
WELSH FARMING:
NEW HORIZONS
#NFUCymru19

Political address

Lesley Griffiths AM

Minister for Environment, Energy and Rural Affairs

Chaired by: John Davies, President, NFU Cymru

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WELSH FARMING:
NEW HORIZONS
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Food politics and policies post-Brexit

Professor Robert Pickard
Food and Nutrition Expert

Professor Michael Lee
Sustainable Agriculture Expert

Chaired by: Dylan Morgan, Deputy Director and Head of Policy, NFU Cymru

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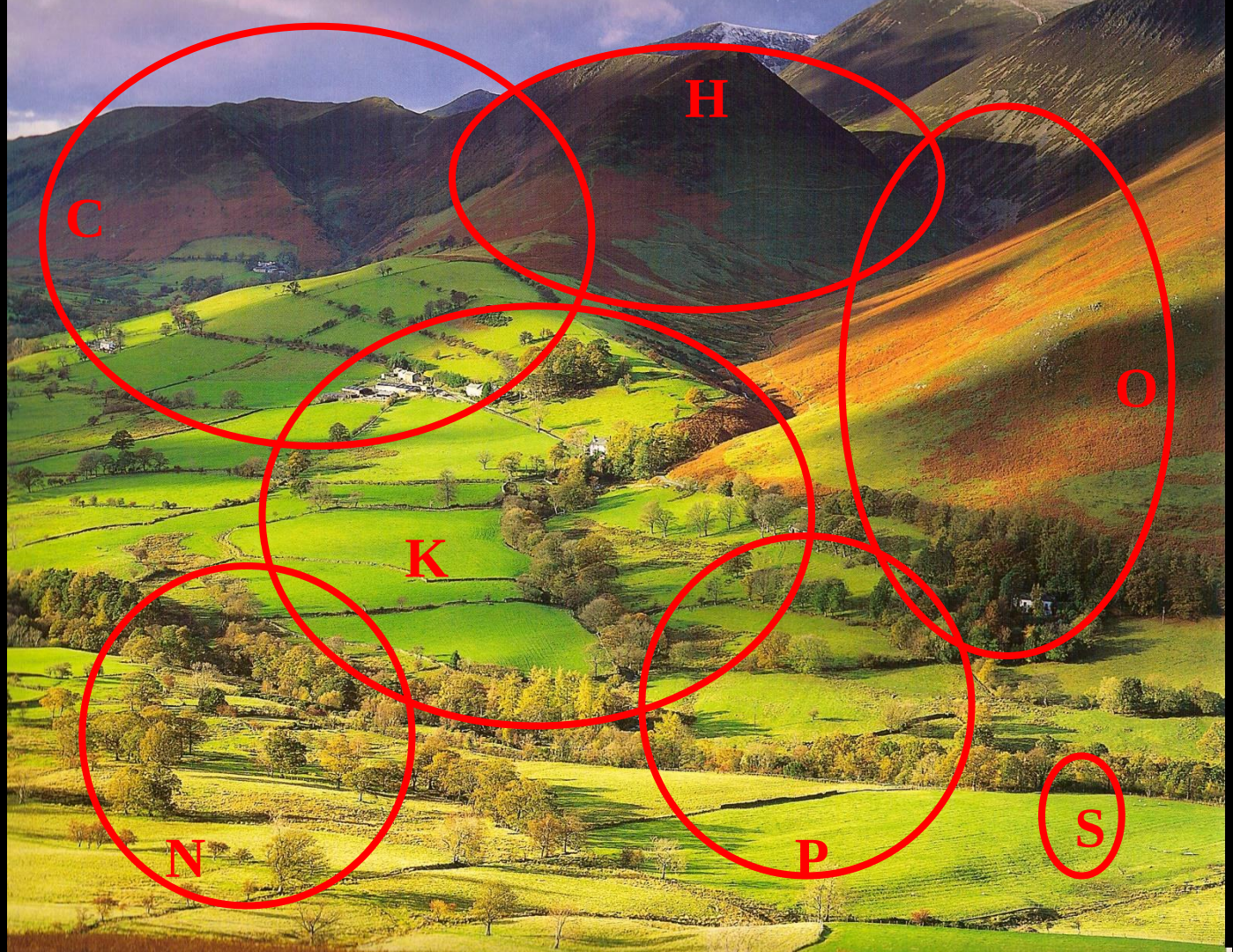
Fake News

Robert Pickard
NFU Cymru
Llandrindod Wells
7 November 2019


From 2.5 million light-years
300 million m/s
186,000 miles/s

Asteroid strike

Disease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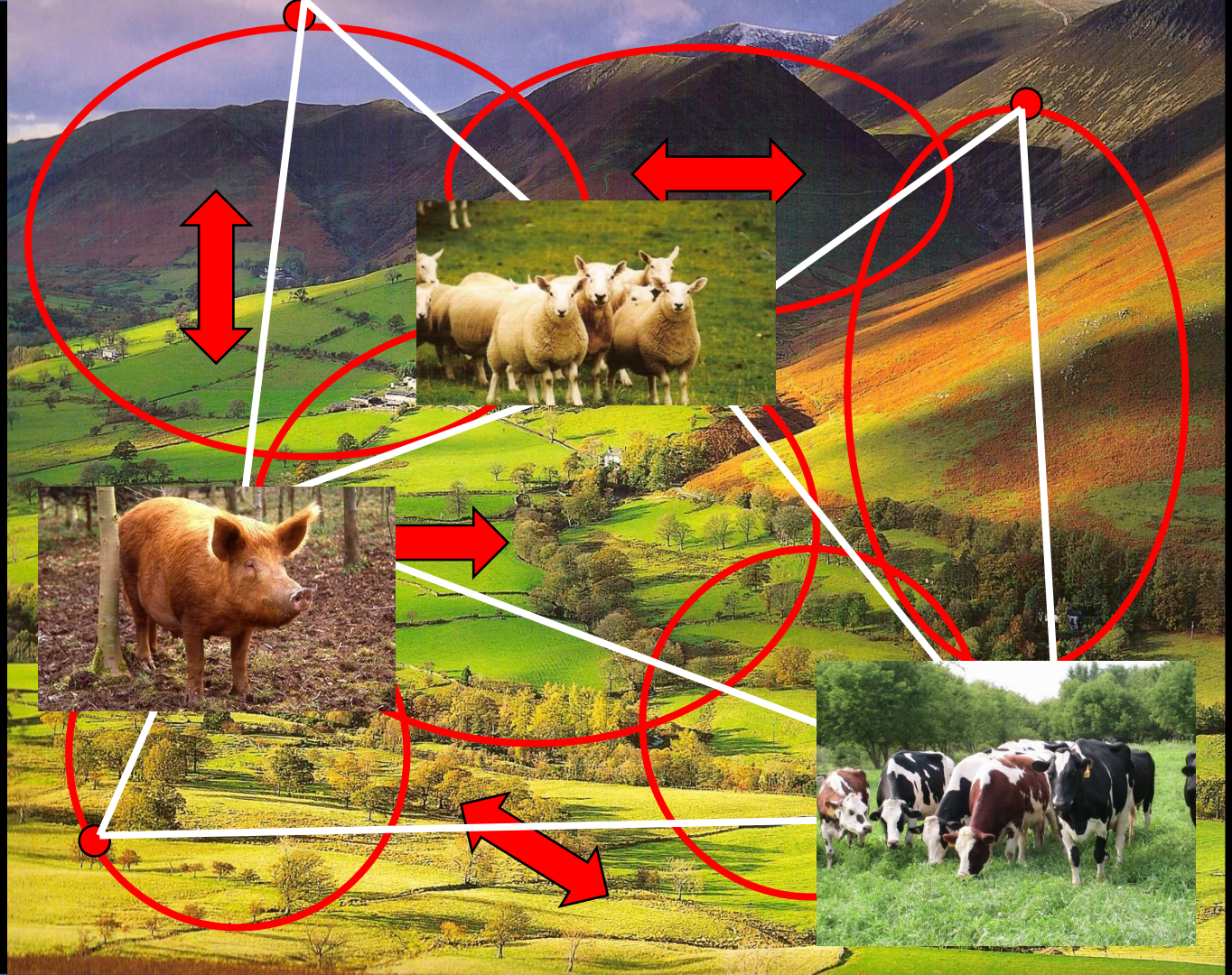
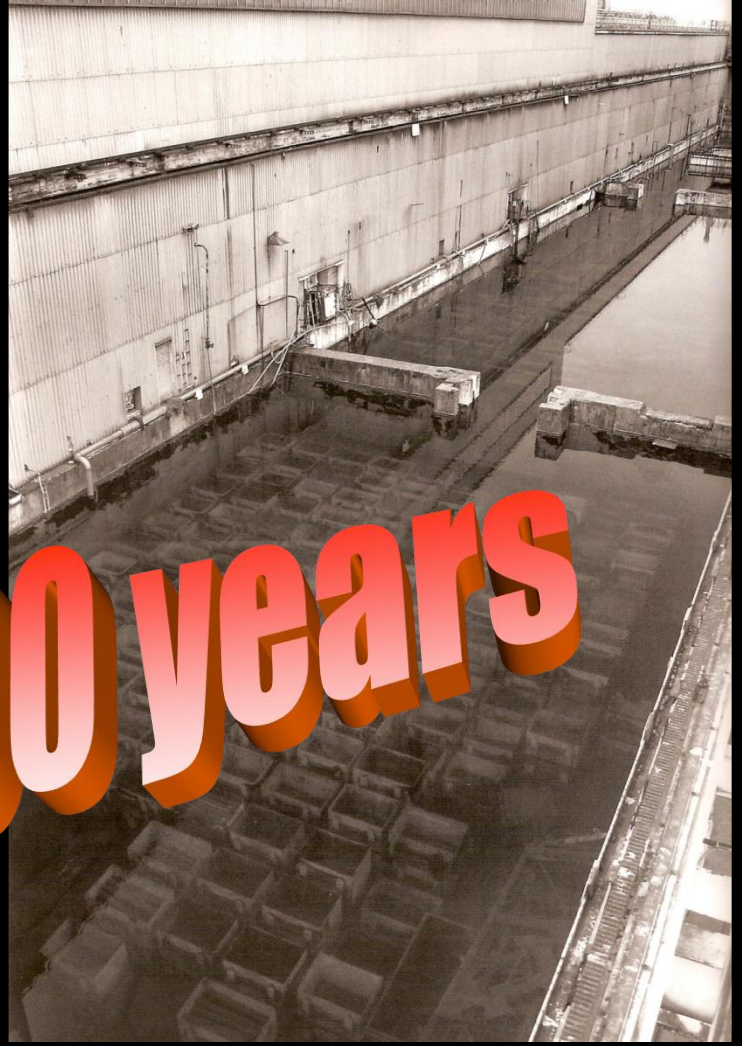


Magnox Pond
Sellafield



Cows, Sheep & Pigs share 80% of their genes with Humans

Communication Chain

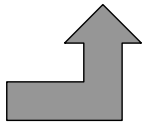
Peer Conferences
Research Theses
Peer-refereed Research Papers
Peer Reviews

Science

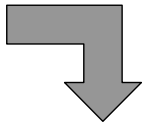
Popular Science Journals
News Media
Weekly Media
Features Media
Monthly Magazines
Public Conferences & Debate

Entertainment

Feedback



Neg

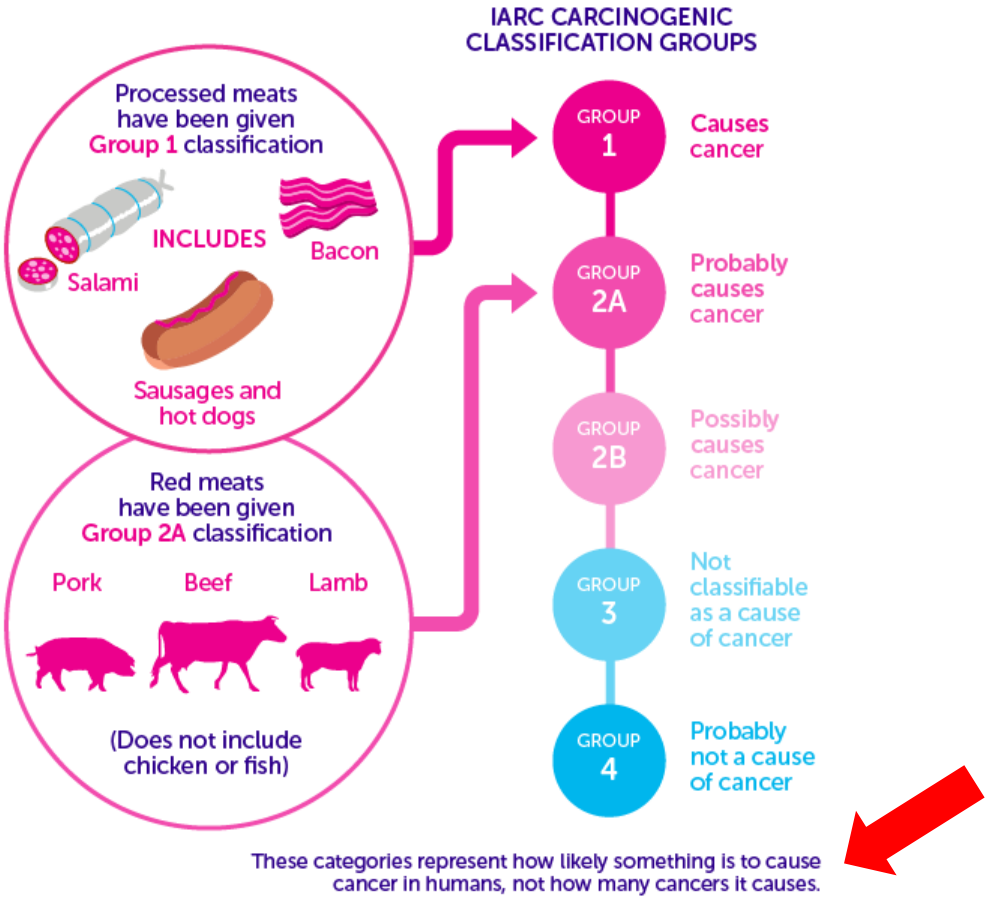


Pos

Epidemiology & Hedgehogs

1994

MEAT AND CANCER
HOW STRONG IS THE EVIDENCE?



These categories represent how likely something is to cause cancer in humans, not how many cancers it causes.

IARC Carcinogen Listings

- Also in Group 1, carcinogenic: aflatoxins, arsenic, asbestos, benzene, coal tar, dichloropropane, diesel exhausts, ethanol, *Helicobacter*, hepatitis B & C, oestrogen therapy, painter, plutonium, sunshine, tamoxifen, tobacco smoke, vinyl chloride, X-rays.

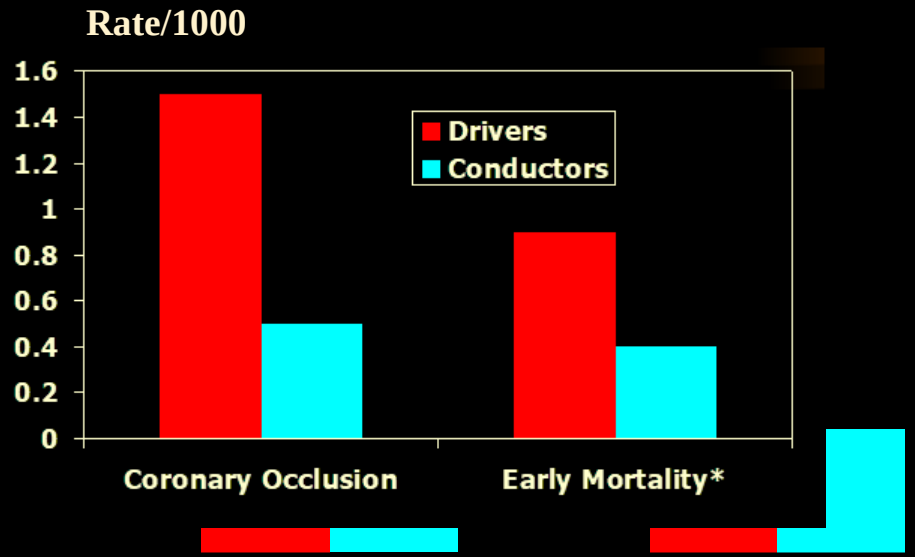
IARC Carcinogen Listings

- Also in Group 2A, probably carcinogenic:

  acrylamide, anabolic steroids, creosotes, DDT, dichloromethane, frying emissions, hairdresser, lead, nickel, nitrate, shiftwork.

- Only one agent of 1,000 was listed in Group 4 as probably not carcinogenic to humans.

