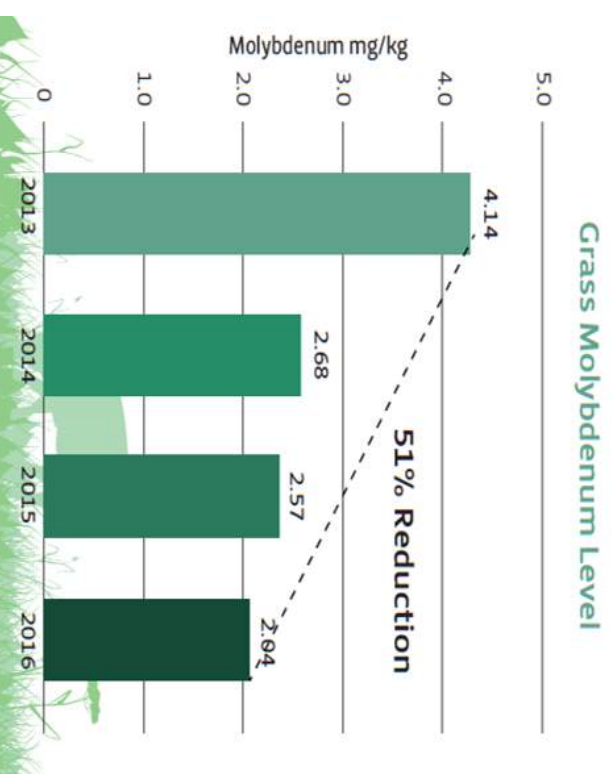
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You are what you eat, Eats!!!



One Health..... from Soil to Society

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



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

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



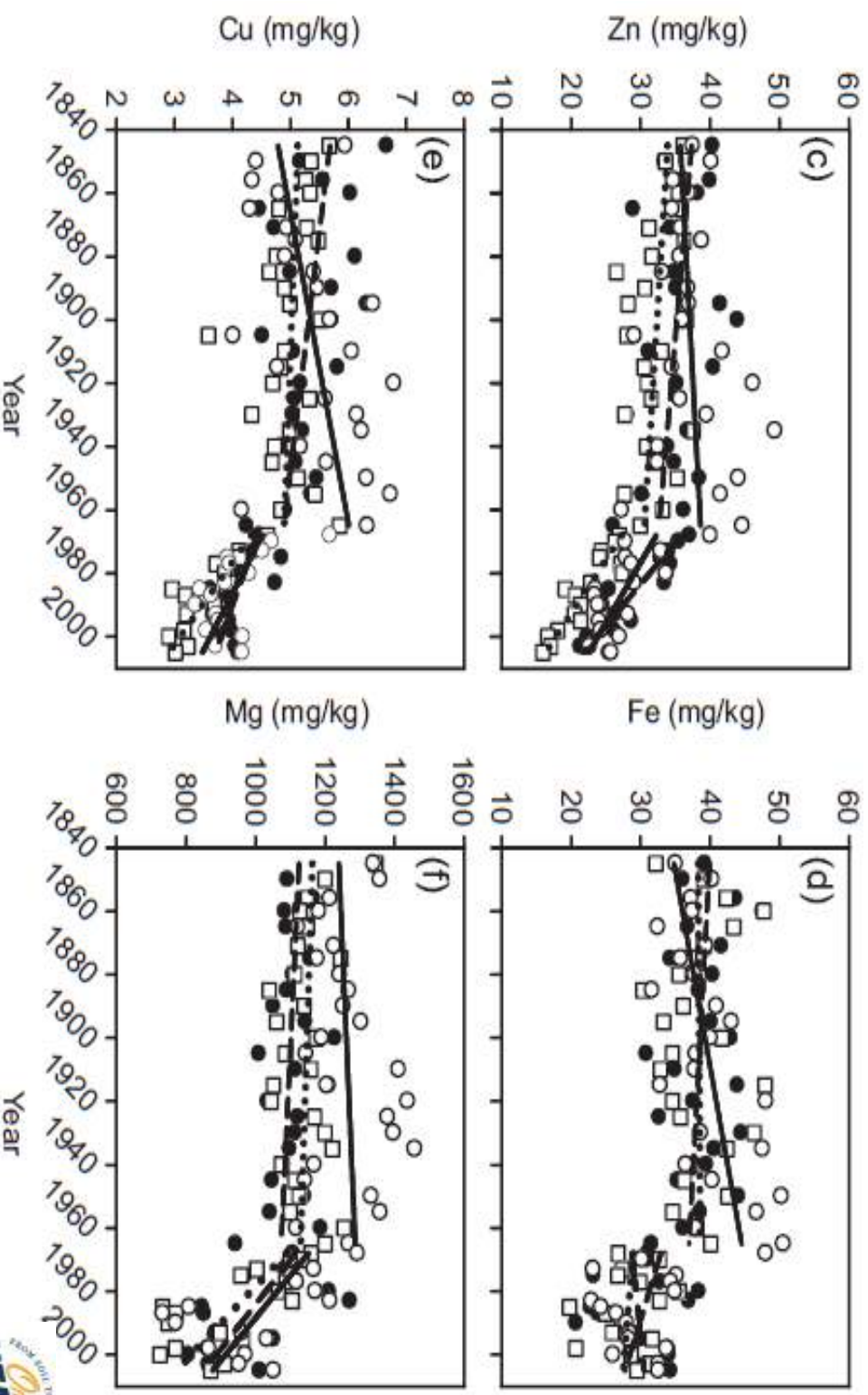
Changes in Nutrient Content of Vegetables & Fruit over time

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

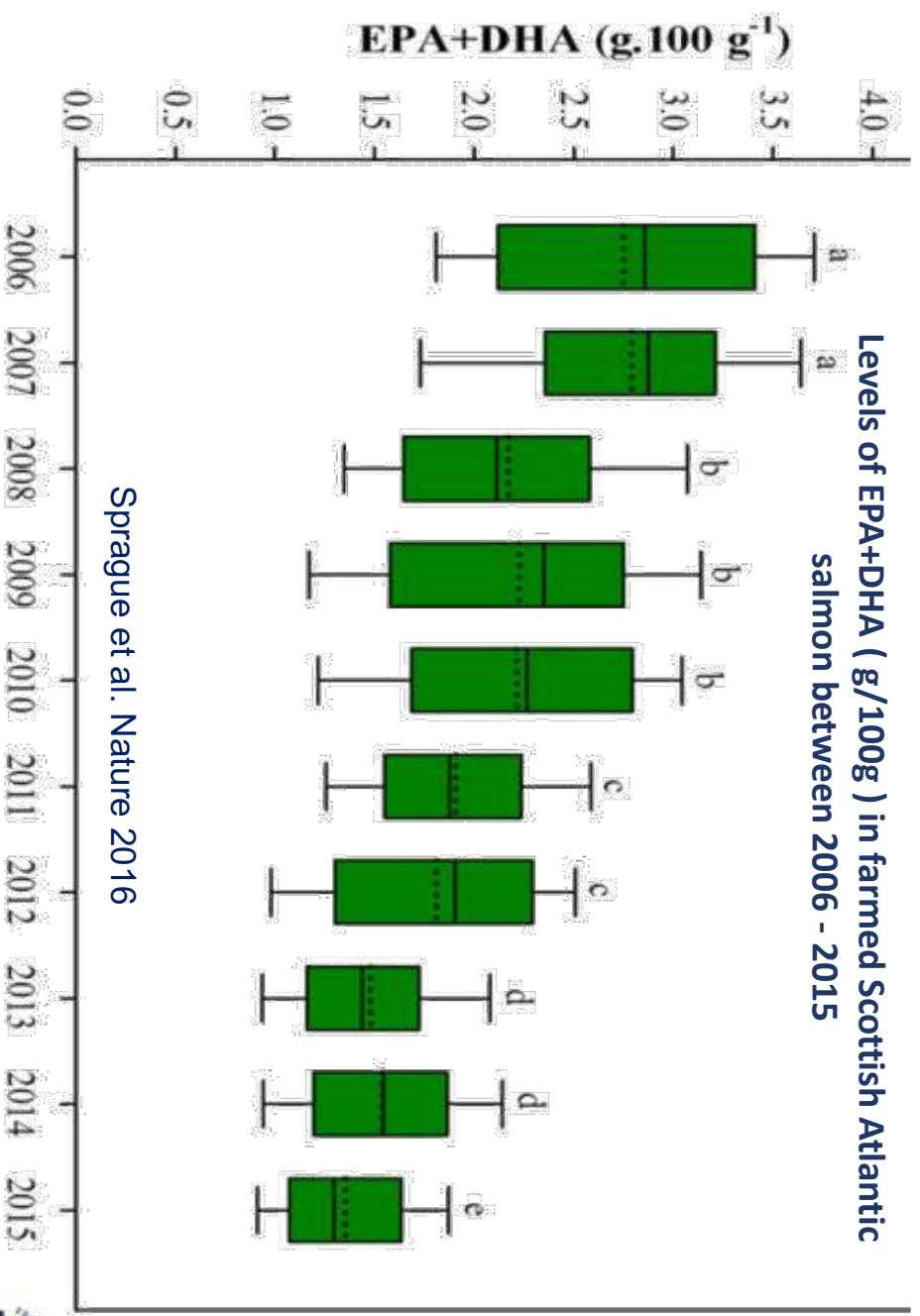
- | | | |
|--------------|---|-----|
| • Protein | ↓ | 6% |
| • Calcium | ↓ | 16% |
| • Phosphorus | ↓ | 16% |
| • Iron | ↓ | 15% |
| • Riboflavin | ↓ | 38% |
| • Vitamin C | ↓ | 20% |



Changes in Nutrient content of Wheat over last 160 years



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



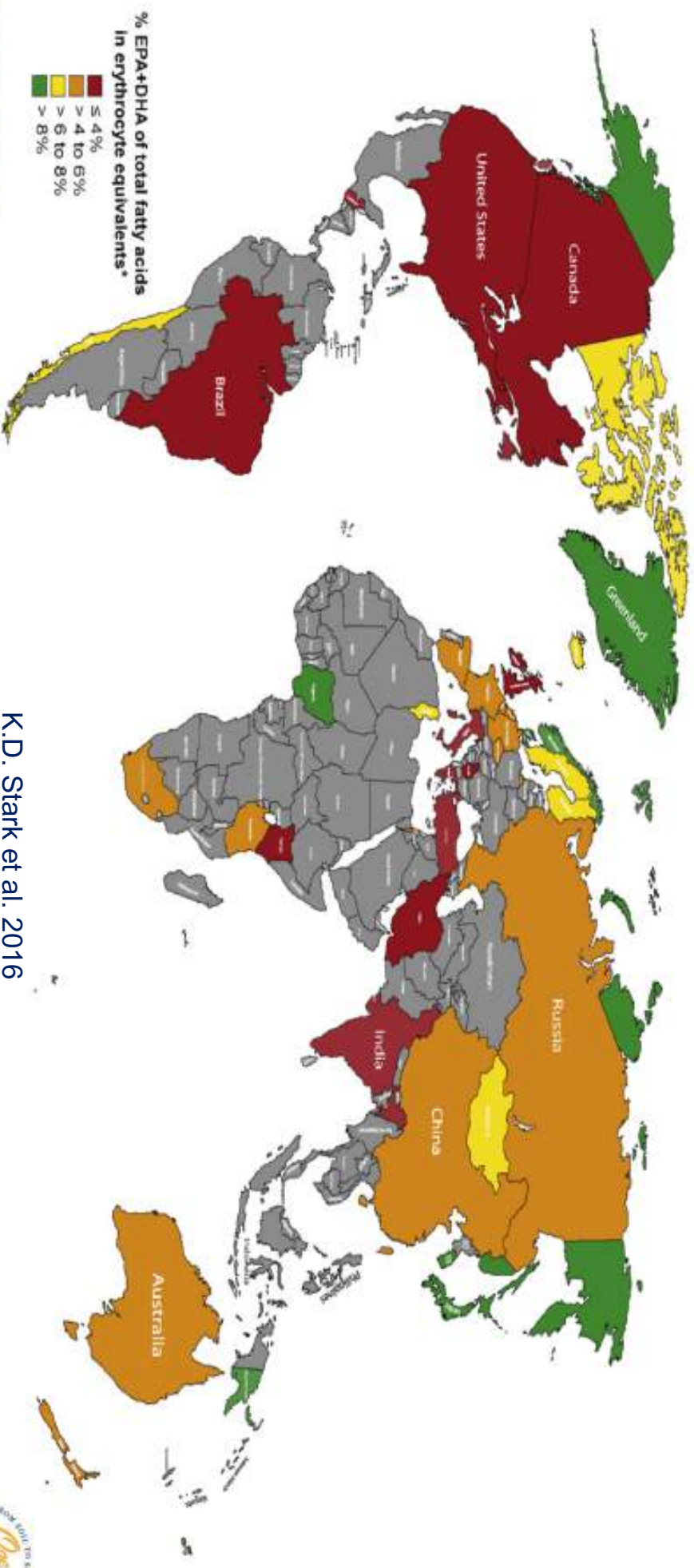
Challenges in Developing Bio-enriched Food, via Livestock Feed

- 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

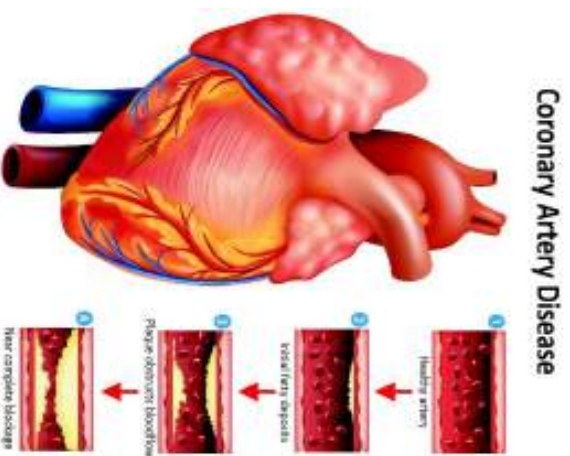


K.D. Stark et al. 2016

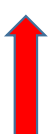
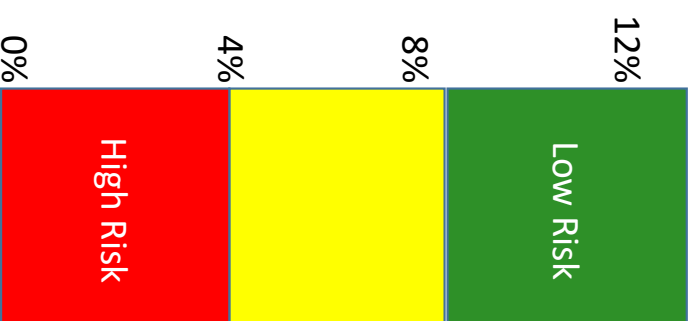
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Being able to Quantify the Scale of the Positive Impact