Physical Activity at Work and Coronary Artery Disease

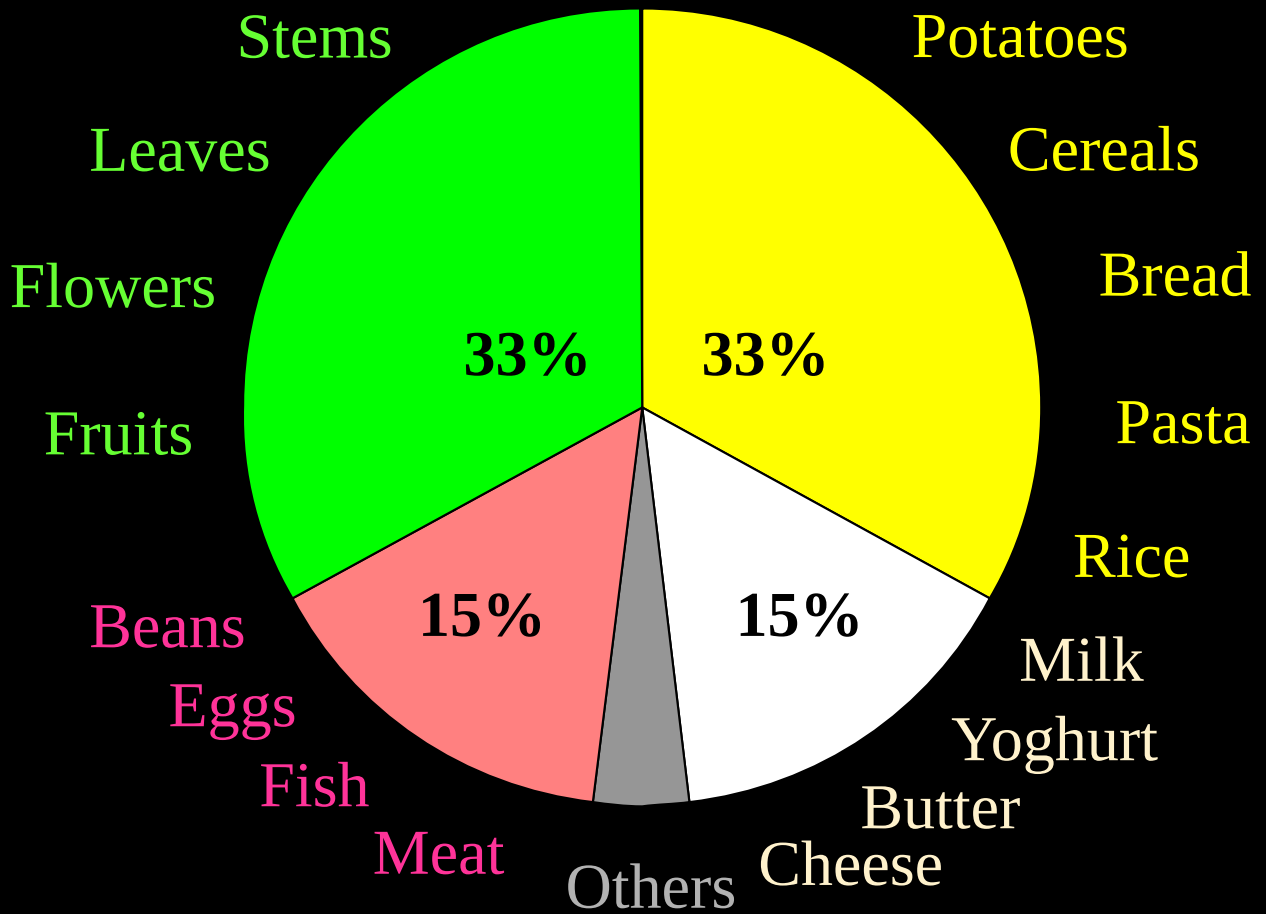


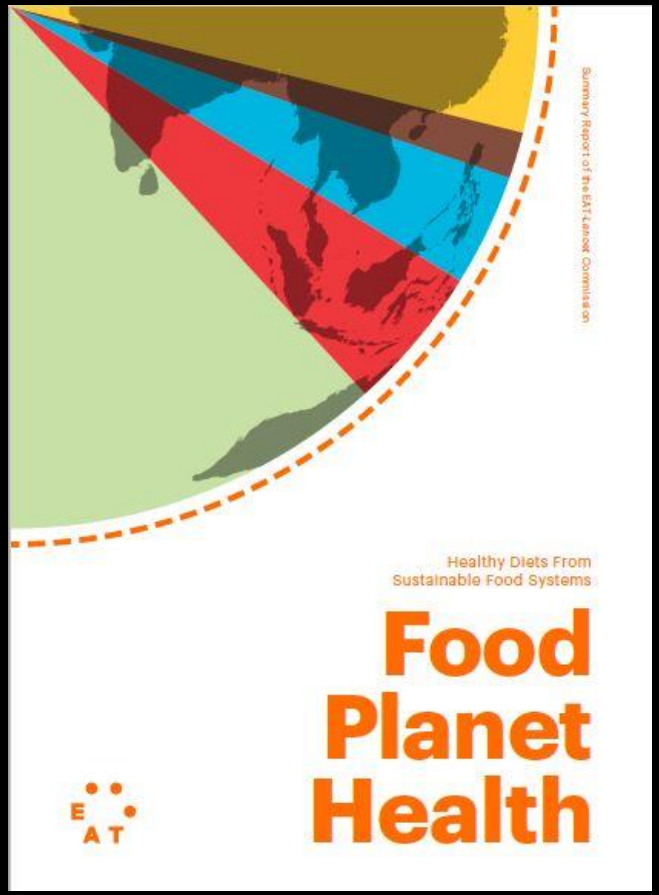
31,000 London Transport Workers

Morris *et al*. 1953

*Within 3 days of MI

Balanced Diet maintaining weight





planet. However, there is still no global consensus on what constitutes healthy diets and sustainable food production and **whether planetary health diets* may be achieved for a global population of 10 billion people by 2050.**

Transformation to healthy diets by 2050 will require substantial dietary shifts.

This includes a more than **doubling in the consumption of healthy foods such as fruits, vegetables, legumes and nuts, and a greater than 50% reduction in global consumption of less healthy foods such as added sugars and red meat** (i.e. primarily by reducing excessive consumption in wealthier countries). However, some populations worldwide depend on agropastoral livelihoods and animal protein from livestock. In addition, many populations continue to face significant burdens of undernutrition and obtaining adequate quantities of micronutrients from plant source foods alone can be difficult. Given these considerations, the role of animal source foods in people's diets must be carefully considered in each context and within local and regional realities.

	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains		
Rice, wheat, corn and other	232	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0–100)	39
Vegetables		
All vegetables	300 (200–600)	78
Fruits		
All fruits	200 (100–300)	126
Dairy foods		
Whole milk or equivalents	250 (0–500)	153
Protein sources		
Beef, lamb and pork	14 (0–28)	30
Chicken and other poultry	29 (0–58)	62
Eggs	13 (0–25)	19
Fish	28 (0–100)	40
Legumes	75 (0–100)	284
Nuts	50 (0–75)	291
Added fats		
Unsaturated oils	40 (20–80)	354
Saturated oils	11.8 (0-11.8)	96
Added sugars		
All sugars	31 (0–31)	120

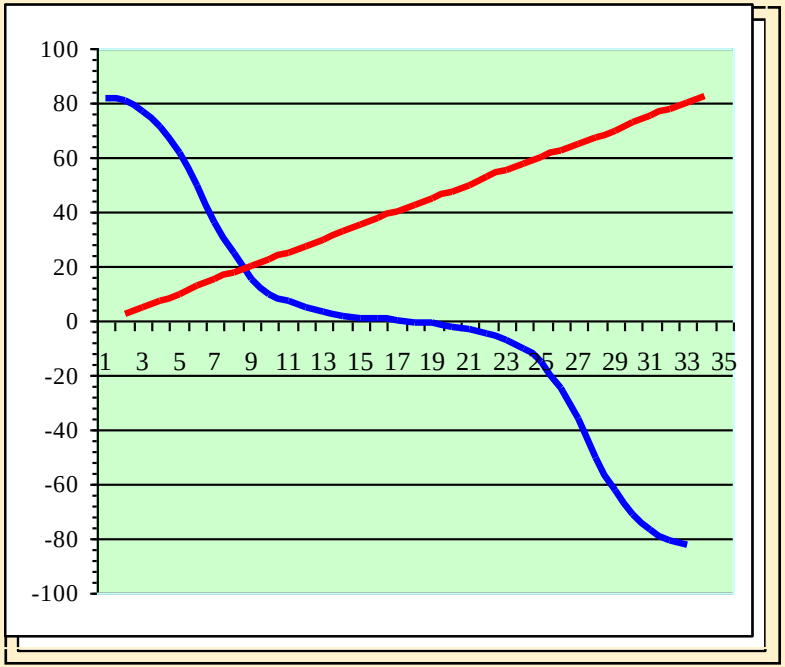
SACN 70g

Table 1
Scientific targets for a planetary health diet, with possible ranges, for an intake of 2500 kcal/day.

Benefit versus Quantity
Micronutrients

Health improved

Health damaged



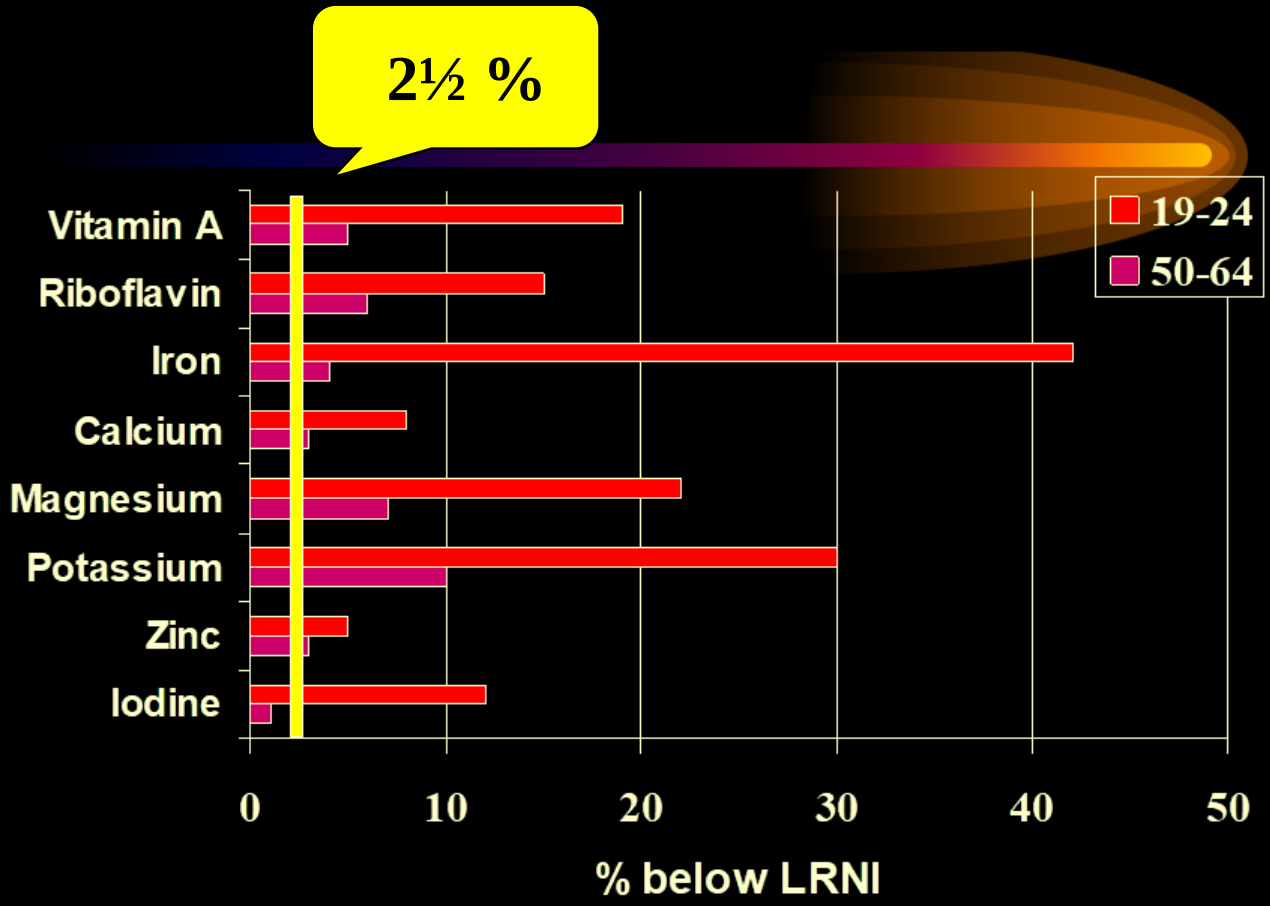
Intake of additional units

Estimated Atomic Composition lean 70-Kg Man

Element	Symbol	No. of Atoms	Element	Symbol	No. of Atoms	Element	Symbol	No. of Atoms	Element	Symbol	No. of Atoms
Hydrogen	H	4.22×10^{27}	Silicon	Si	3.9×10^{23}	Boron	B	2×10^{20}	Mercury	Hg	6×10^{18}
Oxygen	O	1.61×10^{27}	Fluorine	F	8.3×10^{22}	Manganese	Mn	1×10^{20}	Arsenic	As	6×10^{18}
Carbon	C	8.03×10^{26}	Iron	Fe	4.5×10^{22}	Nickel	Ni	1×10^{20}	Chromium	Cr	6×10^{18}
Nitrogen	N	3.9×10^{25}	Zinc	Zn	2.1×10^{22}	Lithium	Li	1×10^{20}	Molybdenum	Mo	3×10^{18}
Calcium	Ca	1.6×10^{25}	Rubidium	Rb	2.2×10^{21}	Barium	Ba	8×10^{19}	Selenium	Se	3×10^{18}
Phosphorus	P	9.6×10^{24}	Strontium	Sr	2.2×10^{21}	Iodine	I	5×10^{19}	Beryllium	Be	3×10^{18}
Sulphur	S	2.6×10^{24}	Bromine	Br	2×10^{21}	Tin	Sn	4×10^{19}	Vanadium	V	8×10^{17}
Sodium	Na	2.5×10^{24}	Aluminium	Al	1×10^{21}	Gold	Au	2×10^{19}	Uranium	U	2×10^{17}
Potassium	K	2.2×10^{24}	Copper	Cu	7×10^{20}	Zirconium	Zr	2×10^{19}	Radium	Ra	8×10^{10}
Chlorine	Cl	1.6×10^{24}	Lead	Pb	3×10^{20}	Cobalt	Co	2×10^{19}			
Magnesium	Mg	4.7×10^{23}	Cadmium	Cd	3×10^{20}	Caesium	Cs	7×10^{18}		Total	6.71×10^{27}

42 Elements

Intakes for Women



Minerals of Concern

	Protons	*Electrons*	*Substance*	*Group*	*Ion*
• Magnesium	12	2,8,2	alkaline earth metal	2	Mg^{++}
• Potassium	19	2,8,8,1	alkali metal	1	K^{+}
• Calcium	20	2,8,8,2	alkaline earth metal	2	Ca^{++}
• Iron	26	2,8,14,2	metal	Transition	Fe^{++} Fe^{+++}
• Zinc	30	2,8,18,2	metal	Transition	Zn^{++}
• Selenium	34	2,8,18,6	non-metal	6	Se^{++}
• Iodine	53	2,8,18,18,7	halogen	7	I^{-}

Minerals of Concern

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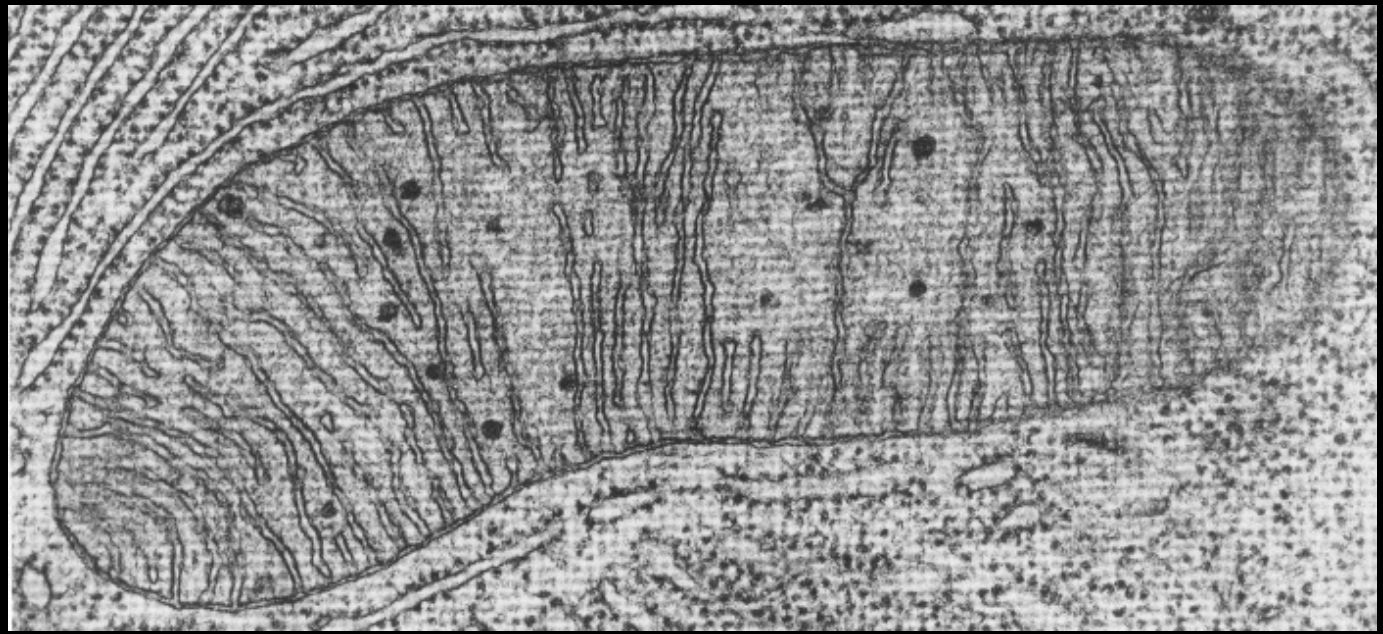
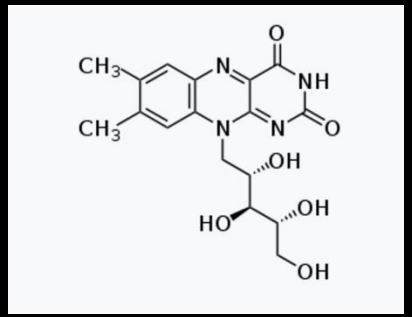
Mitochondrion