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



Omega 3 Index
(EPA and DHA IN RBC)



UK Mean for Adults 3.68%



UK Mean for Children 2.46%

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Being able to Validate the Positive Impact Credibly

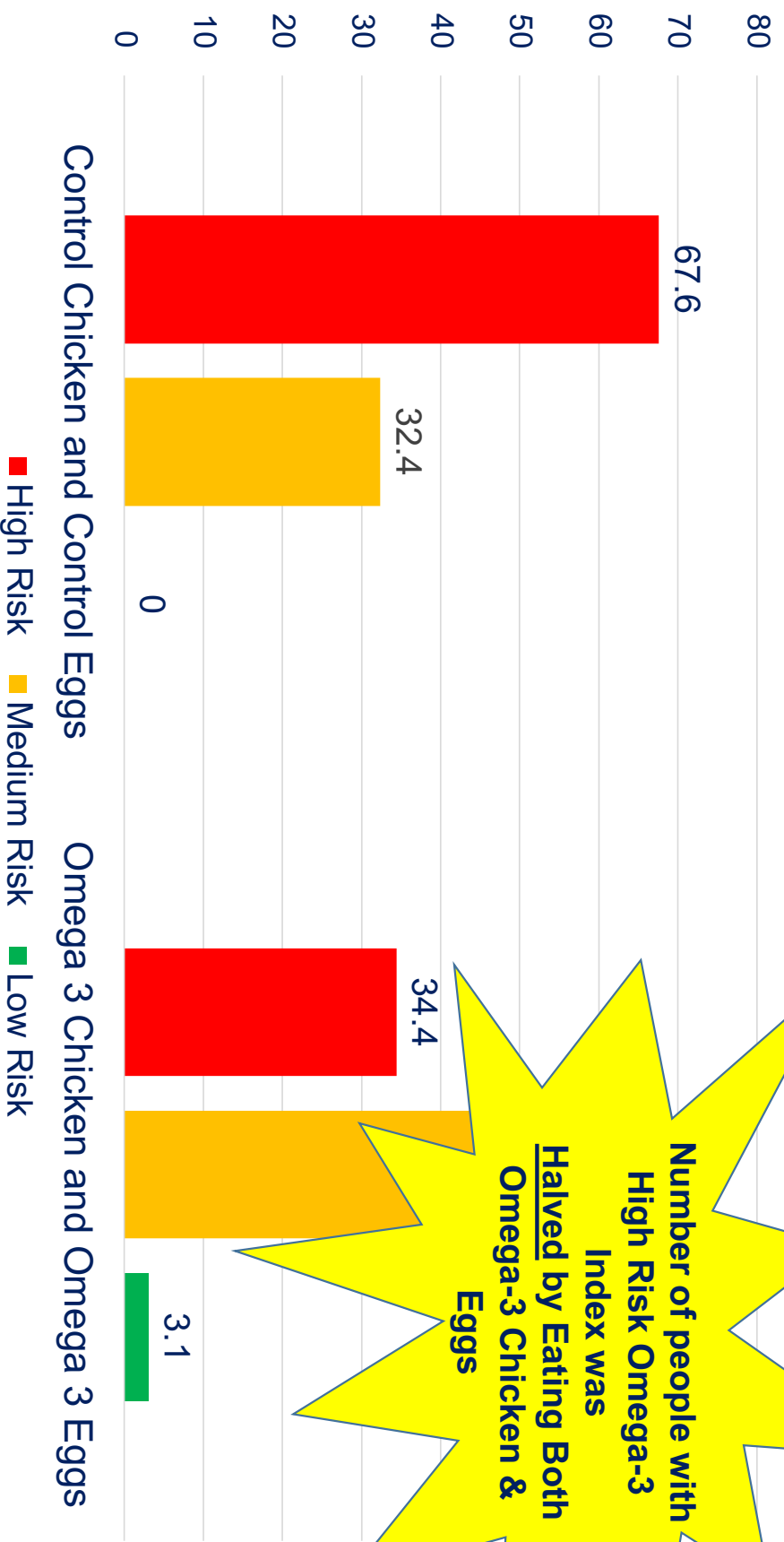
Randomised Double Blind Control Human Trial

- 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.



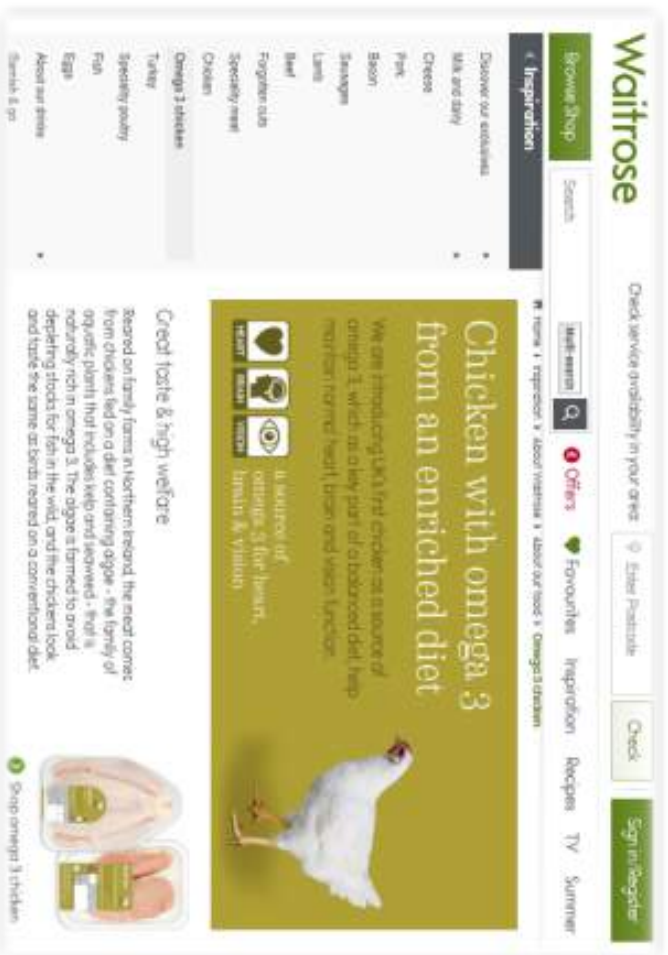
Chicken-meat	Eggs
≥3 Portions Control Chicken-meat/Week (n=80)	≥3 Control Eggs/Week (n=40)
	≥3 Omega-3-PUFA Enriched Eggs/Week (n=40)
≥3 Portions Omega-3-PUFA Enriched Chicken-meat/Week (n=80)	≥3 Control Eggs/Week (n=40)
	≥3 Omega-3-PUFA Enriched Eggs/Week (n=40)

Explaining the Results using the Omega 3 Index



As a Result....