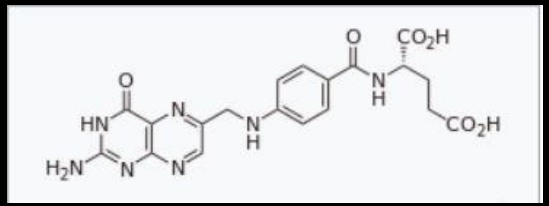
Vitamins of Concern

			Provitamins	*Substance*	*Fat soluble*
• B_2	$C_{17}H_{20}N_4O_6$	Riboflavin		Flavanoid	No
• Folate	$C_{19}H_{19}N_7O_6$	Folic acid		Heterocyclic amine	No
• A	$C_{20}H_{30}O$	Retinol	Carotene	Unsaturated hydrocarbon chain	Yes
• D	$C_{27}H_{44}O$	Calcitriol	Cholecalciferol	Steroid	D_3 Yes
			Ergocalciferol	Steroid	D_2

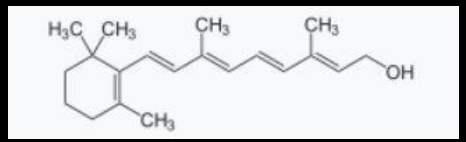
B_2



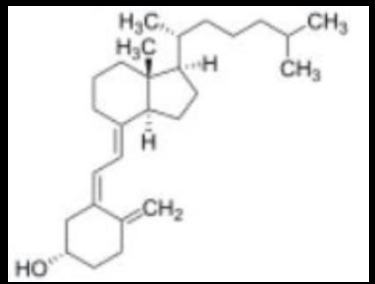
Yes Folate



A



D



Vitamins of Concern

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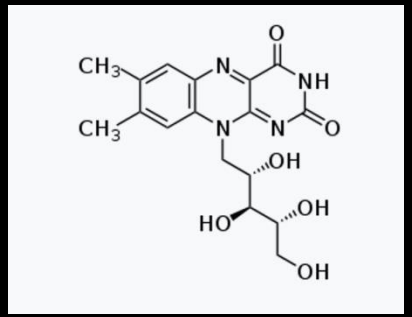
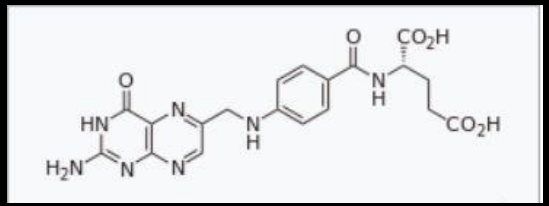
• Folate	$C_{19}H_{19}N_7O_6$	Folic acid		Heterocyclic amine	No
• A	$C_{20}H_{30}O$	Retinol	Carotene	Unsaturated hydrocarbon chain	Yes
• D	$C_{27}H_{44}O$	Calcitriol	Cholecalciferol	Steroid	D_3 Yes
			Ergocalciferol	Steroid	D_2

B_2



Yes Folate



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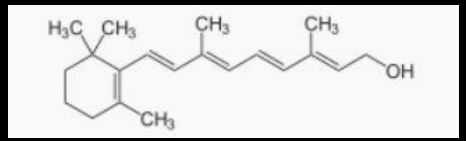

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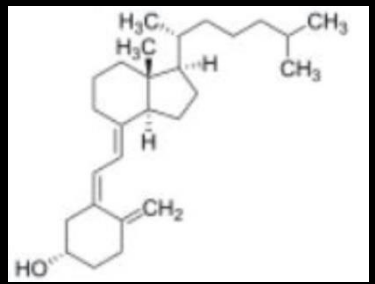
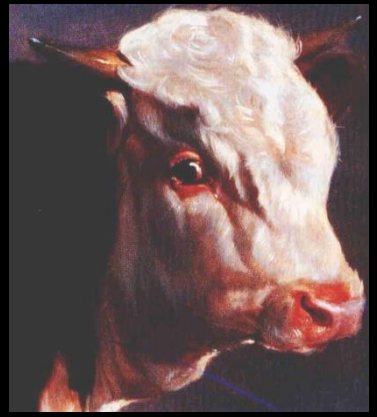
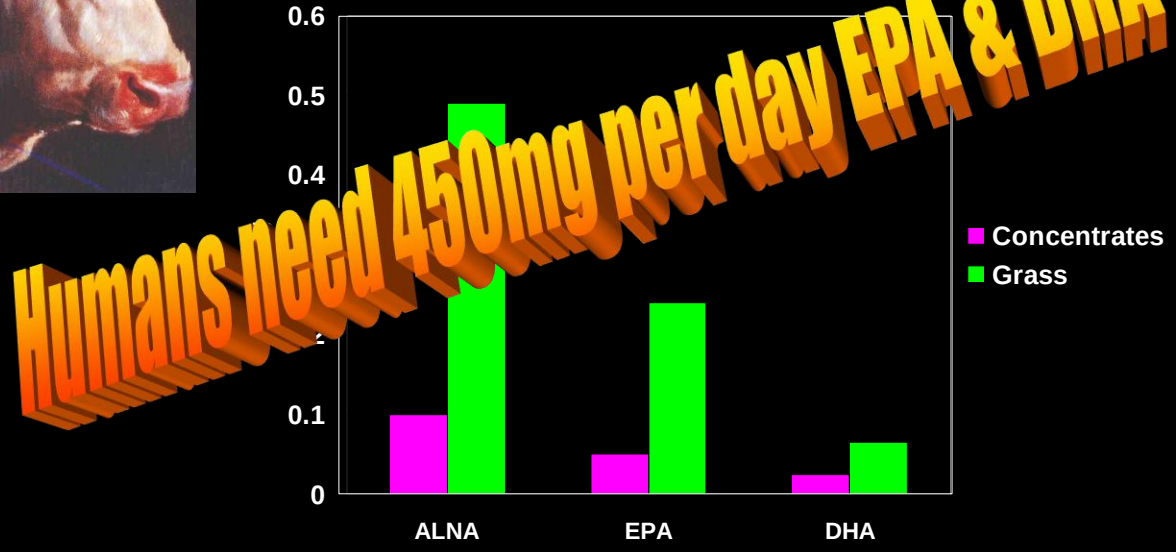


Feed and n-3 PUFAs in beef

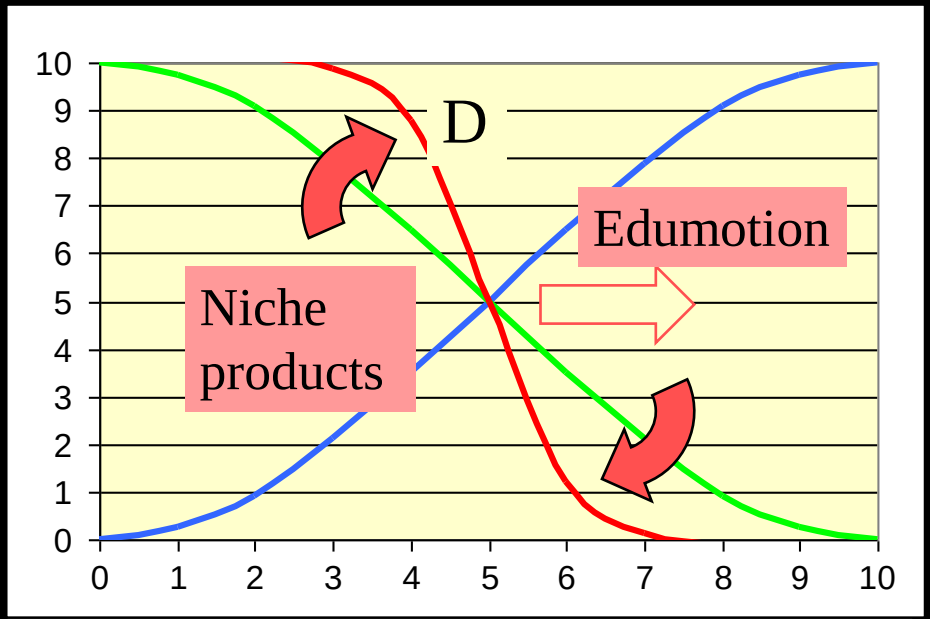




After Enser *et al.* 1998

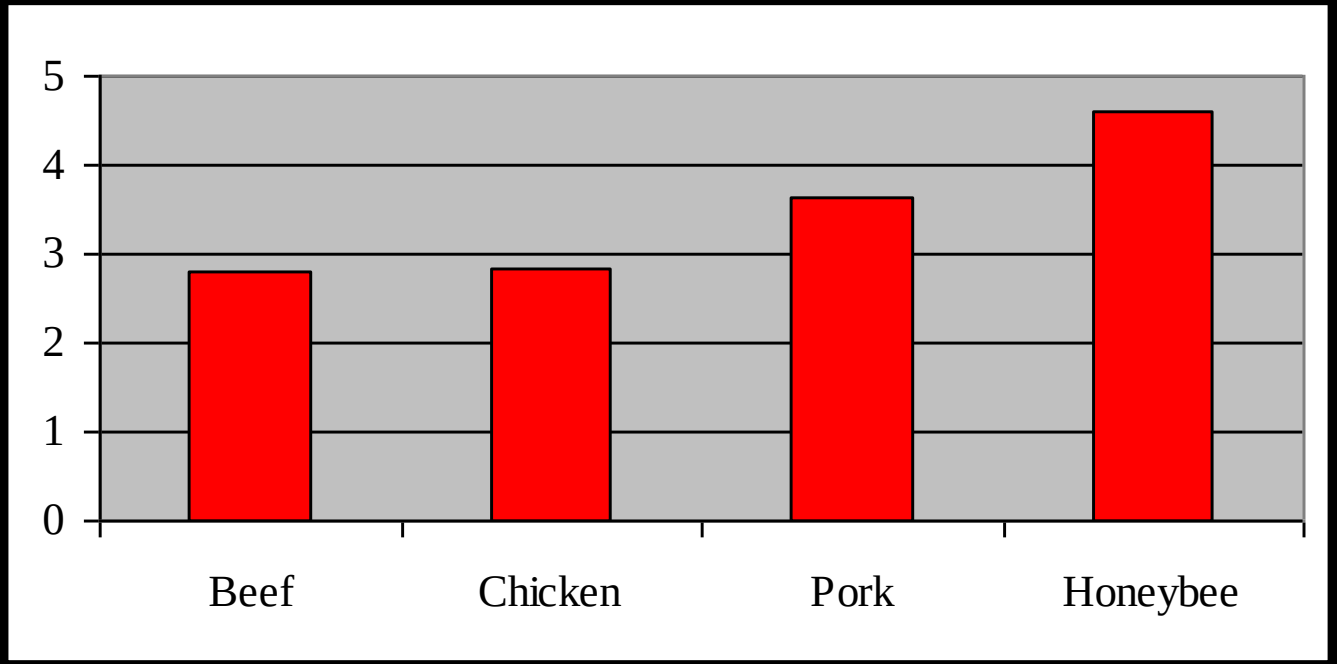
Supply & Demand

Price



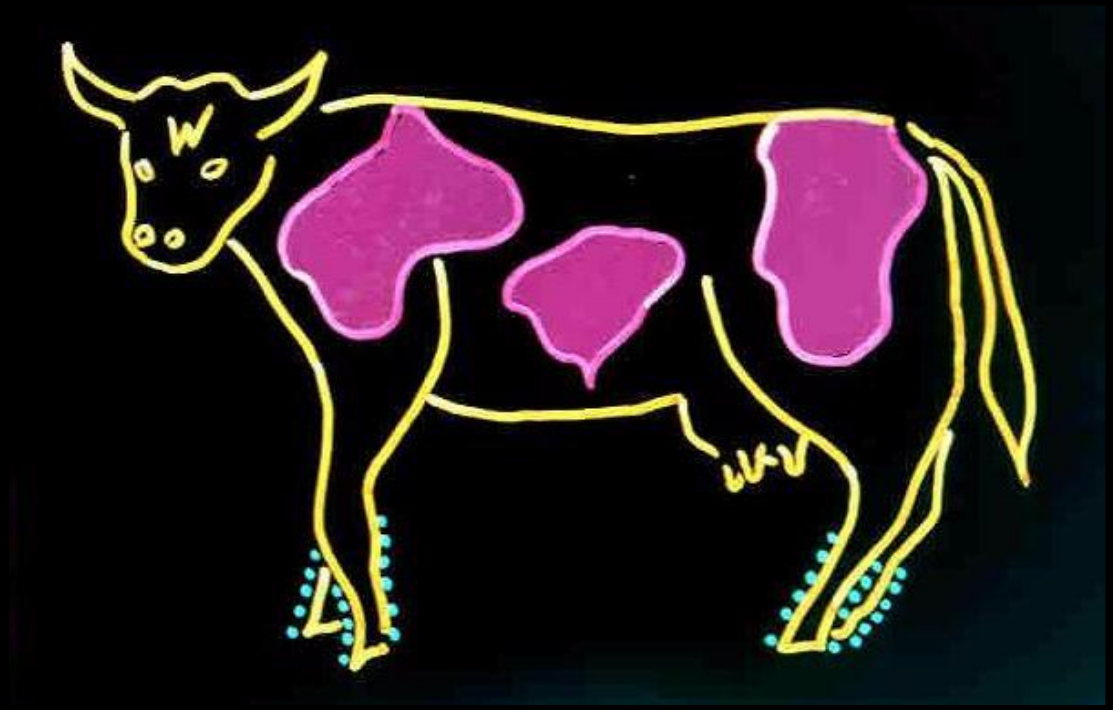
Quantity supplied or demanded

UN Nutrient Value Scores



Payne *et al.* (2016) *Europ. J. Clin. Nut.*

The GM Cow

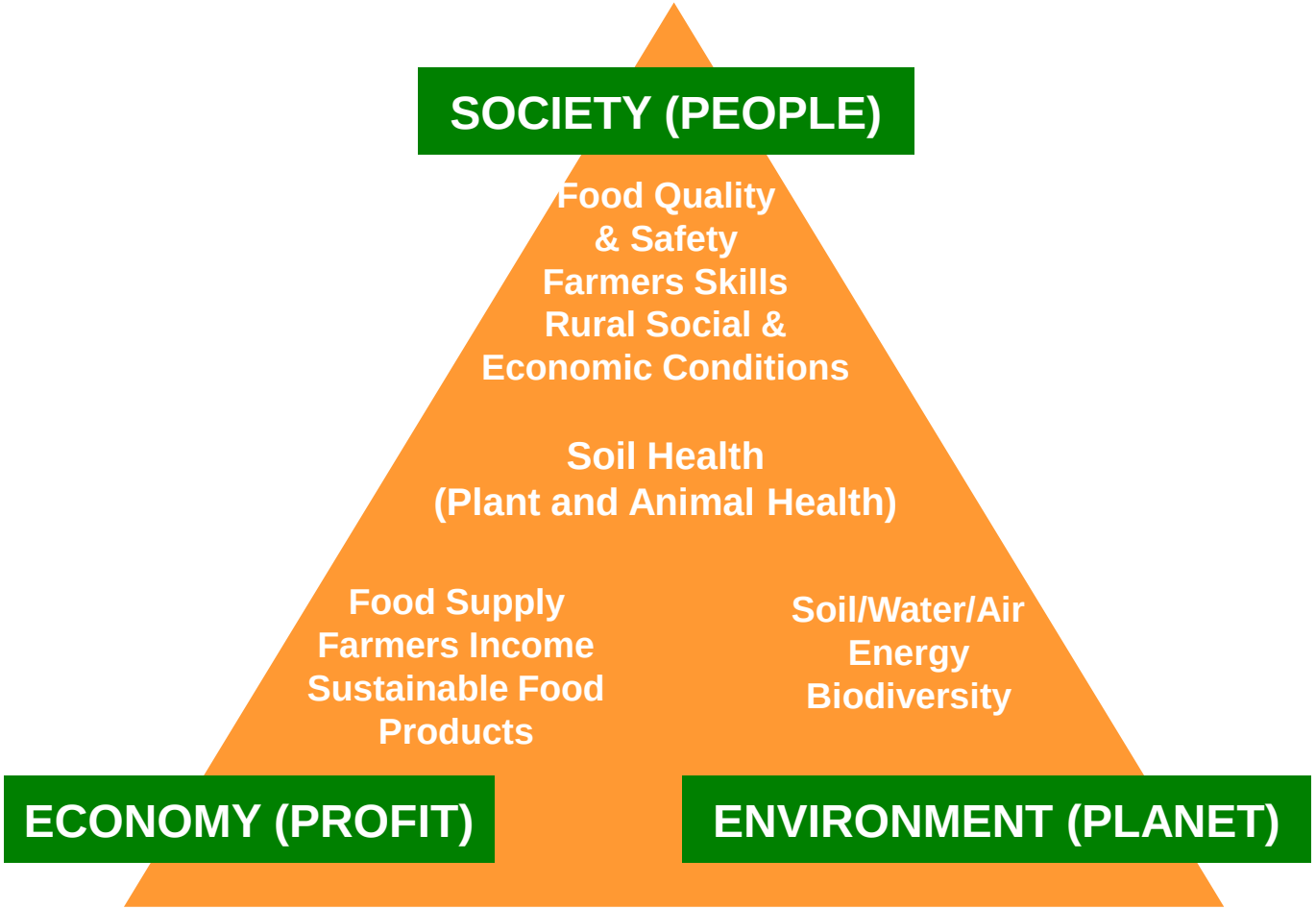


Sustainable agriculture and role of livestock in food security

Prof Michael Lee

Head of Sustainable Agriculture Science, Rothamsted Research, North Wyke; Chair in Sustainable Livestock Systems, Bristol Veterinary School, University of Bristol

Sustainable Farming Systems



Trade – offs (e.g. Beef)