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



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

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You are what you eat, Eats!!!



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



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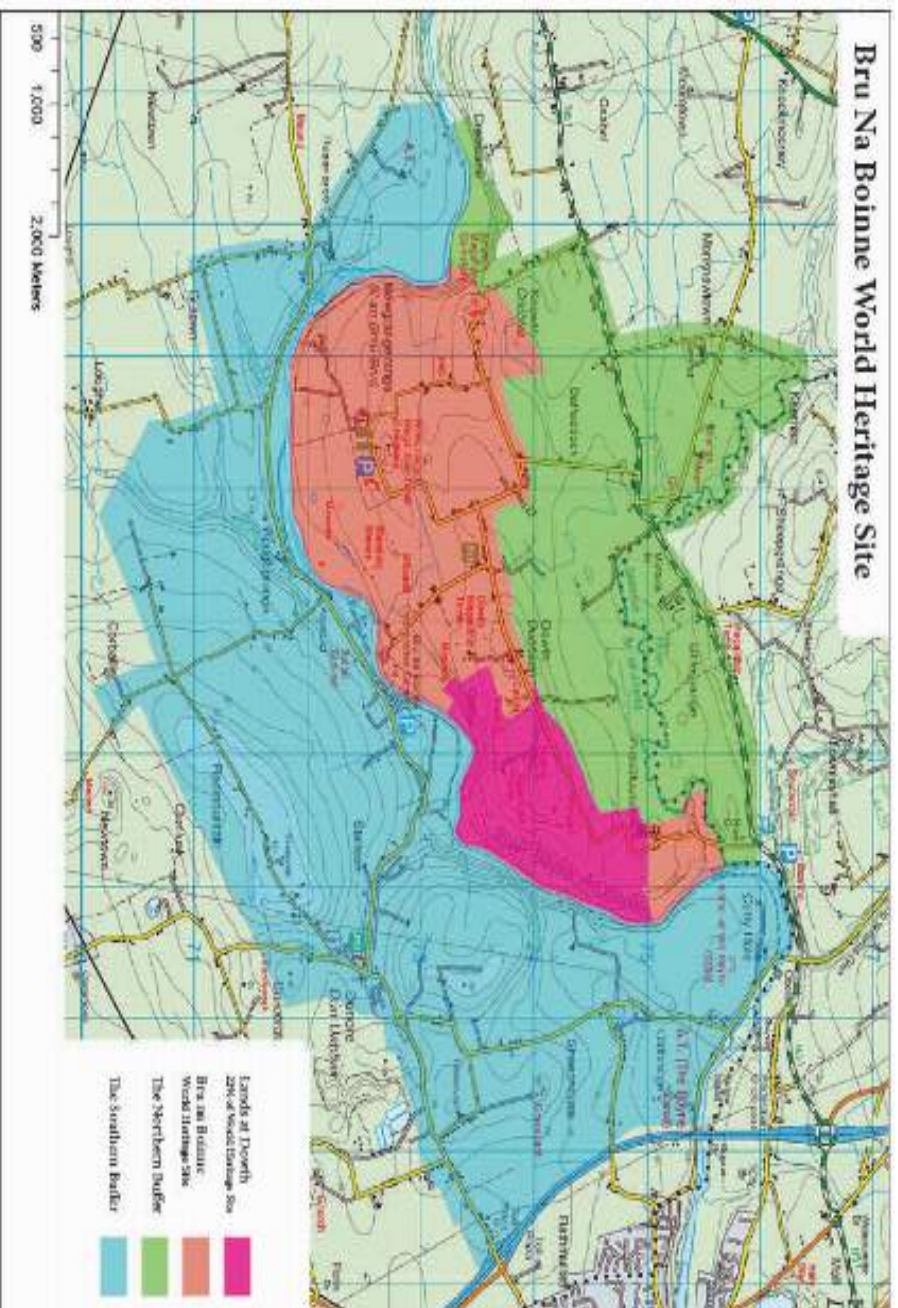
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170 ha Grass & Woodland Farm