Criteria	Measure	Units
Animal performance	Daily weight gain	Kg weight gain/day
Carrying capacity	Animals per hectare	Kg weight/ha
Nutritional quality	Nutrients per hectare (e.g. calories, protein, minerals)	Kg nutrient/ha
Nutrient and soil loss to water Soil Health	Losses per hectare per day SOC	Kg/ha/day %
Greenhouse gas emissions Sulphonation Eutrophication	CO_2 (or equivalent) per unit of animal product (S and P equivalents)	Kg CO_2eq/kg product (S and P equivalents)
Animal health	Costs of preventive veterinary care and treatment of diseases	Veterinary costs (£)
Animal Welfare	Negative and Positive assessment	Disease/EU Behaviour /time
Biodiversity	Range of wildlife and plant species	Species/ha
Inputs (fertiliser, machinery, labour)	Purchase cost	£
Outputs (beef cattle)	Sales value	£

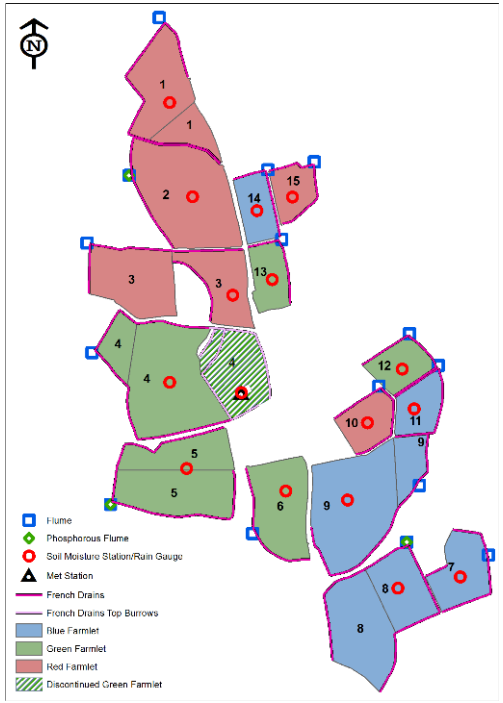
Metrics of Sustainability

ROTHAMSTED RESEARCH

Correlations between soils, environment and production

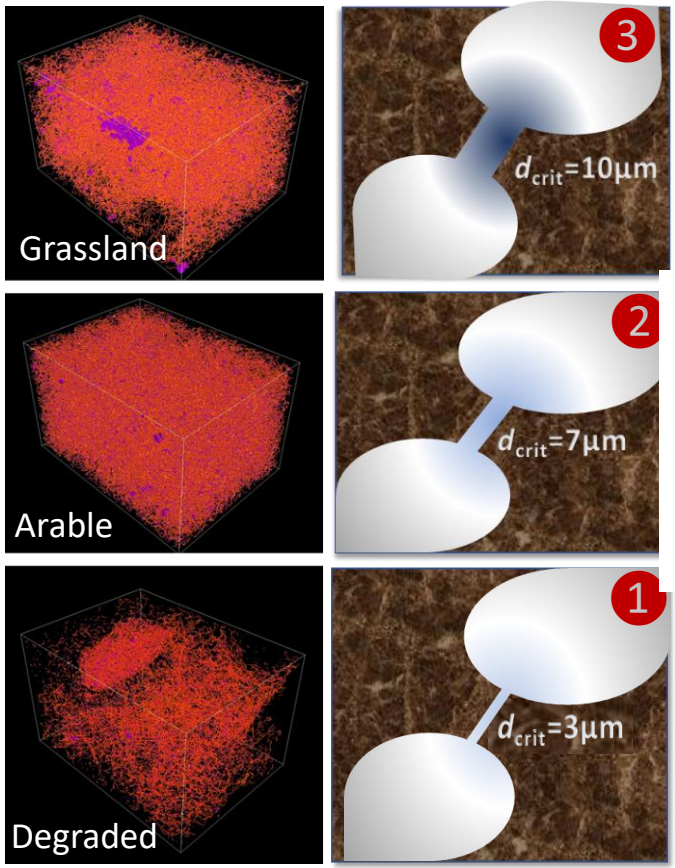
	SOC	HET	BOT	WAT	STO	LIV
SOC (t/ha)	1					
SOC heterogeneity	0.131	1				
Botanical β-diversity	0.306	0.342	1			
Water discharge (L/ha)	– 0.383	0.097	– 0.111	1		
Stocking rate (kg day/ha)	0.476	– 0.048	0.603	– 0.427	1	
Liveweight gain (kg/ha)	0.376	– 0.469	0.558	– 0.387	0.697	1

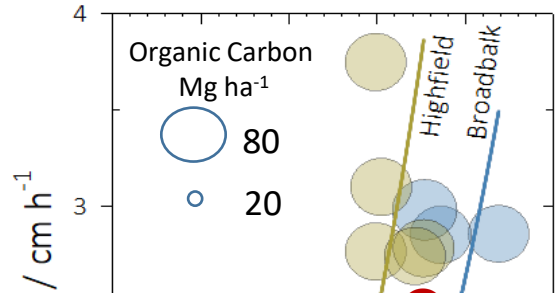
Based on pre-2013 data from 15 catchments at the North Wyke Farm Platform



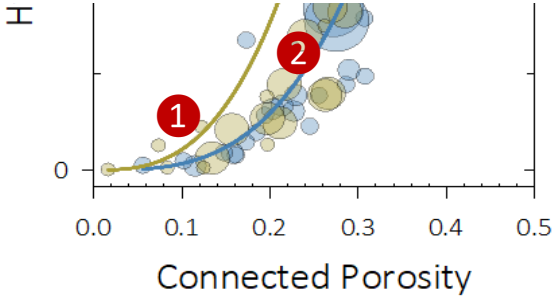
Takahashi *et al*. (2018)

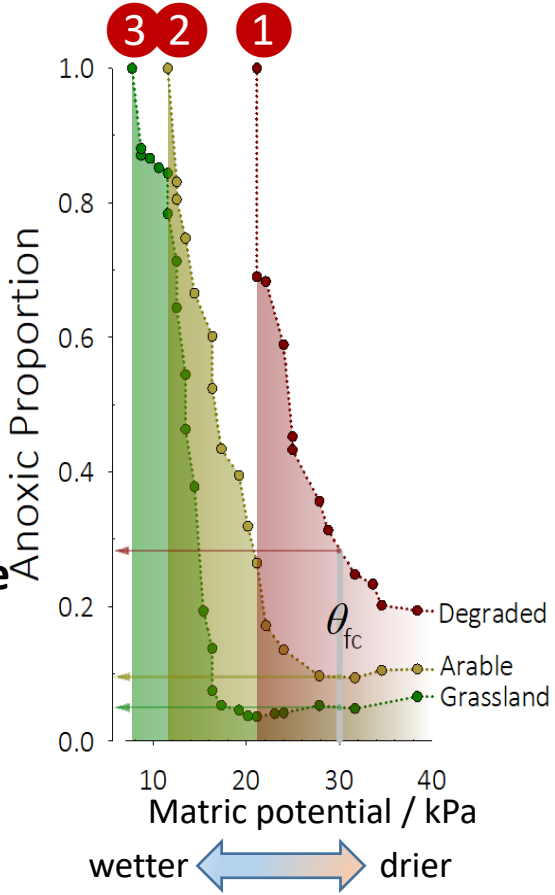
Soil health – Role of grazing livestock



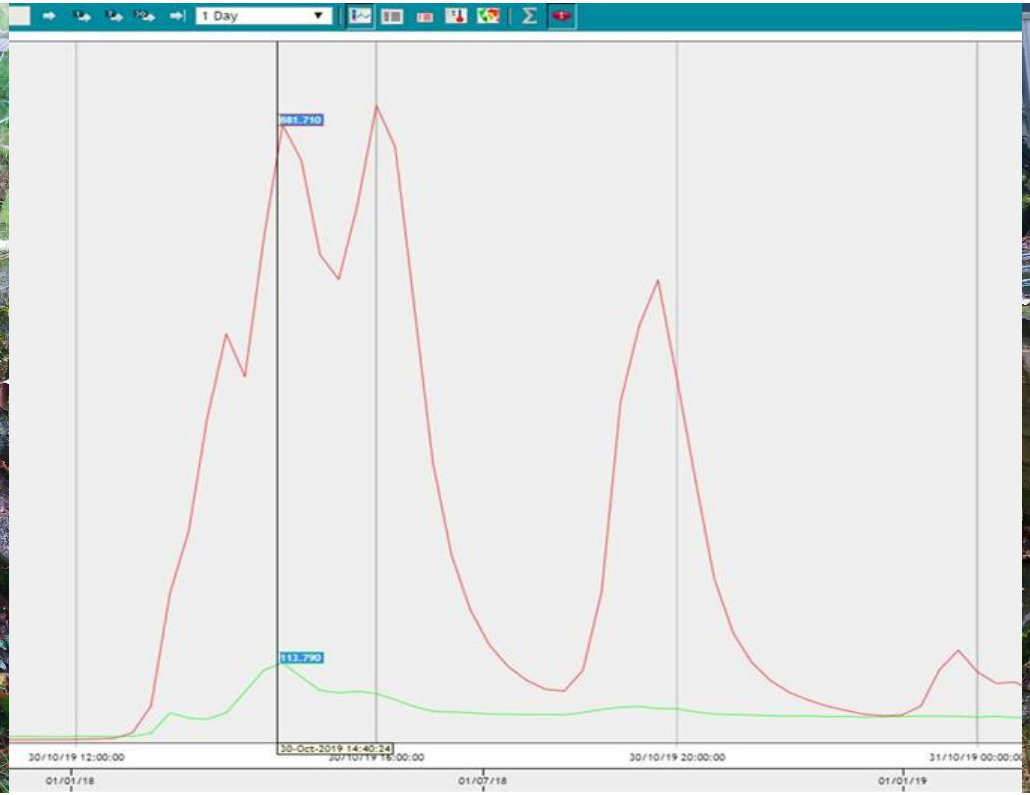


SOC influence on connected porosity regulates not only nutrient flow but gene expression by controlling O_2 diffusion within the soil profile

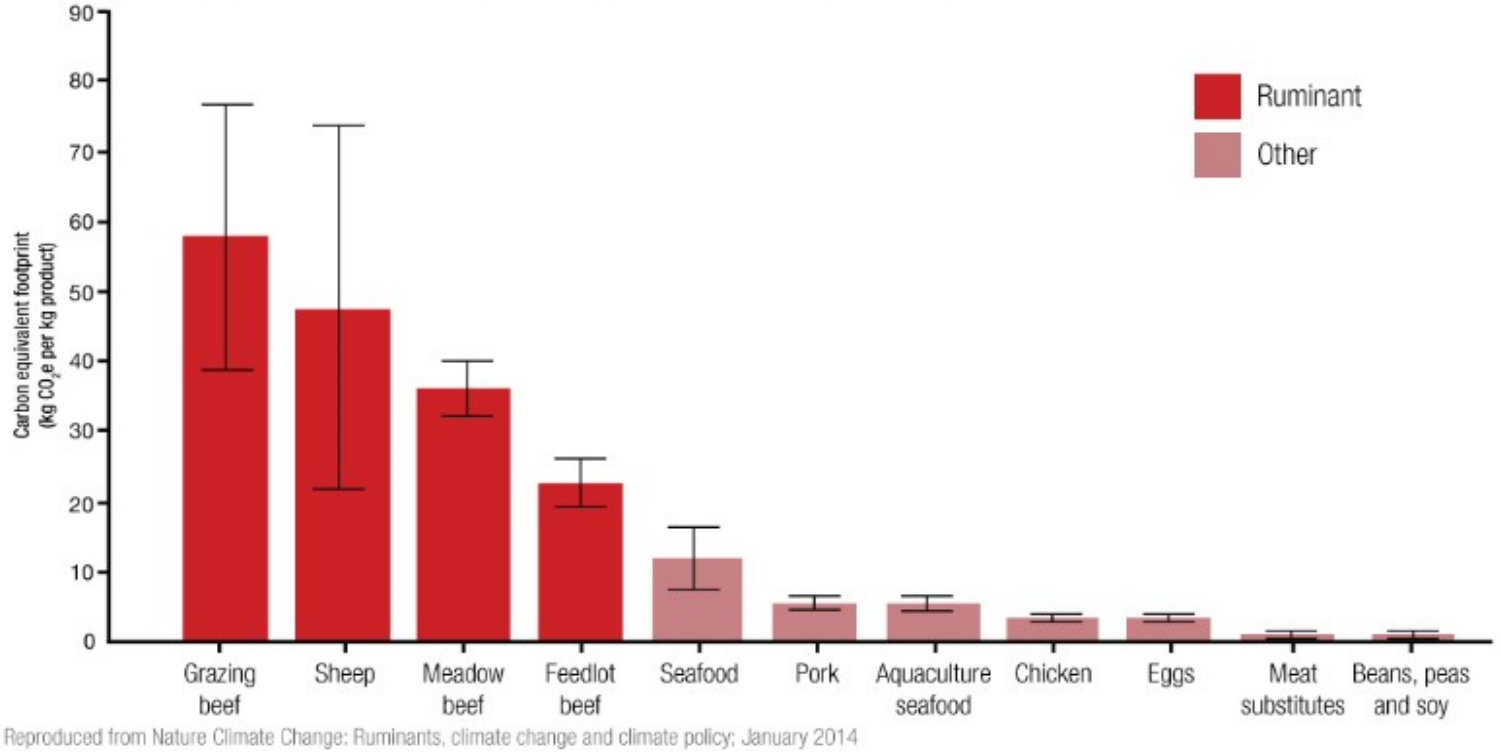




Soil loss from arable versus grassland soil – North Wyke Farm Platform



Global Warming potential – mass based assessment (CO2eq/kg product)



Reproduced from Nature Climate Change: Ruminants, climate change and climate policy; January 2014

BBSRC bioscience for the future

NORTH WYKE ROTHAMSTED RESEARCH

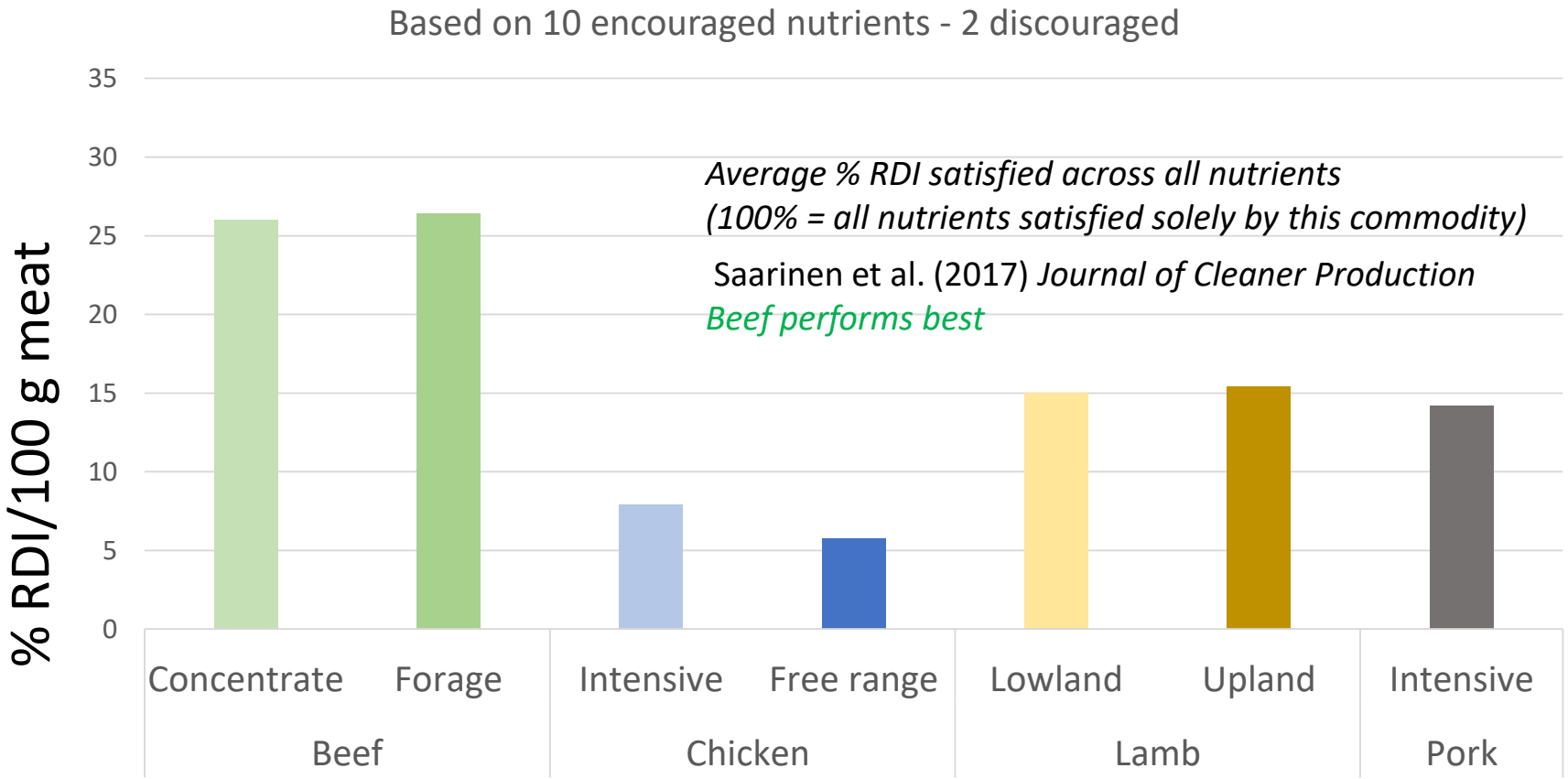
Accounting for nutritional quality: nutrient index (NI)

(contents per 100 g meat)

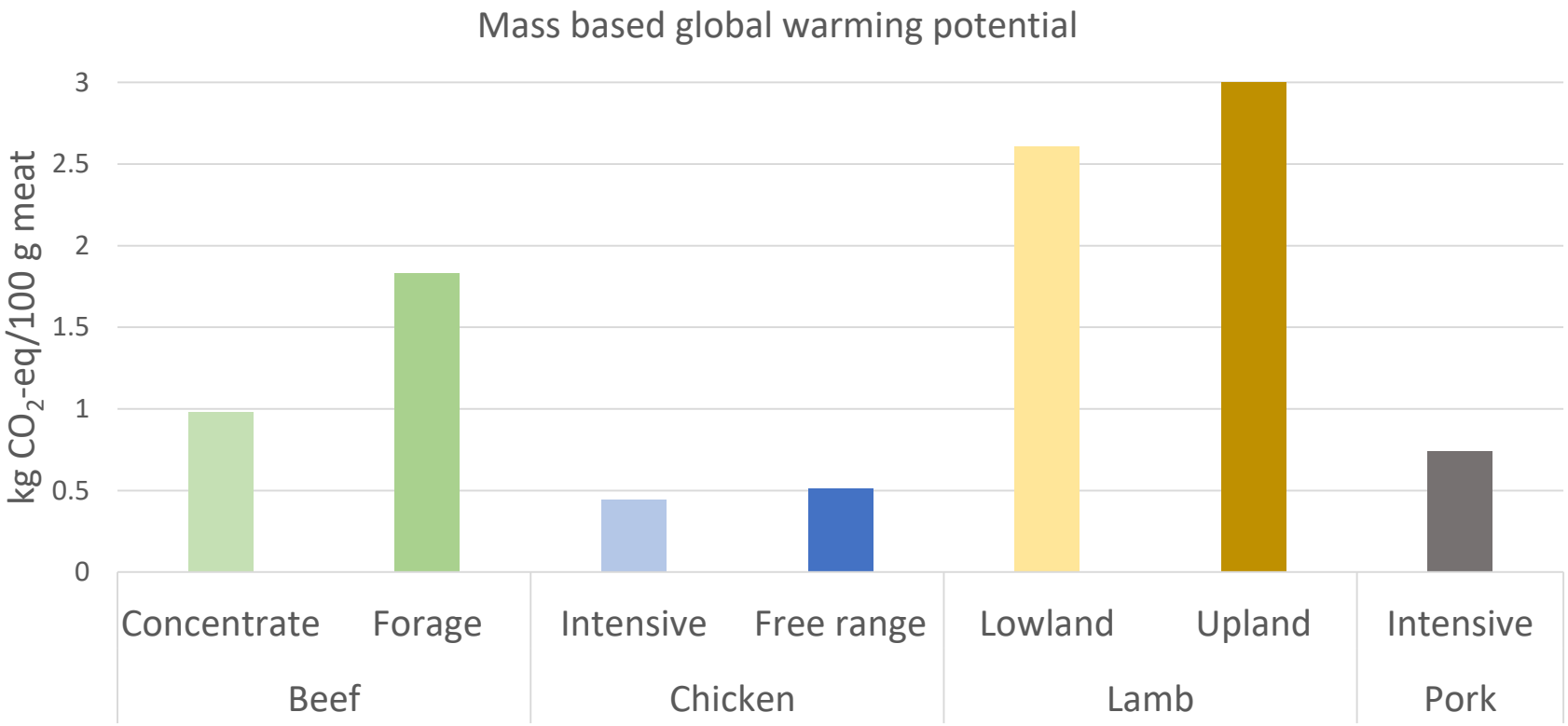
			Beef		Chicken		Lamb		Pork
Nutrient	Unit	RDI	Concentrate	Forage	Intensive	Free range	Lowland	Upland	Intensive
Protein	g	50.25	23.5	23.5	26.3	26.3	20	20	18.6
MUFA	g	37.5	1.13	1.63	3.70	5.44	1.30	1.07	0.85
EPA+DHA	mg	250	3.4	27.4	17.6	14.7	26.4	31.7	14.8
Ca	mg	700	5	5	11	11	12	12	10
Fe	mg	11.75	1.6	1.6	0.7	0.7	1.4	1.4	0.4
Riboflavin	mg	1.2	0.26	0.26	0.15	0.15	0.2	0.2	0.18
Folic acid	µg	200	16	16	9	9	6	6	1
Vitamin B12	µg	1.5	2	2	0	0	1	1	1
Se	µg	67.5	8	8	15	15	3	3	11
Zn	mg	8.25	4	4	1.5	1.5	2	2	1.3
Na	g	6	0.07	0.07	0.08	0.08	0.07	0.07	0.05
SFA	g	25	1.14	1.50	2.43	3.69	1.34	1.21	0. 90

Red: nutrients to be discouraged

Accounting for nutritional quality: nutrient index (NI)

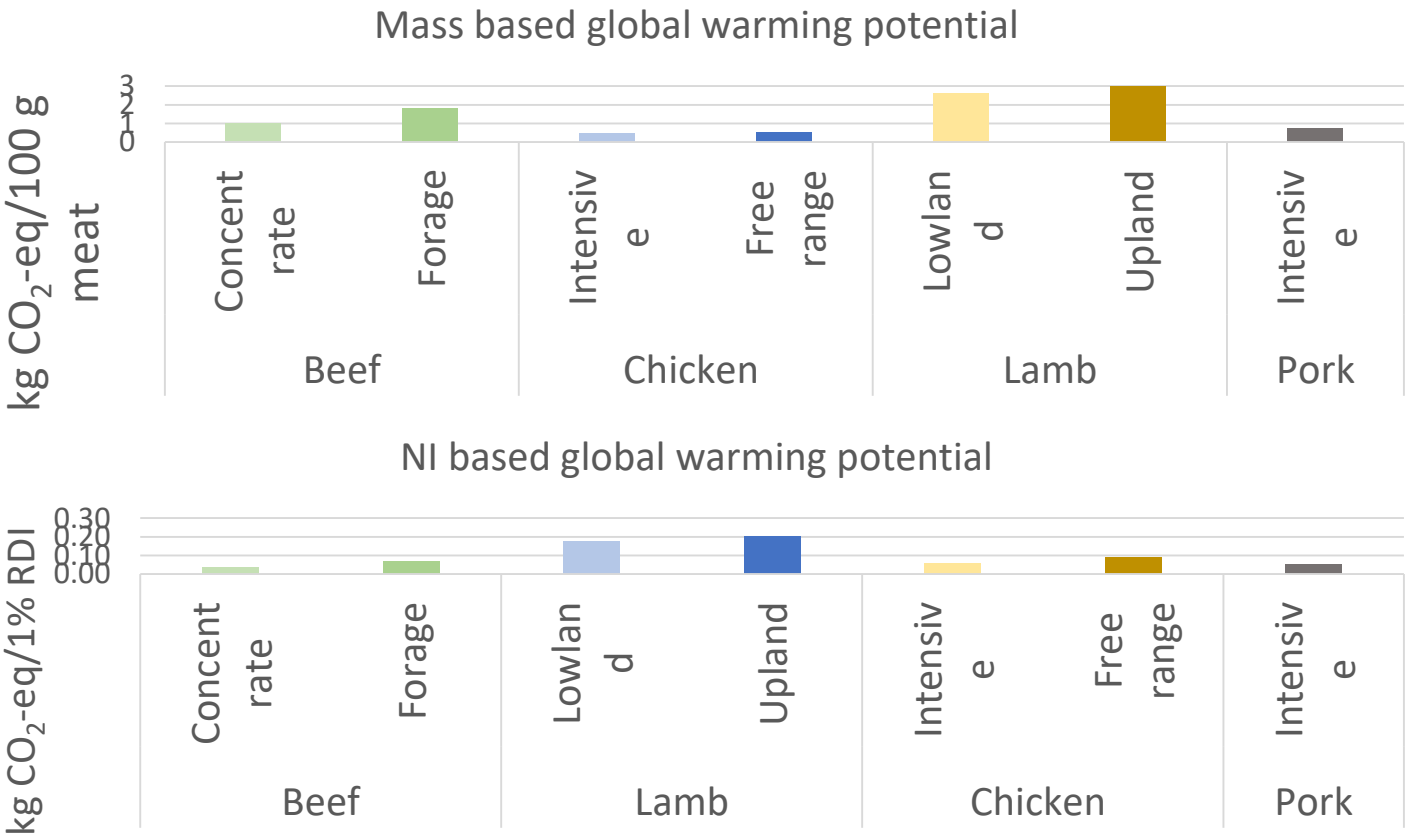


Baseline: conventional GWP (mass-based)



Chicken performs best

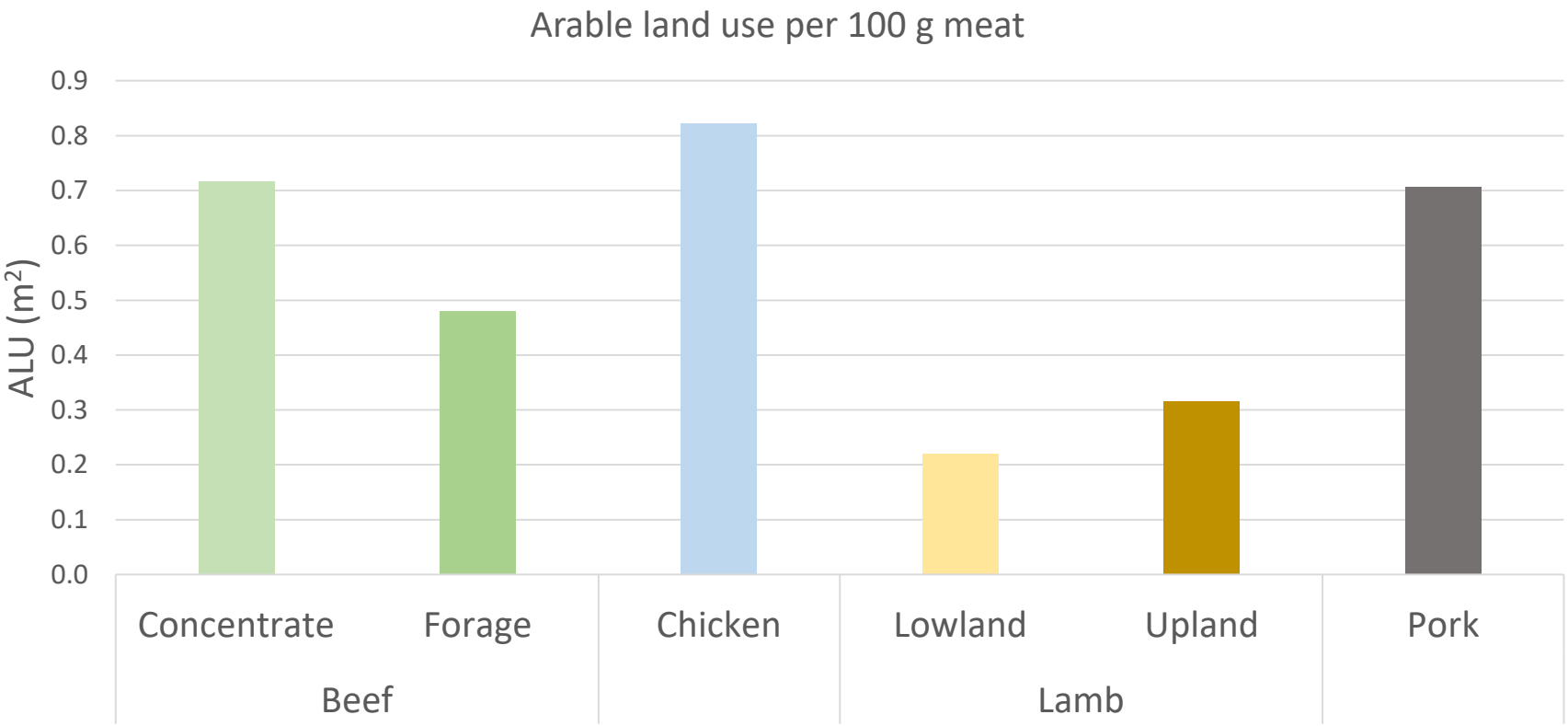
Mass-based GWP vs NI-based GWP



McAuliffe et al. (2018) *Food and Energy Security*

Beef performs best

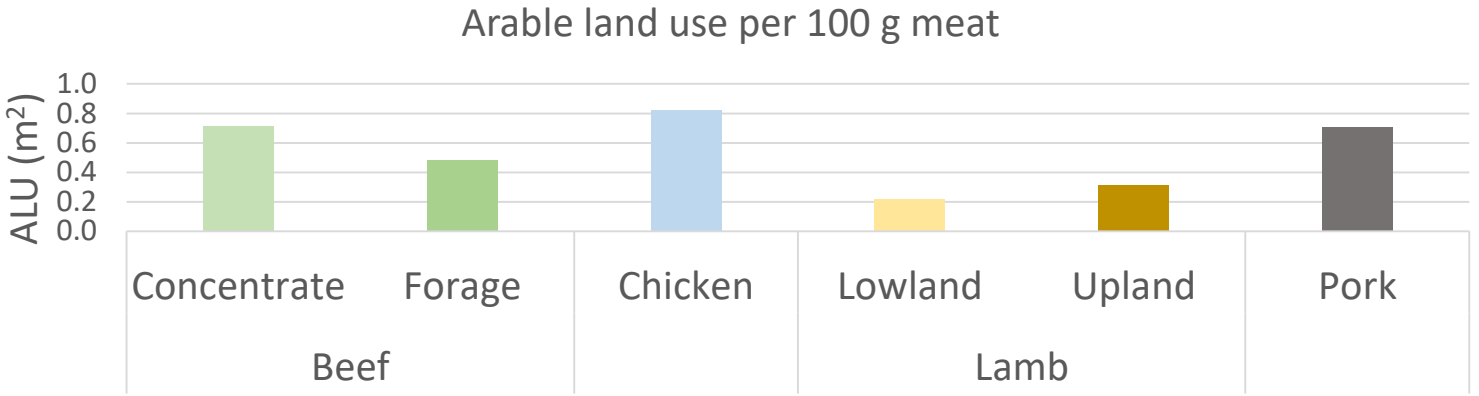
Accounting for other metrics: arable land use (ALU)

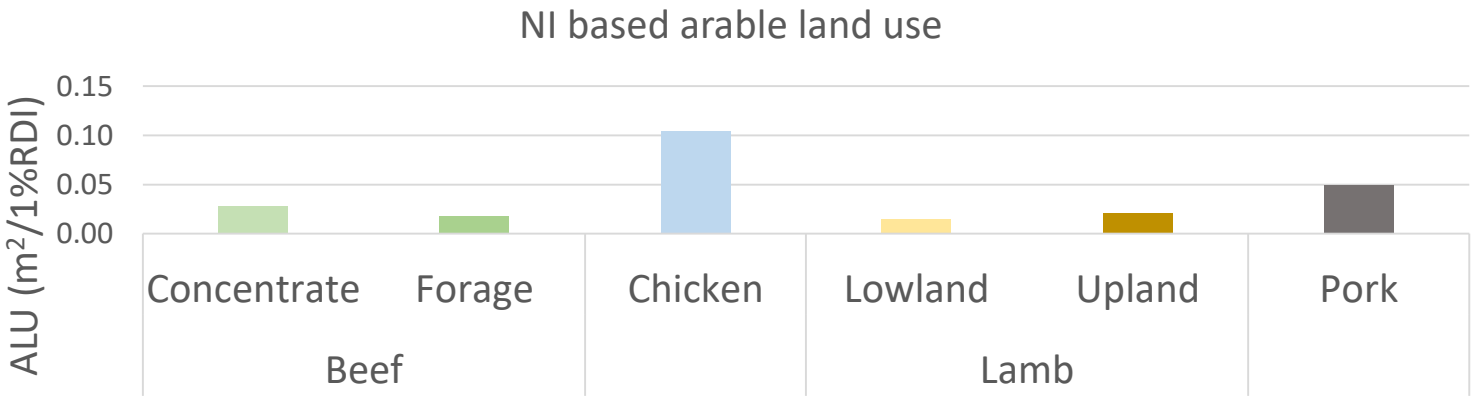


Lamb performs best

Wilkinson and Lee (2018) *animal*

Finally: Arable land use (ALU) per NI provision





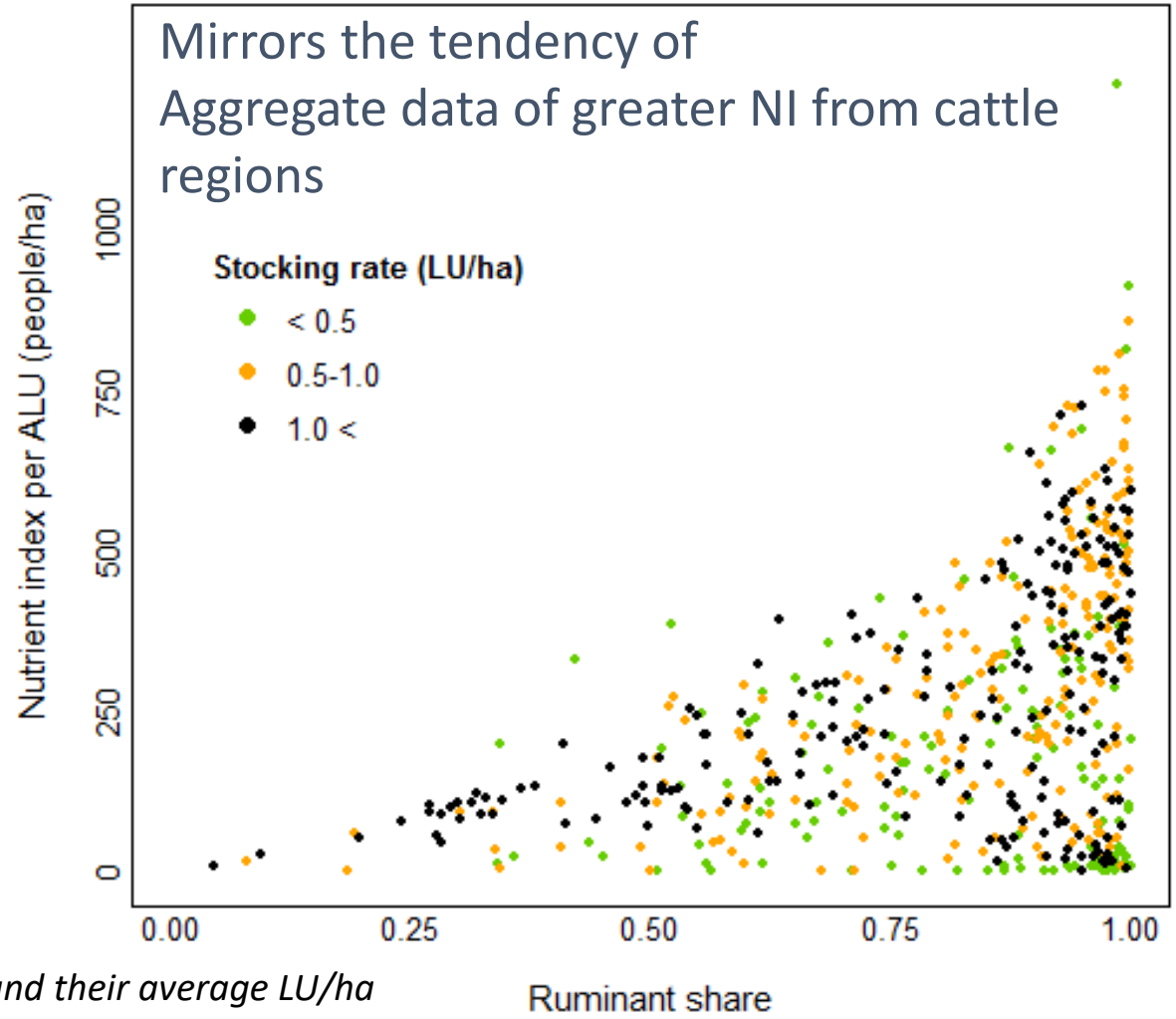
Lamb performs best

Upscaling the framework

- **Objective:** to test the hypothesis that ruminants can provide more nutrients for humans per ha of arable land than monogastrics
- **Case study:** INRA France 
- **Sample:** 571 agricultural land units (petites régions agricoles)