A Ruminant Landscape Performance House



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



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



The Lands at
Dowth

The Lands at Dowth

A Science Based Approach to Exploration & Discovery



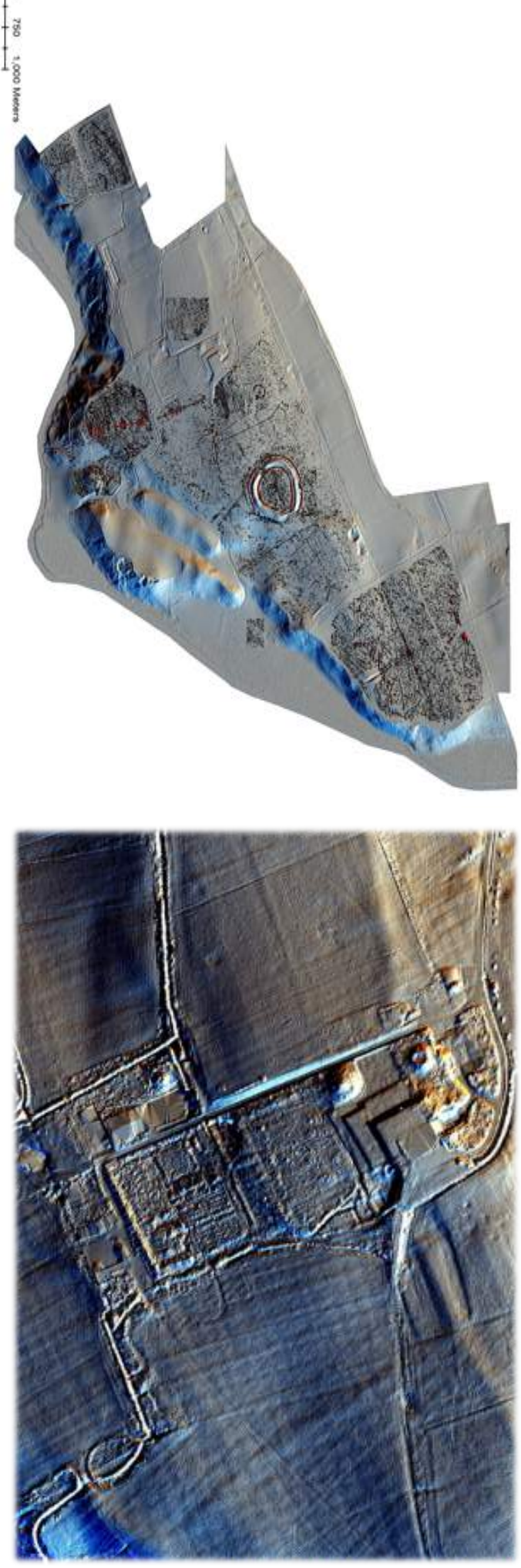
Surveys carried out since 2014

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

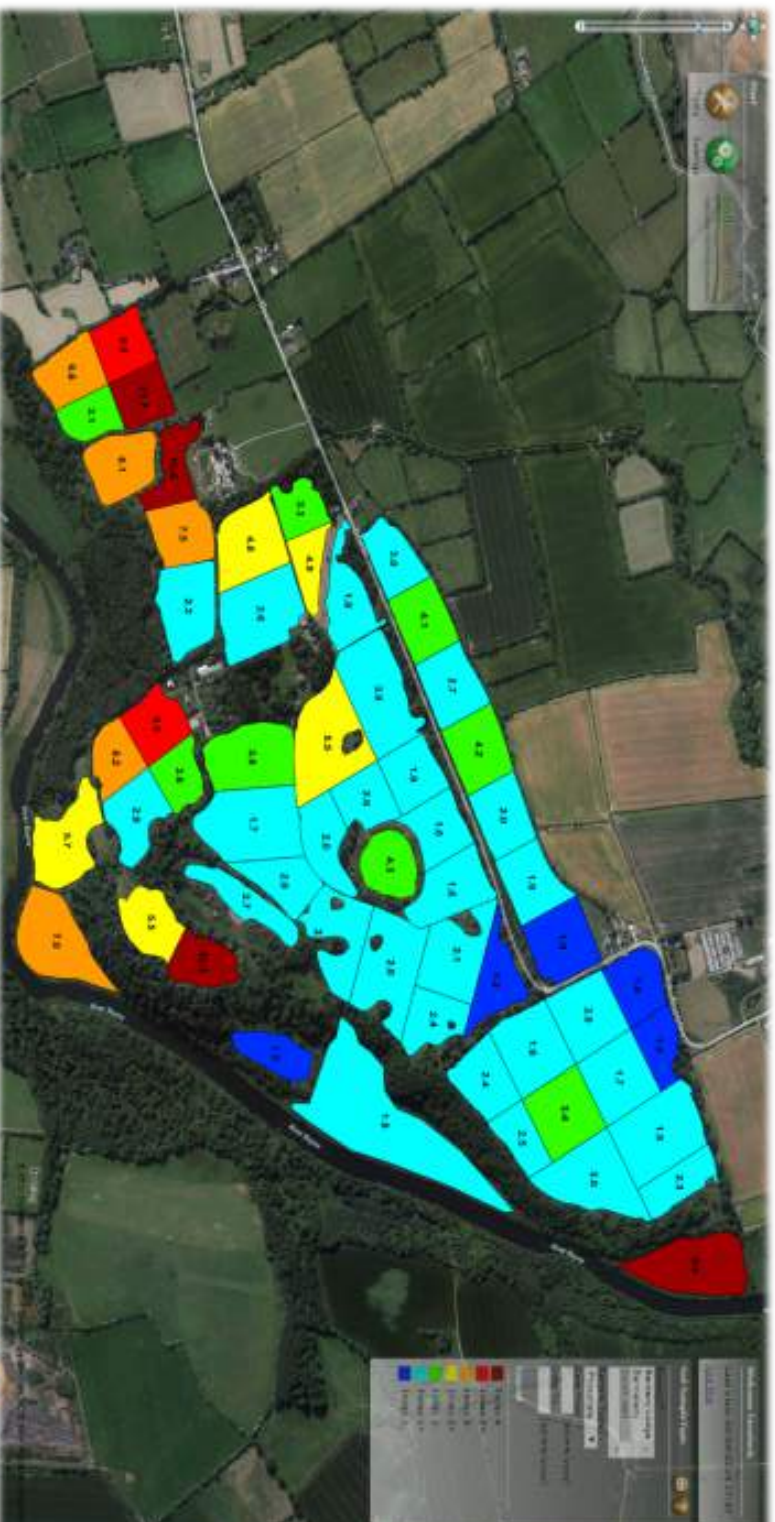
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(S. Davis, UCD. 2014)



The Lands at Dowth – GPS Soil Analysis



Initially, using GPS Soil Sampling to aid Phosphate Management

Subsequently, to find Archaeology

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(P. Ward 2014)

 The Lands at
Dowth

The Lands at Dowth – Geophysical Surveying

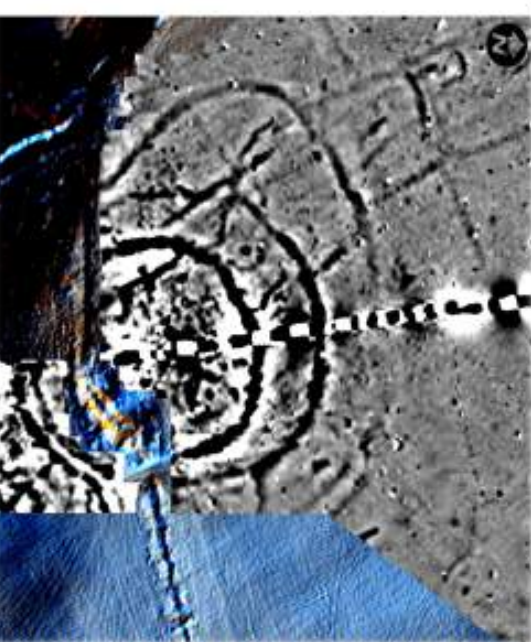


Scale of Surveying to Date



The Henge & Shadow Henge

(S. Davis, UCD. 2015)