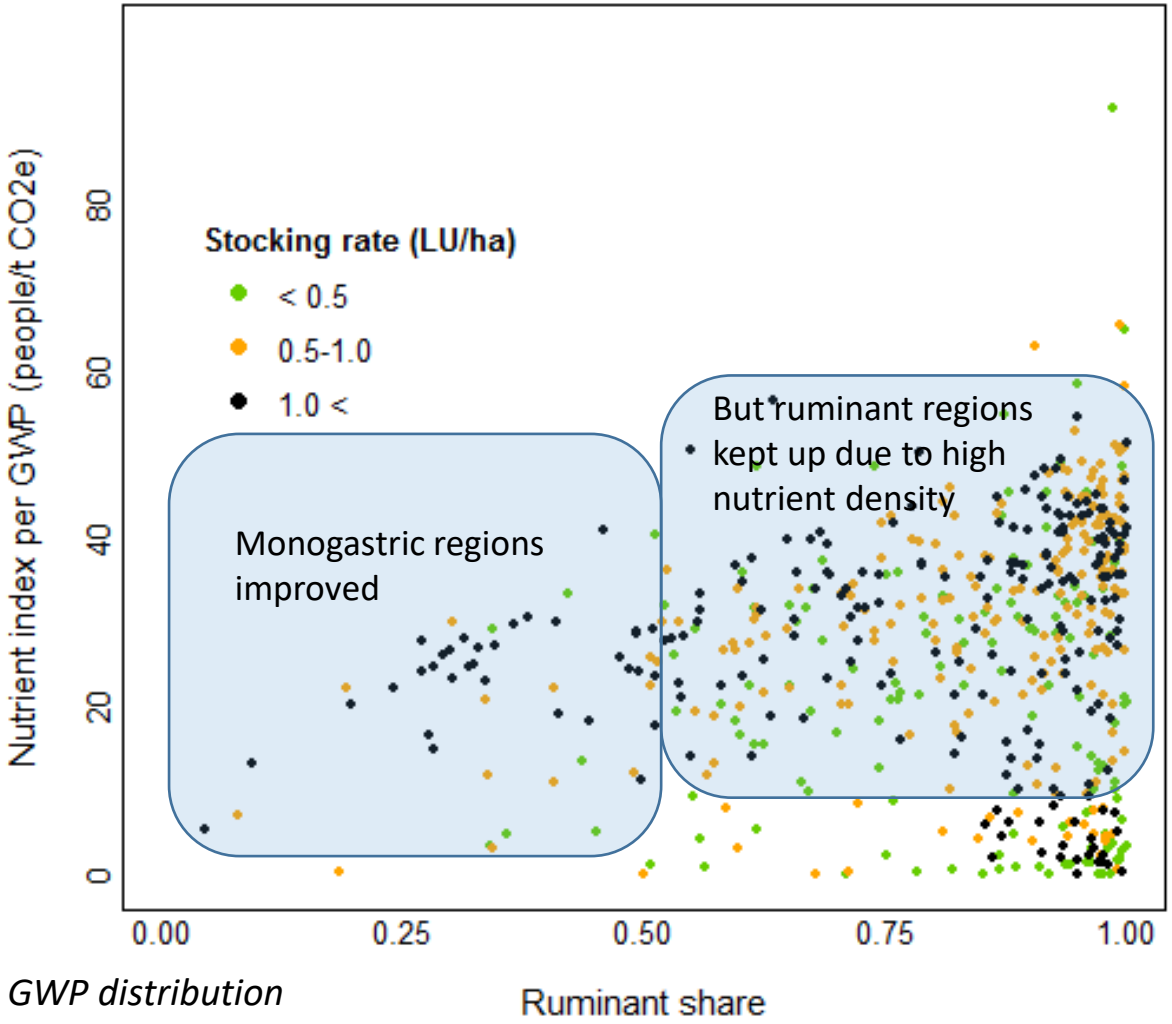
- Ruminant share: 0 – 1 based on livestock units
- NI: accounts for meat, milk and eggs
- GWP: based on life cycle assessment (LCA)
- ALU: includes displaced land outside PRA (Tichit et al., 16:45 today)

NI per ALU



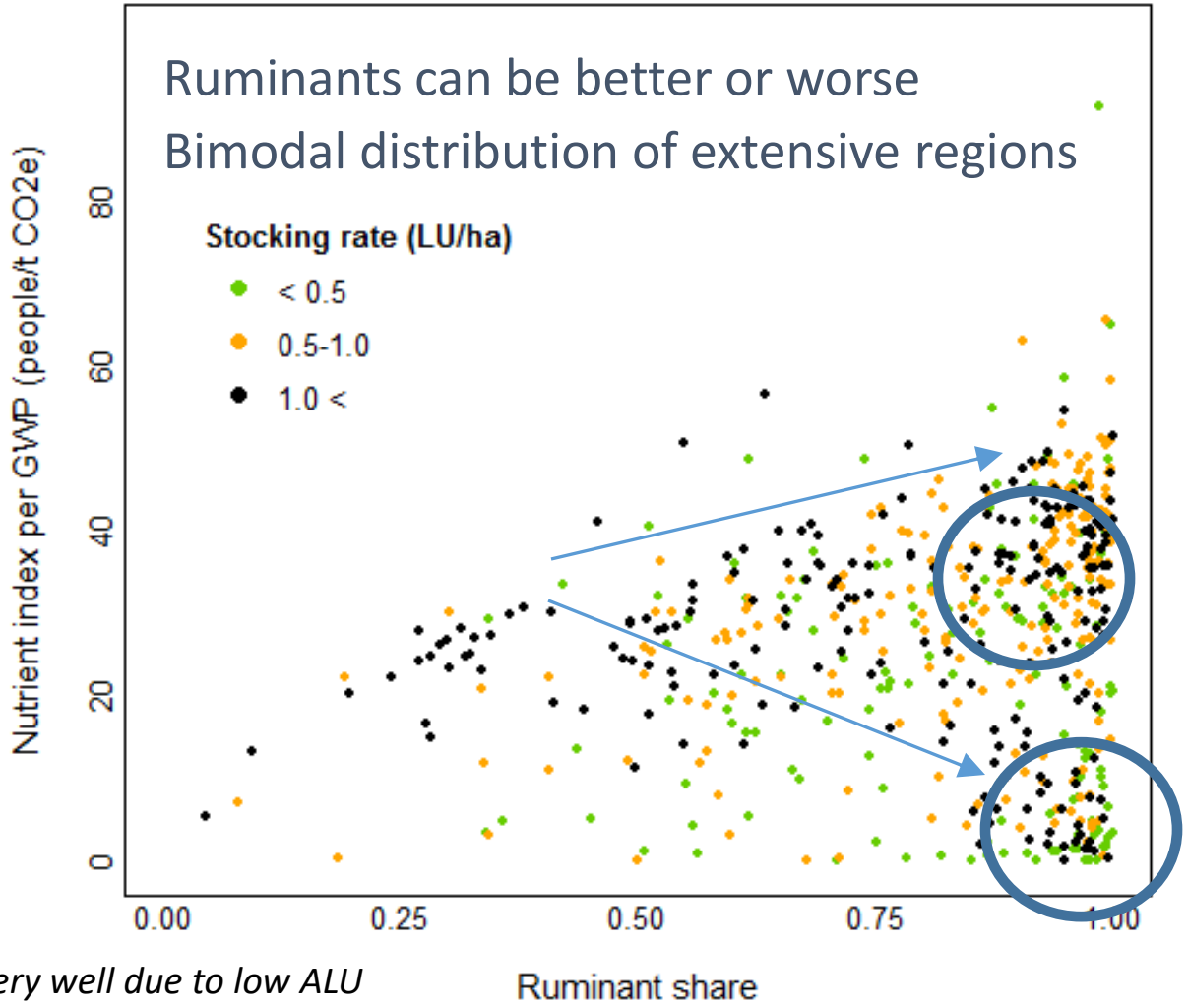
Each dot represents a PRA and their average LU/ha

NI per GWP



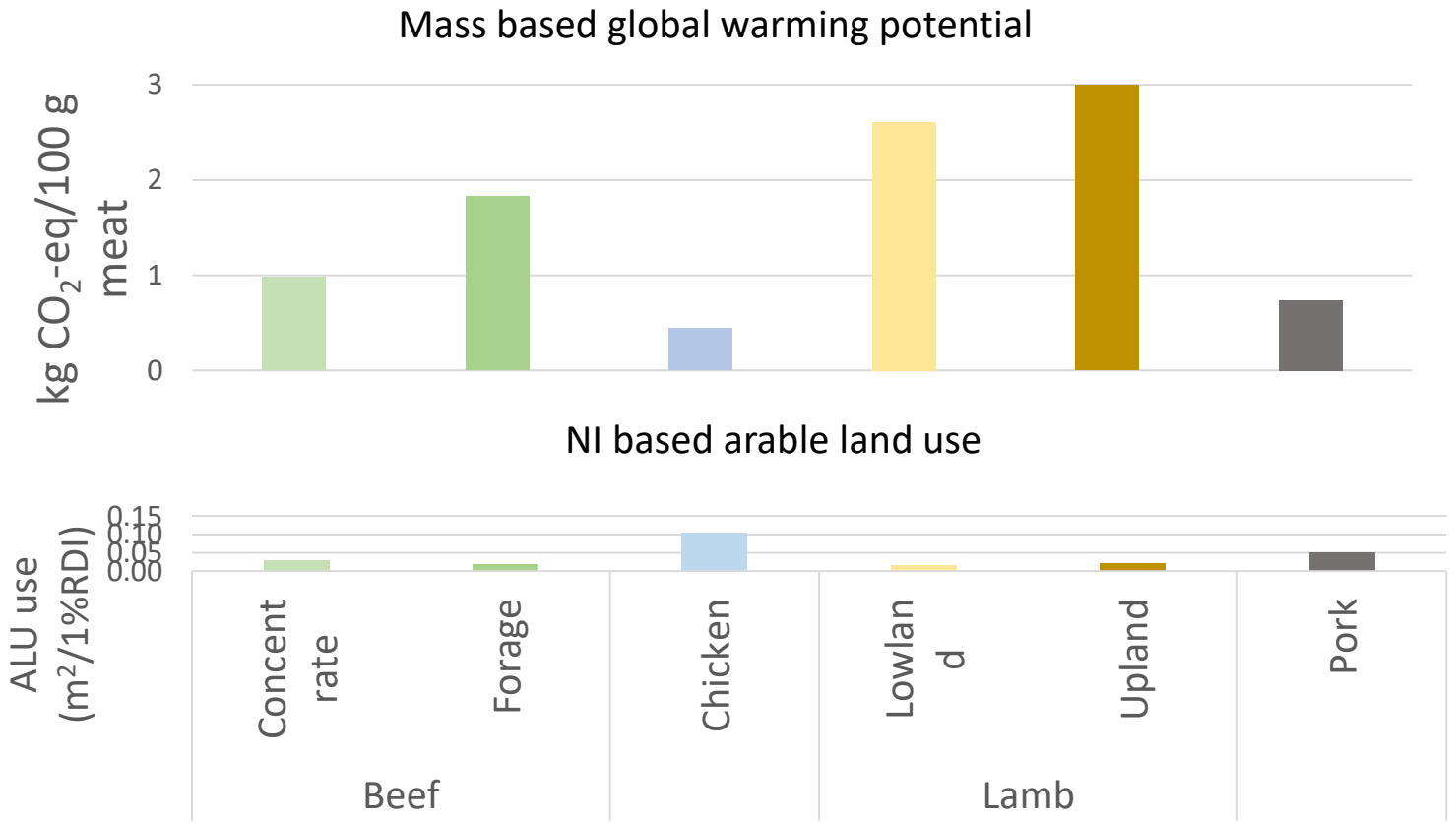
High nutrient density affects GWP distribution

NI per GWP

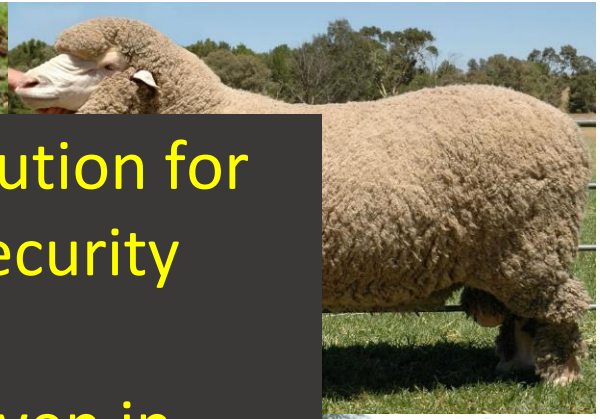


Extensive regions can perform very well due to low ALU

What is sustainability?



Livestock of course are more than food



Livestock are part of the solution for sustainable global food security

But great care must be given in developing metrics when determining their role

Soil to Nutrition Institute Strategic Programme

ROTHAMSTED RESEARCH

Mechanistic understandin

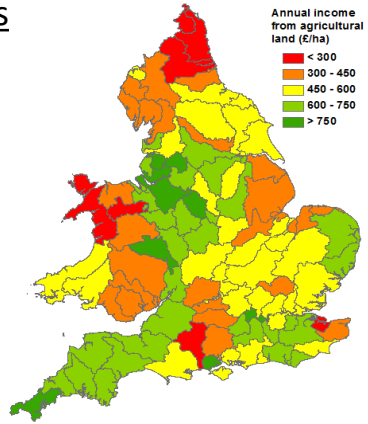
Micro-scale processes which drive nutrient use

Targeted interventions

Management impacts on nutrient use

Food Systems Private and public good

Delivering 'fit-for-purpose' metrics to benchmark and improve nutrient use

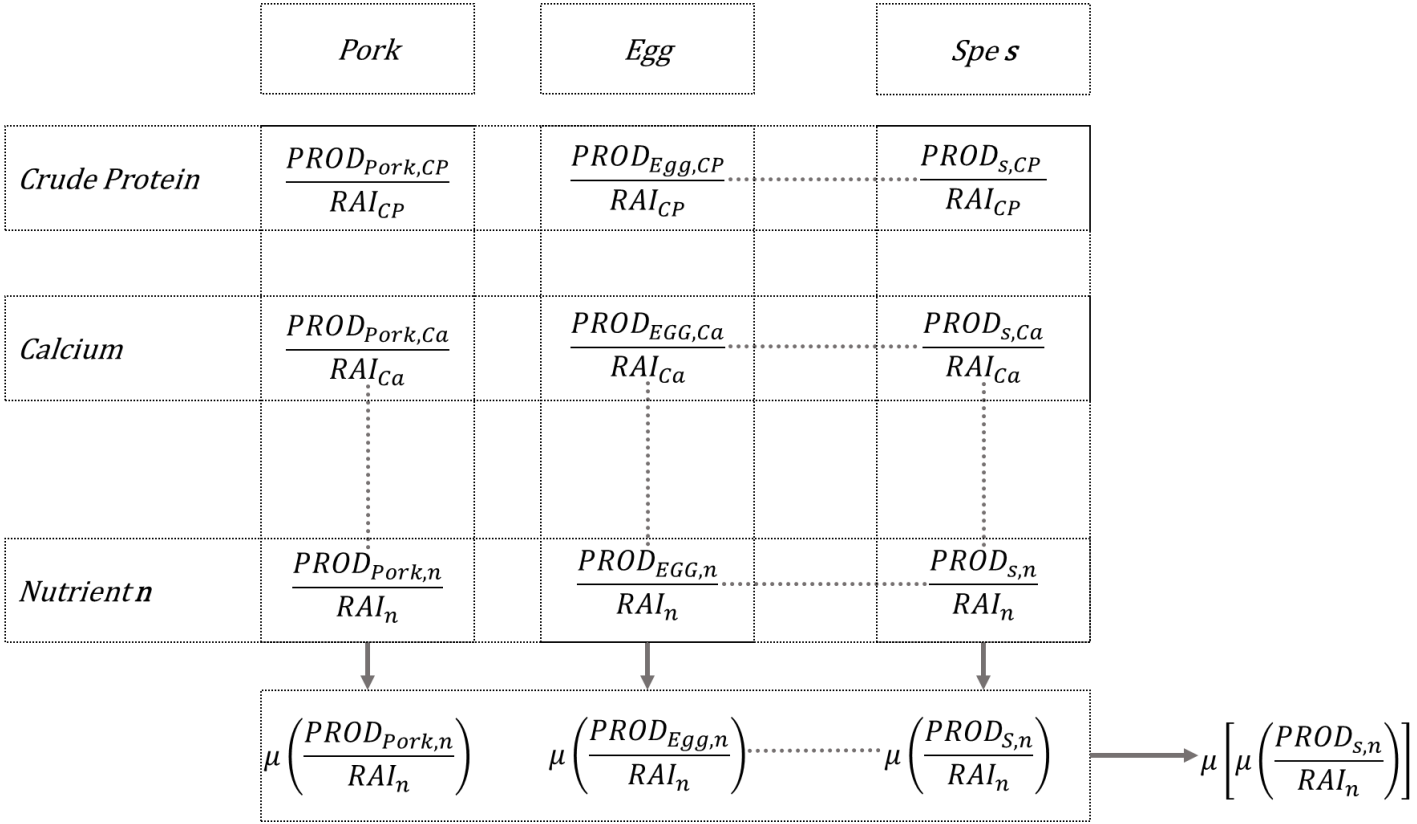


BBSRC bioscience for the future | UK Research and Innovation

www.globalfarmplatform.org

GLOBAL INNOVATION INITIATIVE

Strengthening global research through multilateral partnerships


Pork
Egg
Spe s
Crude Protein
Calcium
Nutrient n
$\frac{PROD_{Pork,CP}}{RAI_{CP}}$
$\frac{PROD_{Egg,CP}}{RAI_{CP}}$
$\frac{PROD_{s,CP}}{RAI_{CP}}$
$\frac{PROD_{Pork,Ca}}{RAI_{Ca}}$
$\frac{PROD_{EGG,Ca}}{RAI_{Ca}}$
$\frac{PROD_{s,Ca}}{RAI_{Ca}}$
$\frac{PROD_{Pork,n}}{RAI_{n}}$
$\frac{PROD_{EGG,n}}{RAI_{n}}$
$\frac{PROD_{s,n}}{RAI_{n}}$
$\mu\left(\frac{PROD_{Pork,n}}{RAI_{n}}\right)$
$\mu\left(\frac{PROD_{Egg,n}}{RAI_{n}}\right)$
$\mu\left(\frac{PROD_{S,n}}{RAI_{n}}\right)$
$\mu\left[\mu\left(\frac{PROD_{s,n}}{RAI_{n}}\right)\right]$


WELSH FARMING:
NEW HORIZONS
#NFUCymru19

The realities of international trade

Dmitry Grozoubinski
Founder and Lead Trainer, ExplainTrade.com

Chaired by: John Mercer, Director, NFU Cymru

#NFUCymru19

Trade Policy and Farming
(the 13 slides in 20 minutes version)

Dmitry Grozoubinski
Founder, ExplainTrade
@DmitryOpines

Trade policy
is a **government toolbox**

International Trade policy is **restrictions** on that toolbox

What are the farming relevant "tools?"

- Tariffs
- Regulations
- Subsidies

Tariffs

- Taxes on Imports
- Either:
  - Per cent of value;
  - Flat rate based on volume; or
  - Both

EU's Lamb Tariff

0204 10 - **Carcases and half-carcases of lamb, fresh or chilled :**

0204 10 00 10 ▼ - - Of domestic lamb

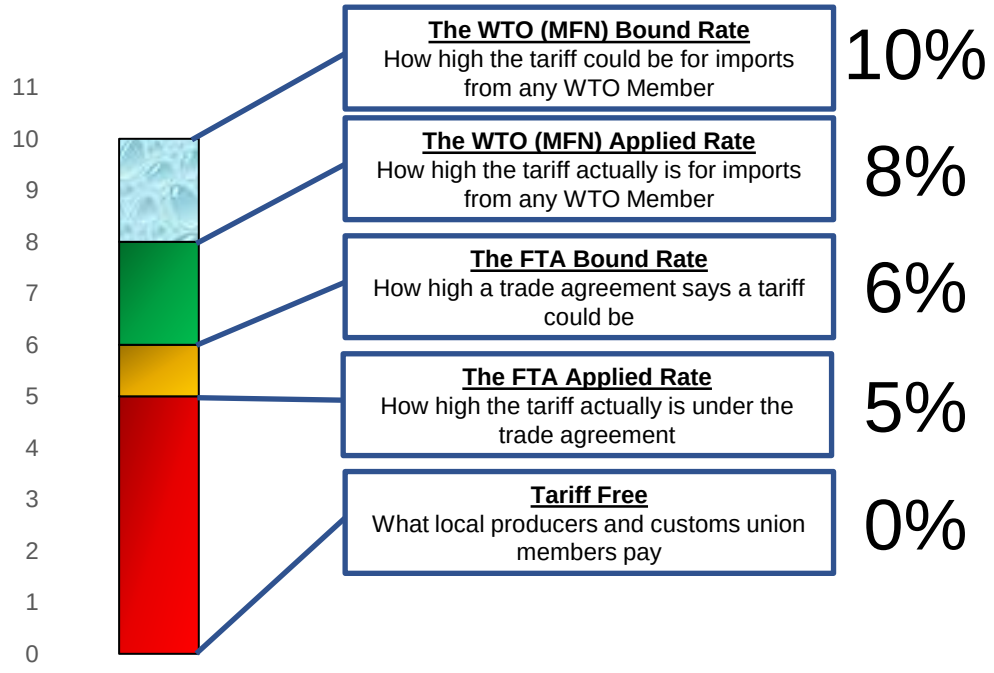
ERGA OMNES (ERGA OMNES 1011)

→| Third country duty (01-07-2000 -) : **12.80 % + 171.30 EUR / 100 kg**

Tool 1: Tariffs – Detecting Nonsense

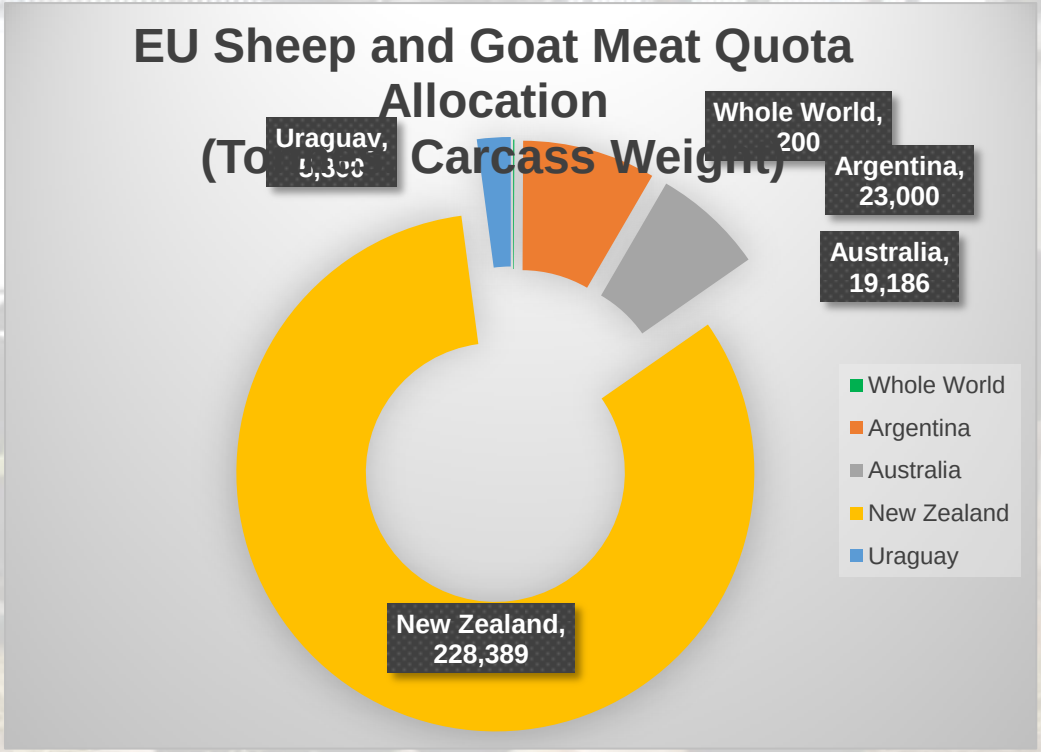
- Bounds vs Applied and WTO vs FTA
  - How high was it?
  - How high will it be?
  - How high is it for my competitors?

Anatomy of a Tariff



Quotas – Two Tiered Tariffs

- A lower tariff rate, but only for a fixed volume
  - After that, a higher one
- EU Quotas:
  - Country Specific: Can be very large
  - Open to All: Generally very small



Tool 2: Regulations

- Protection vs Protectionism

Tool 2: Regulations

- Protection vs Protectionism
- Regulation is really two questions:

Rules around Regulation

- Rules for what can be banned:
  - "Legitimate Policy Objective"
    - Protect plant and animal health <u>in own territory</u>
  - "Non-discriminatory"
  - "Established science"
  - "Not a disguised barrier to trade."

Regulations in Trade Negotiations

- About the process and approach

Tool 3: Subsidies

- Under international trade rules:
  - The government can subsidize farming
    - A lot

Subsidy Types

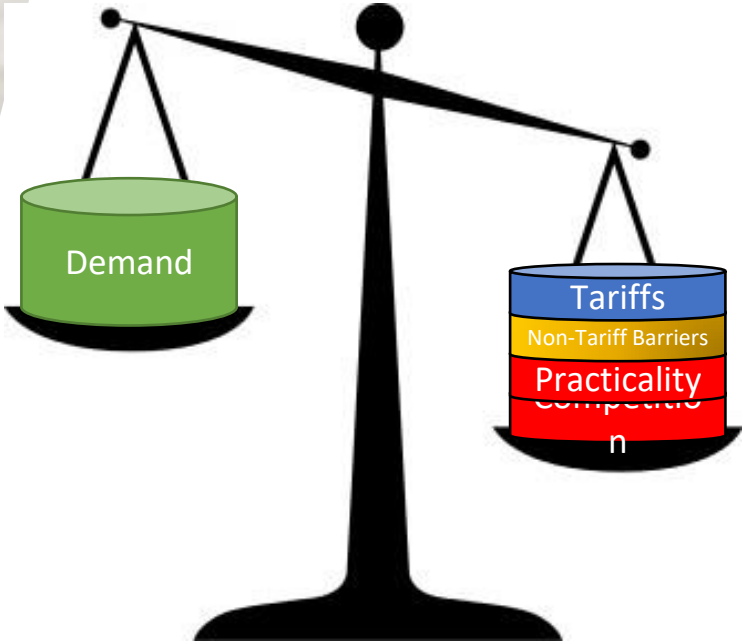
Non-Production Linked Payments ➡ **Unlimited**

Production Limiting Payments ➡ **Unlimited**

Production Linked Payments ➡ **Generously Limited**

Export Subsidies ➡ **Banned**

What can an FTA do for a non-viable export?



An FTA

May Reduce or Eliminate

Tariffs

May Partially Streamline

Non-Tariff Barriers

Won't Improve

Practicality

Won't Reduce

Won't Increase

Demand

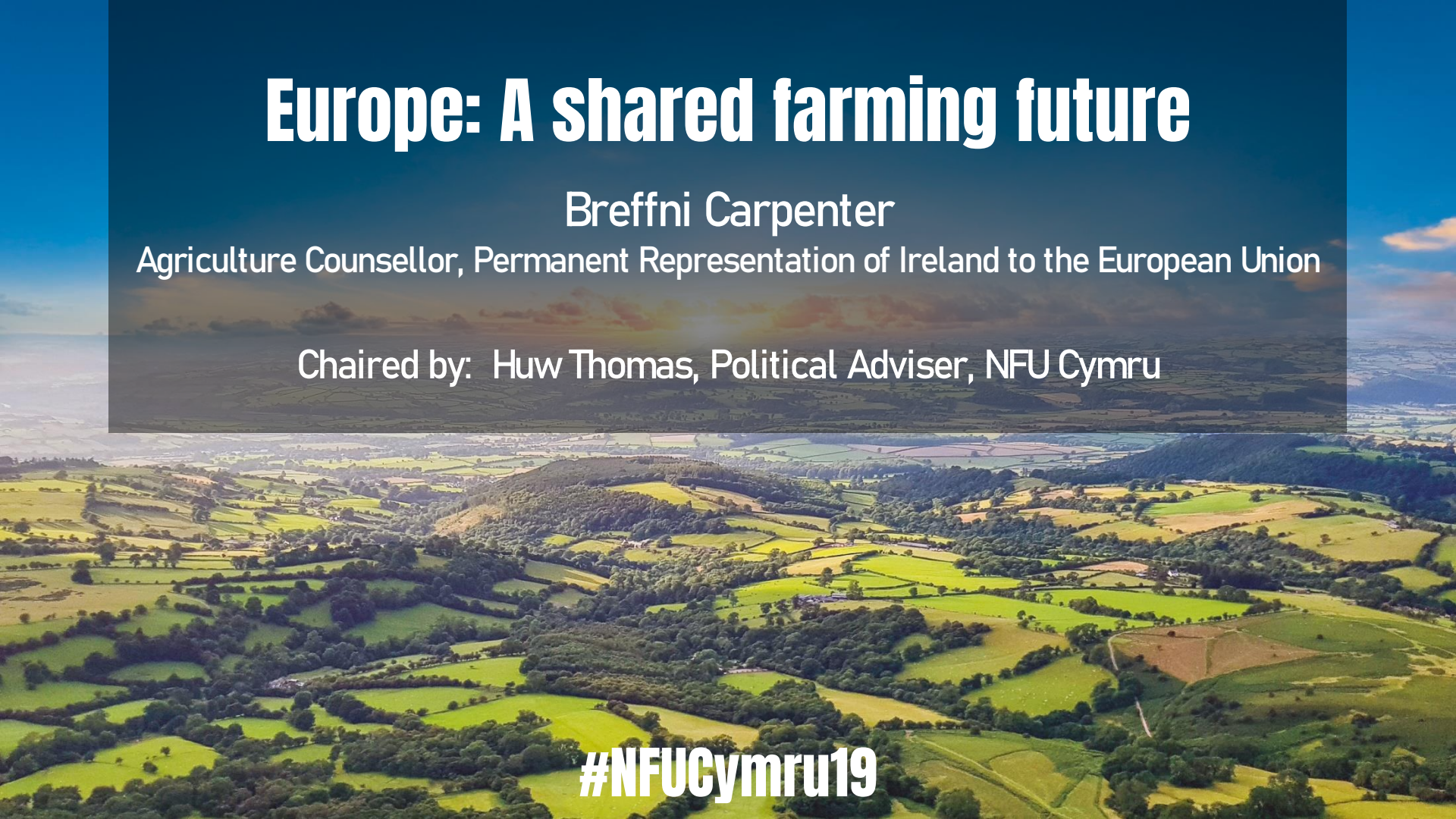
… and those are the basics


WELSH FARMING:
NEW HORIZONS
#NFUCymru19

Europe: A shared farming future

Breffni Carpenter
Agriculture Counsellor, Permanent Representation of Ireland to the European Union

Chaired by: Huw Thomas, Political Adviser, NFU Cymru



#NFUCymru19

Europe: A shared farming future…?