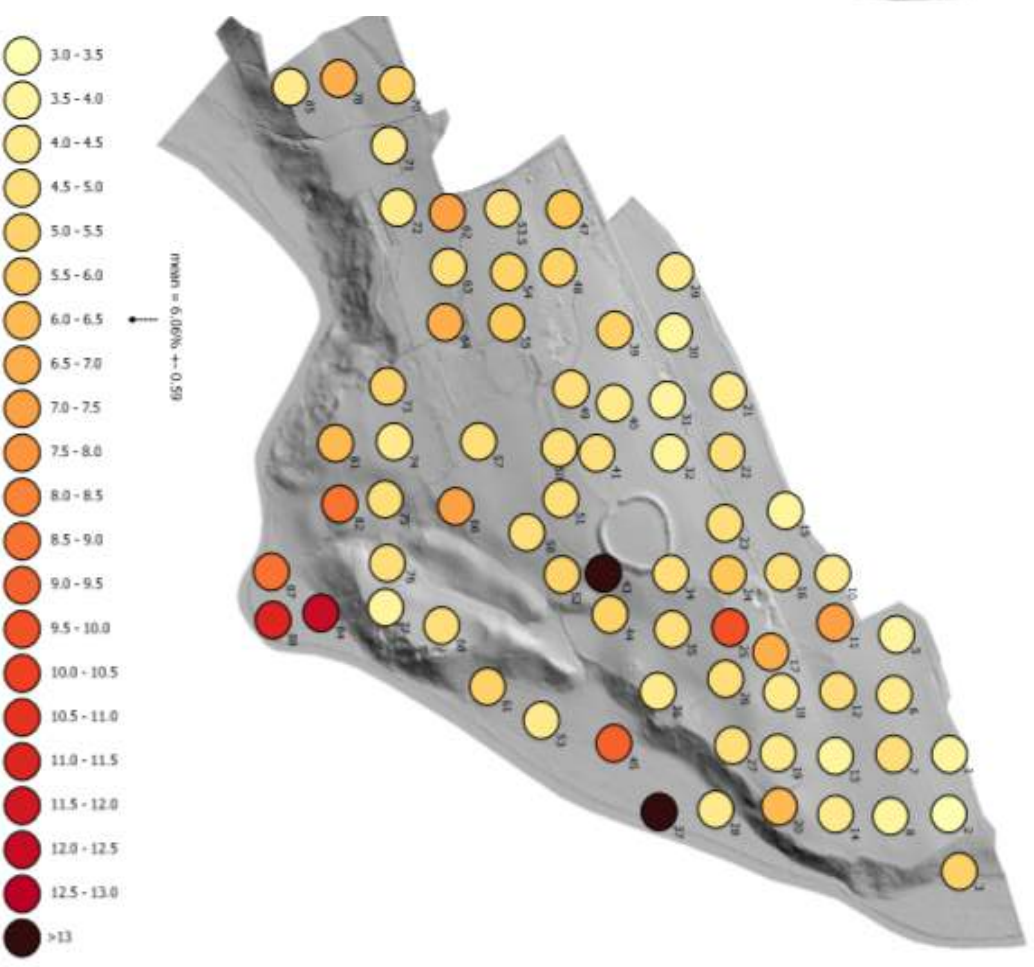
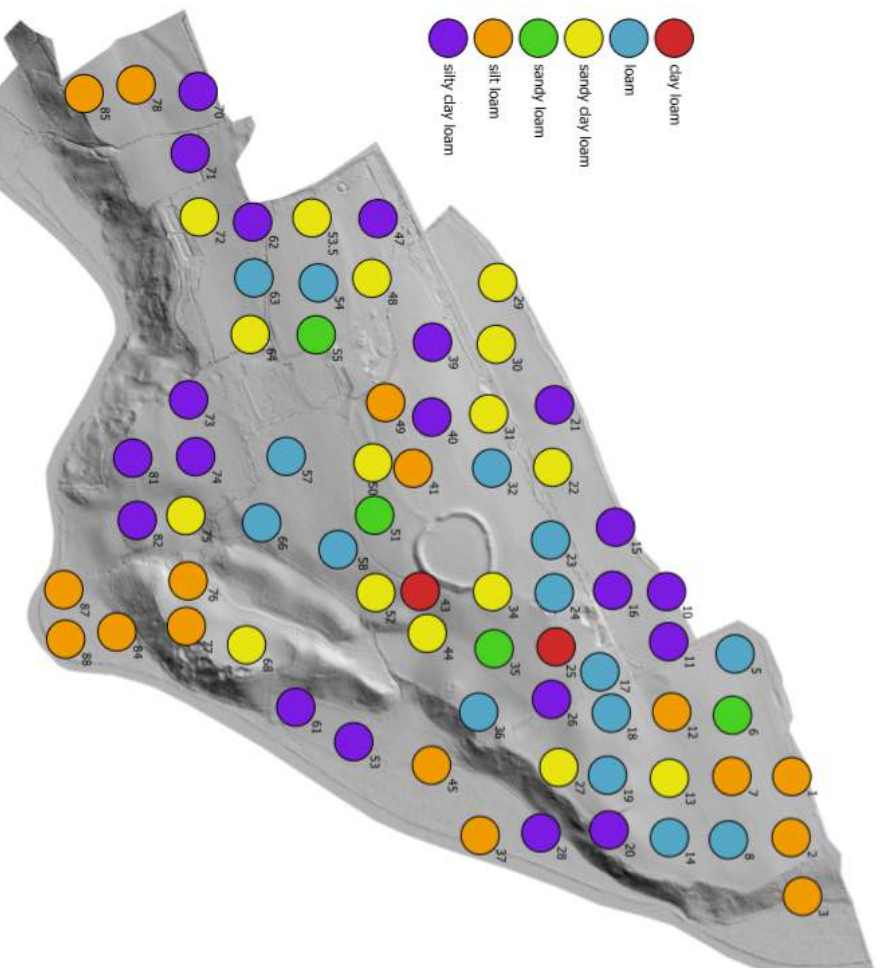


A Concentric Enclosure

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

The Lands at Dowth – Soil Texture & Organic Matter Variations

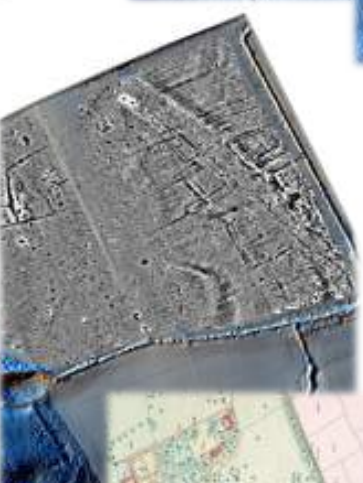
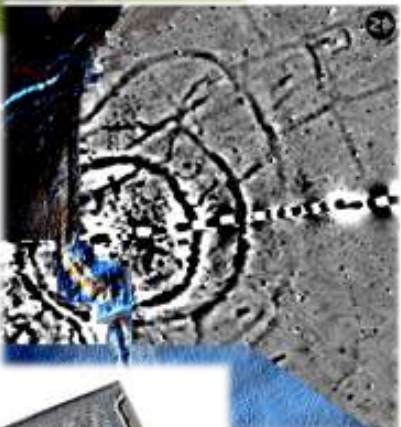
2017 Sampling of A Horizon of Soil, to 30cm



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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

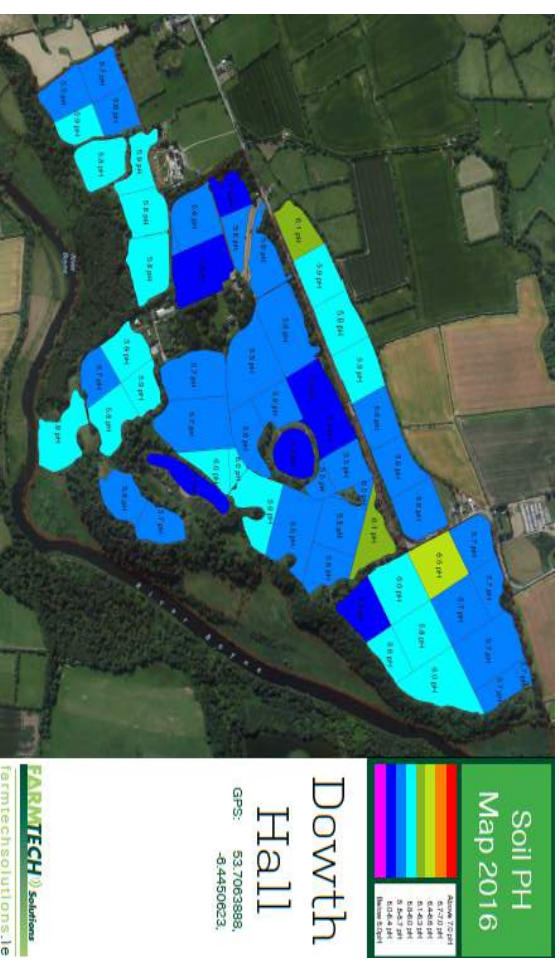
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Role of Drowth in Idea Generation for NI Land Management Strategy

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 (& Drowth initially) – 5.1t/ha/yr

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

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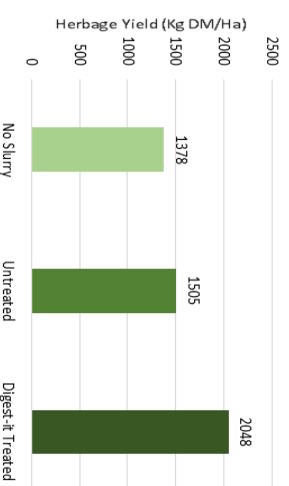
Role of Drowth in Idea Generation for NI Land Management Strategy

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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Validating the Economics of Soil Improvement Programme

In Partnership with Thomson & Joseph

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



Healthy Soils

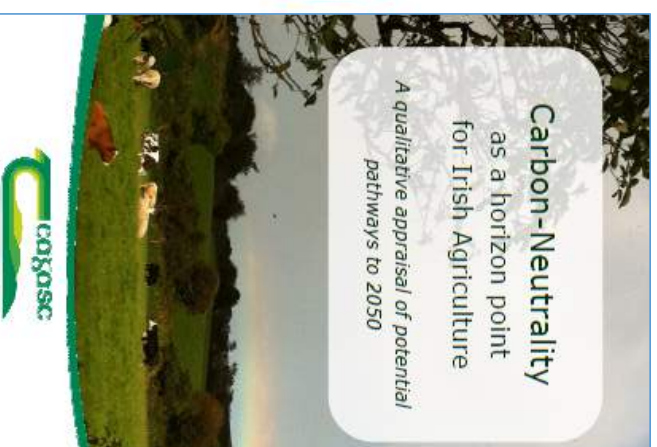
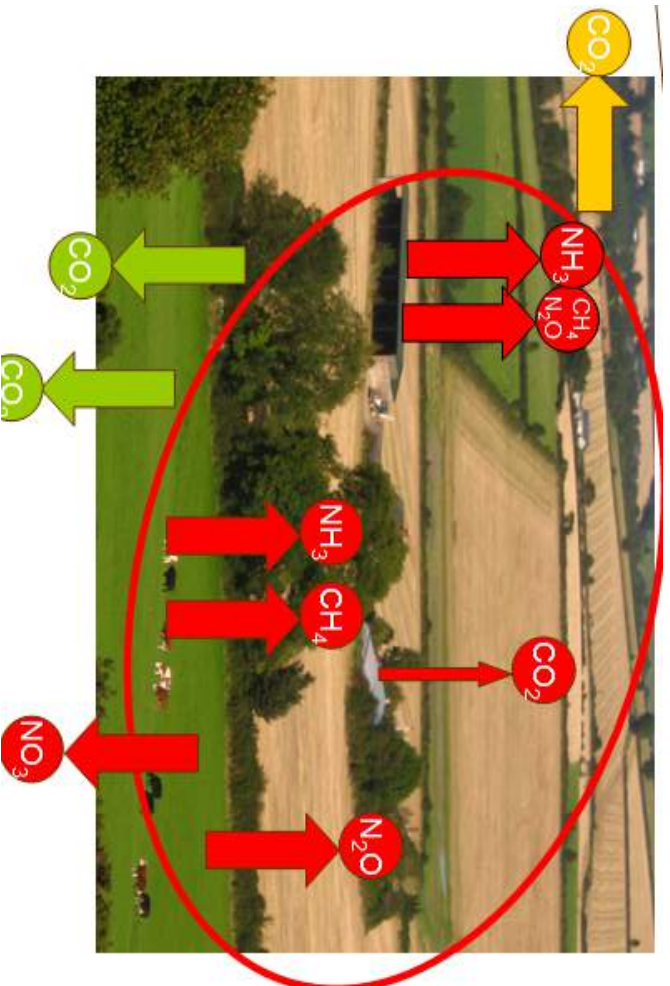
Healthy Grass

Healthy Livestock

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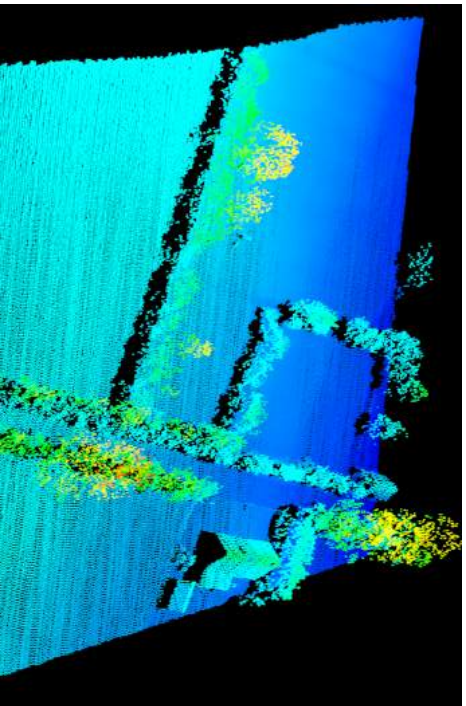
Role of Douth in Idea Generation for NI Land Management Strategy

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



Role of Dowth in Idea Generation for NI Land Management Strategy

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



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

C Sequestration (Above Ground) Renewable Heat Total

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!!)

The Devenish Lands at Douth – Success to date

Influencing Decisions beyond our Shores



WWF Global



Home en español



WWF



What We Do

Our Earth

You Can Help

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

Like 67

G+1 0

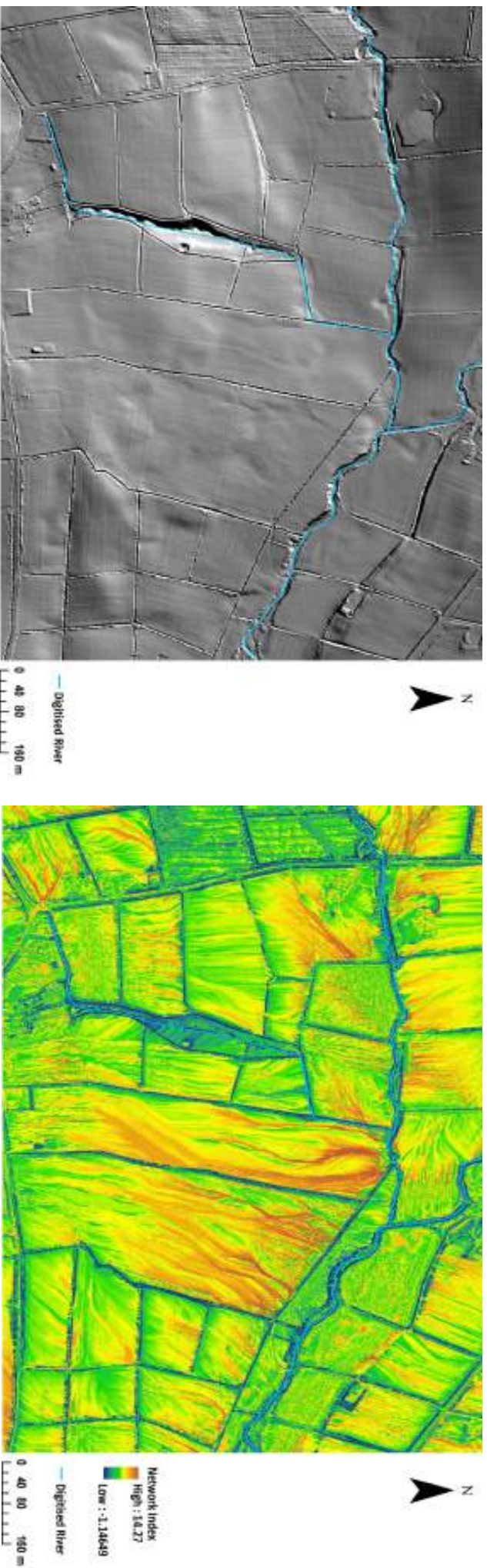
Posted on 28 April 2017

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.



Role of Douth 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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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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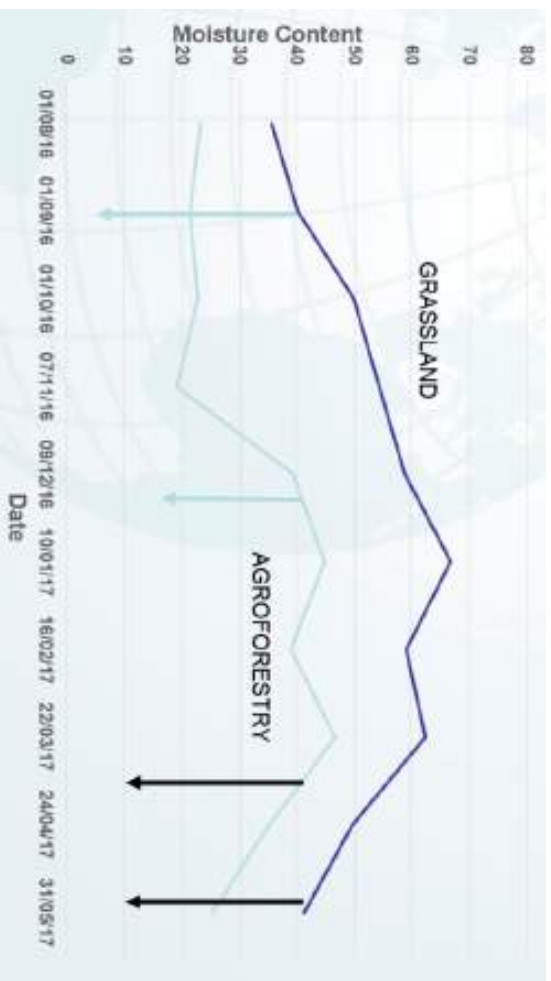
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J. Gilliland 2012



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

European Recognition of N.I. Sustainable Land Management Strategy

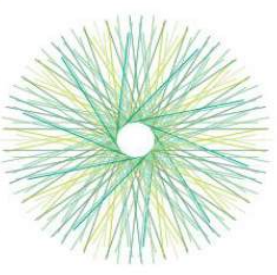
Worth £198m of Extra Farm Income, to N. Ireland, per Year



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



eip-agri
AGRICULTURE & INNOVATION

DG Ag/DG Env, Joint Workshop

Bratislava Oct 16

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DG Agriculture, eip-agri Newsletter, Feb 17

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	+ £279 / 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

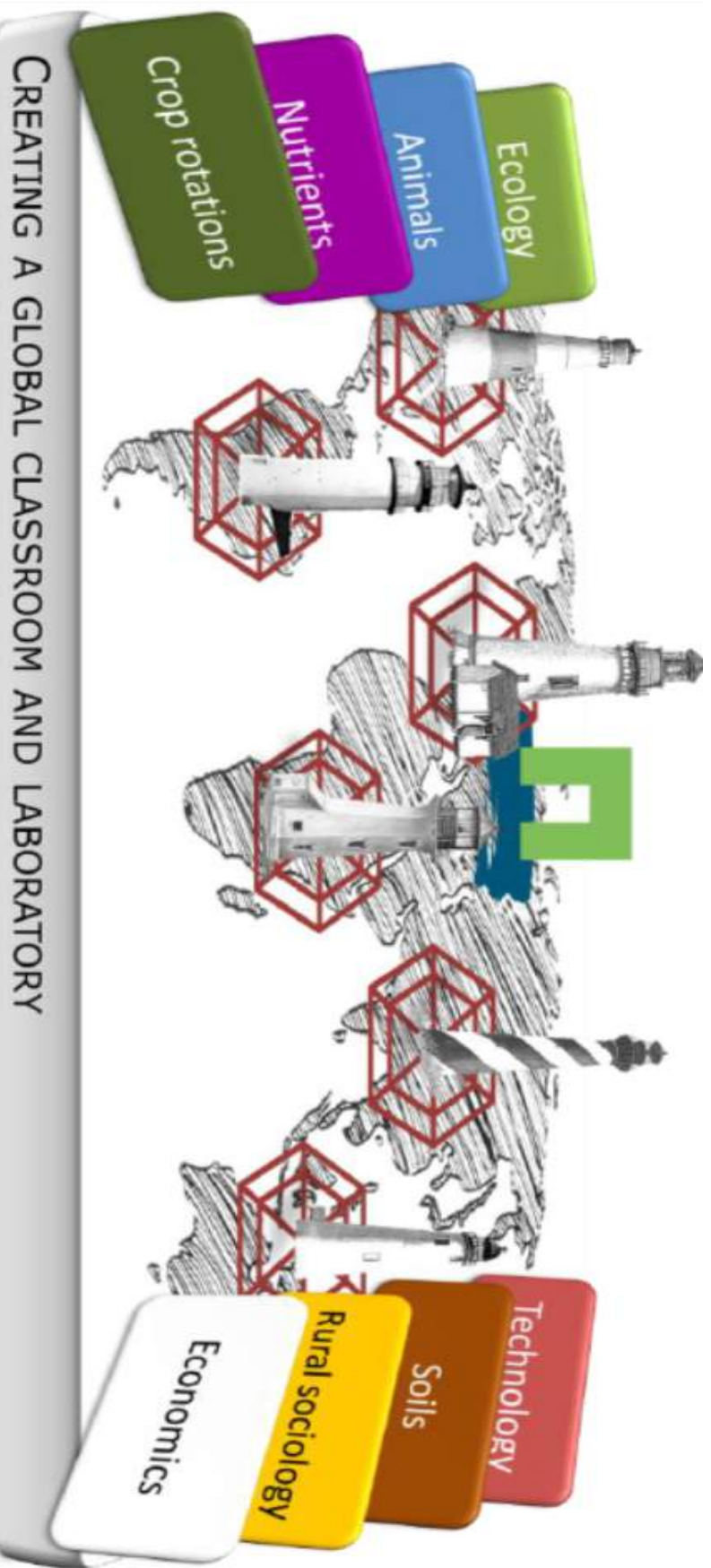
Healthy Grass

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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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



Our Future – Proactively Delivering Innovative Farming & Food Systems

Improving Human & Environmental Health, through International Partnership

One Health