Breffni Carpenter

Permanent Representation of Ireland to the EU

Characteristics of the agriculture sector vary widely between countries, the main challenges are broadly the same:

- Lagging farm incomes
- Resource constraints (Land, Water)
- Environmental/Climate (labelling?)
- Rapidly increasing future demand for food

Fundamental shift in Supply-Demand balance

- **Demand!**
- **Population**, **Income** increasing
- China and others eating **more meat, dairy**
- Shift to **Urban Living**
- **Bio-energy** use growing
- Food **Demand +60%** by 2050

Supply!
- **Land** & **Water** constraints
- Government **policies:**
  - Price, stocks, insurance
  - Trade
  - Environment
- **Climate Change**

Increased volatility

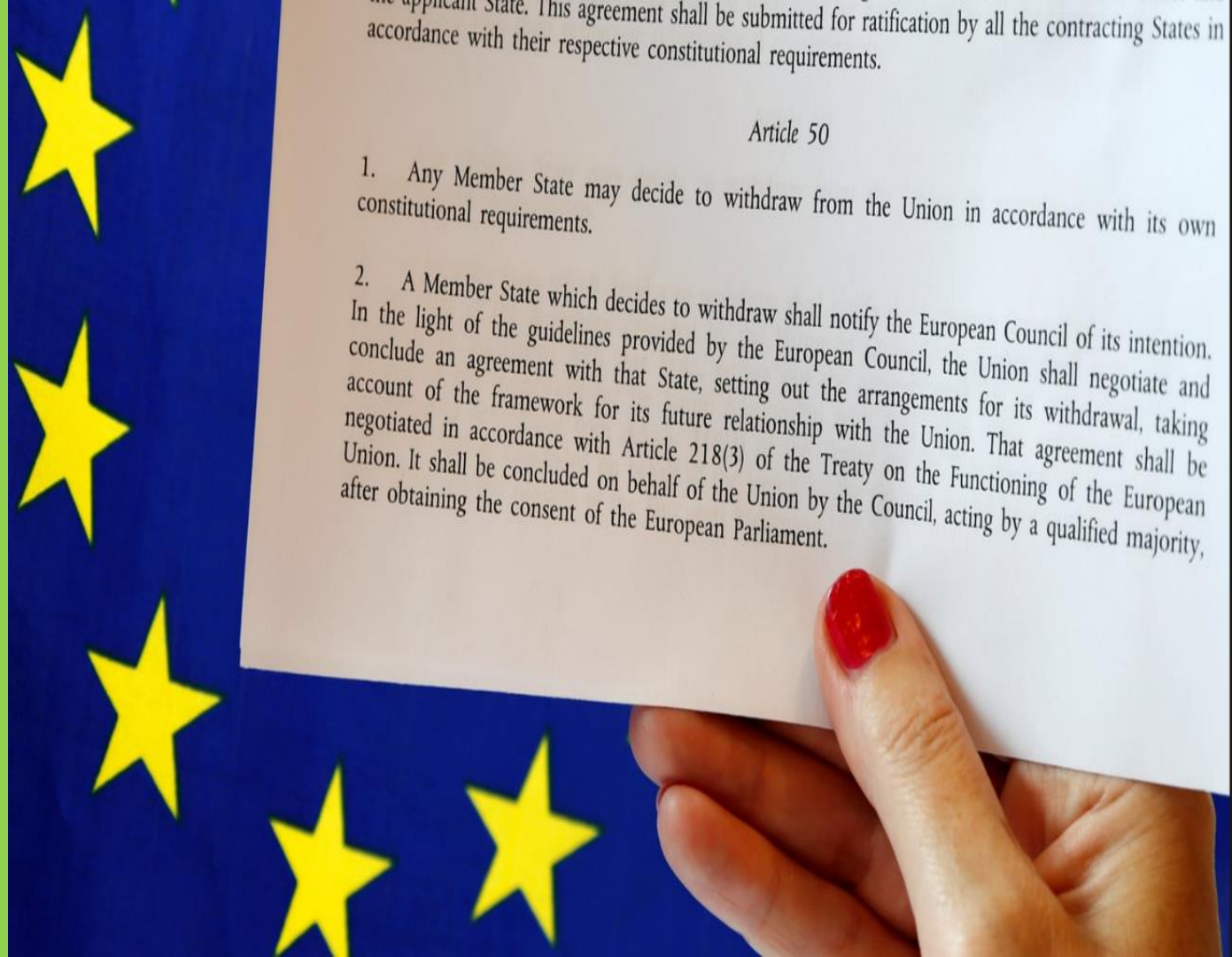
Irish Agri –Food

Employment 8 %

Number of farm families
130,000

UK/Ireland Agri Food Trade (Global Macro Numbers)
10Bn

Article 50


the applicant State. This agreement shall be submitted for ratification by all the contracting States in accordance with their respective constitutional requirements.
Article 50
1. Any Member State may decide to withdraw from the Union in accordance with its own constitutional requirements.
2. A Member State which decides to withdraw shall notify the European Council of its intention. In the light of the guidelines provided by the European Council, the Union shall negotiate and conclude an agreement with that State, setting out the arrangements for its withdrawal, taking account of the framework for its future relationship with the Union. That agreement shall be negotiated in accordance with Article 218(3) of the Treaty on the Functioning of the European Union. It shall be concluded on behalf of the Union by the Council, acting by a qualified majority, after obtaining the consent of the European Parliament.

Taking Back Control!

29 March 2017

Notification but no clear plan

United Kingdom's Red Lines

Leaving Customs Union

Leaving Single market

Trading on WTO terms?

➢ Leave EU Single Market/Customs Union

- Political declaration of October 2019…
- It's a Framework for our future relationship which envisages a *"FREE TRADE AREA"* with a level playing field and deep regulatory and customs cooperation.
- FTA to ensure no tariffs, fees, charges or quantitative restrictions across all sectors.
- Aspires to single SPS entity…

But,…. But,….But,….

➢ Fall out of EU FTAs

- Assuming Withdrawal Agreement Bill is passed, we reach *"The end of the beginning"*
- *Transition (i.e. the Status Quo) until 31st December 2020*

  (extendable on request)
- *Negotiations on Future Relationship as set out in Political Declaration*

Negotiate ambitious FTAs

- *Free Trade Agreements take time to negotiate – one took up to 20 years!*
- *The Politics of EU FTAs: Trade-off (infighting) between Member States offensive and defensive interests.*
- *EU Member States and European Parliament must agree on Commission's negotiating mandate – this also takes time!*

- *The EU has been negotiating FTAs for decades…. experience counts!*

“Don’t underestimate the difficulties of the process of ratification of a future UK-EU trade deal and other agreements the UK must negotiate in the coming years. If it is not ratified, we return to zero.”

Michel Barnier, Oct 2019

And, as Peter Sutherland is reported to have said after his first briefing session as GATT Director General...


WELSH FARMING:
NEW HORIZONS
#NFUCymru19

Technology: The future of farming

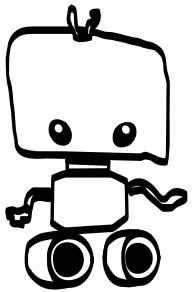
Sam Watson Jones
Co-Founder, Small Robot Company

Dr Andrea Graham
Head of Policy Services, NFU and 'The Future of Food 2040' Author

Campbell Mauchan
Head of UK Operations, AgriWebb

Chaired by: Aled Jones, Deputy President, NFU Cymru

#NFUCymru19



Small Robot Company

Every Plant Matters

THE THIRD AGRICULTURAL REVOLUTION IS DEAD

Arable farming stopped working in 1990.

That’s when yields stopped trending upwards.

That’s when costs started growing faster than revenues.

FARMS AREN’T WORKING…

BUT FARMERS ARE CHANGING

-

£180/Ha

How much an average farm will lose in 2020-2021

85%

Arable farms unprofitable without subsidy

£2.1bn

UK arable subsidies 2018 - 64% of TOTAL farm income

Creating a

$240bn

opportunity

800%

Increase - zero till farming since 1999

917%

Increase in regenerative farming 2018-2050

$5.4bn

Value of precision farming market 2019

The Aga sessions

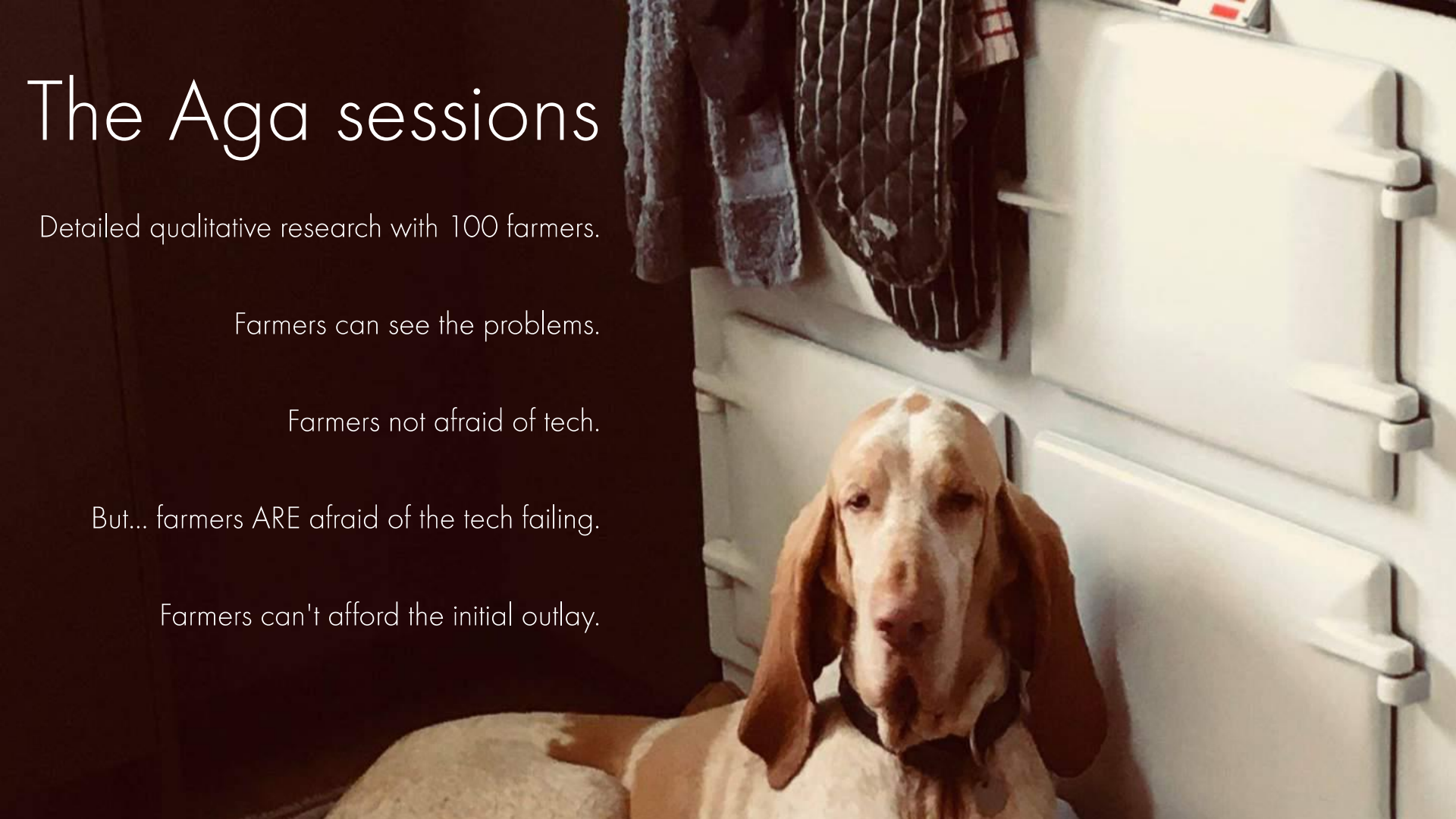
Detailed qualitative research with 100 farmers.

Farmers can see the problems.

Farmers not afraid of tech.

But... farmers ARE afraid of the tech failing.

Farmers can't afford the initial outlay.



LONG LIVE THE

4th AGRICULTURAL REVOLUTION

3RD

Heavyweight

High cultivation

Per field intelligence

Mass application

Nutrient draining

Unsustainable

4TH

Lightweight

Minimum cultivation

Per plant intelligence

Precision application

Nutrient neutral

Sustainable

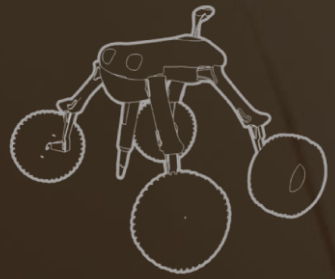
mate value generated of $800 bn if all of the technologies are fully adopted globally b

Goldman Sachs - Cheating Malthus with Digital Agriculture

MEET THE ROBOTS

TOM
Per plant mapping and monitoring

WILMA
Data analysis and decision engine



DICK
Weed, pest and disease control

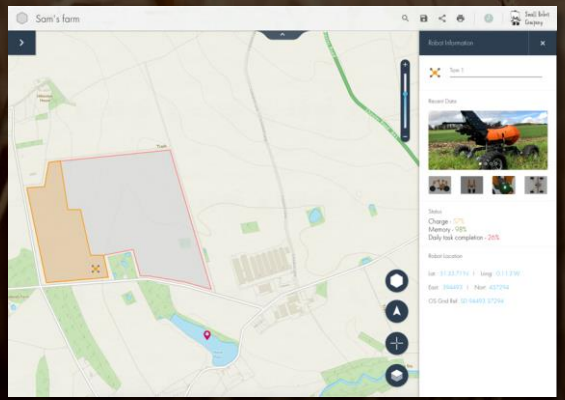
HARRY
Planting and feeding

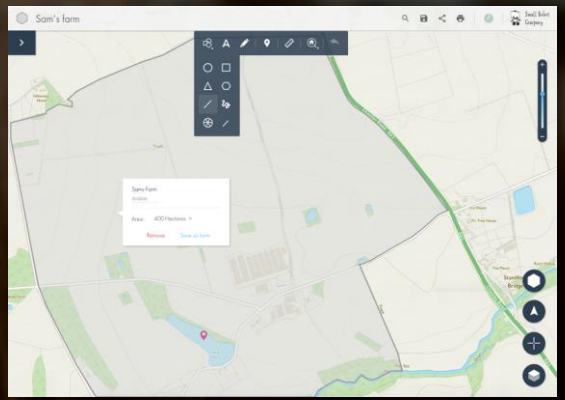
WILMA IS THE BOSS

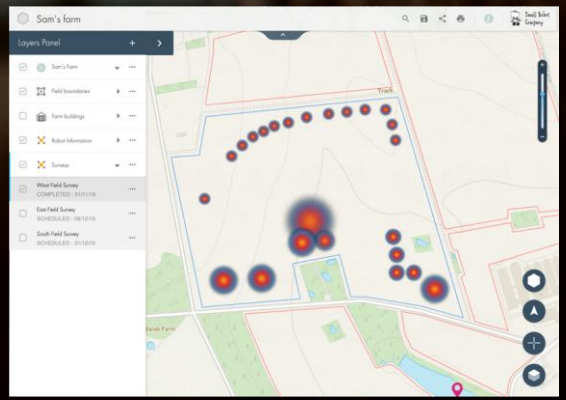
Takes Tom’s data and turns it into instructions for Dick and Harry

She is a distributed operating system that uses AI and data analytics to deliver per-plant intelligence on a farm scale.*

Wilma will be ready to go in October.





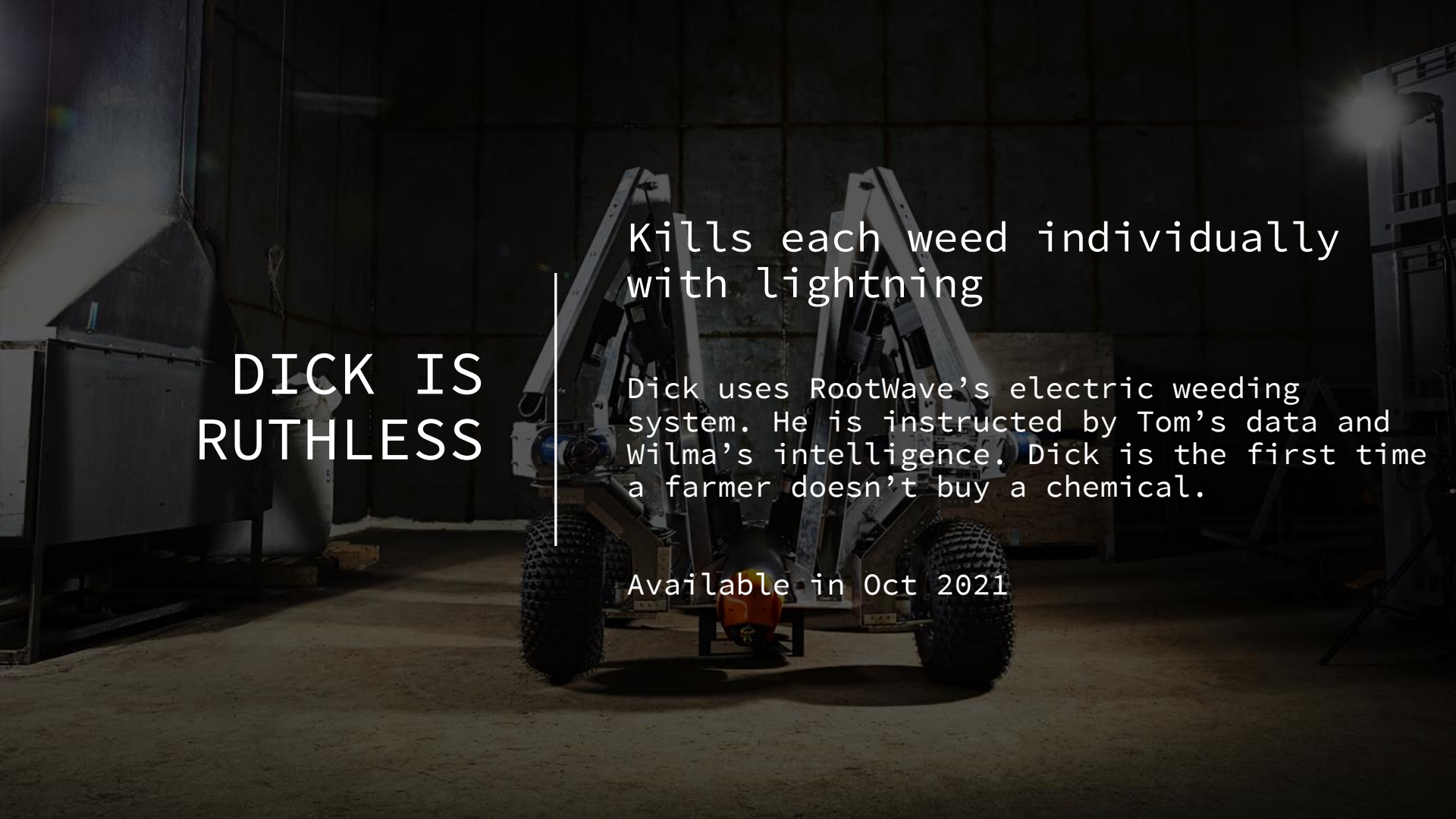


TOM IS CURIOUS

Constantly gathers per plant data

Tom is a scanning robot that lives on the farm covering 20 Ha/day. Soon he will be fully autonomous, living in his own kennel equipped with battery charging and edge processing.

Available in October.

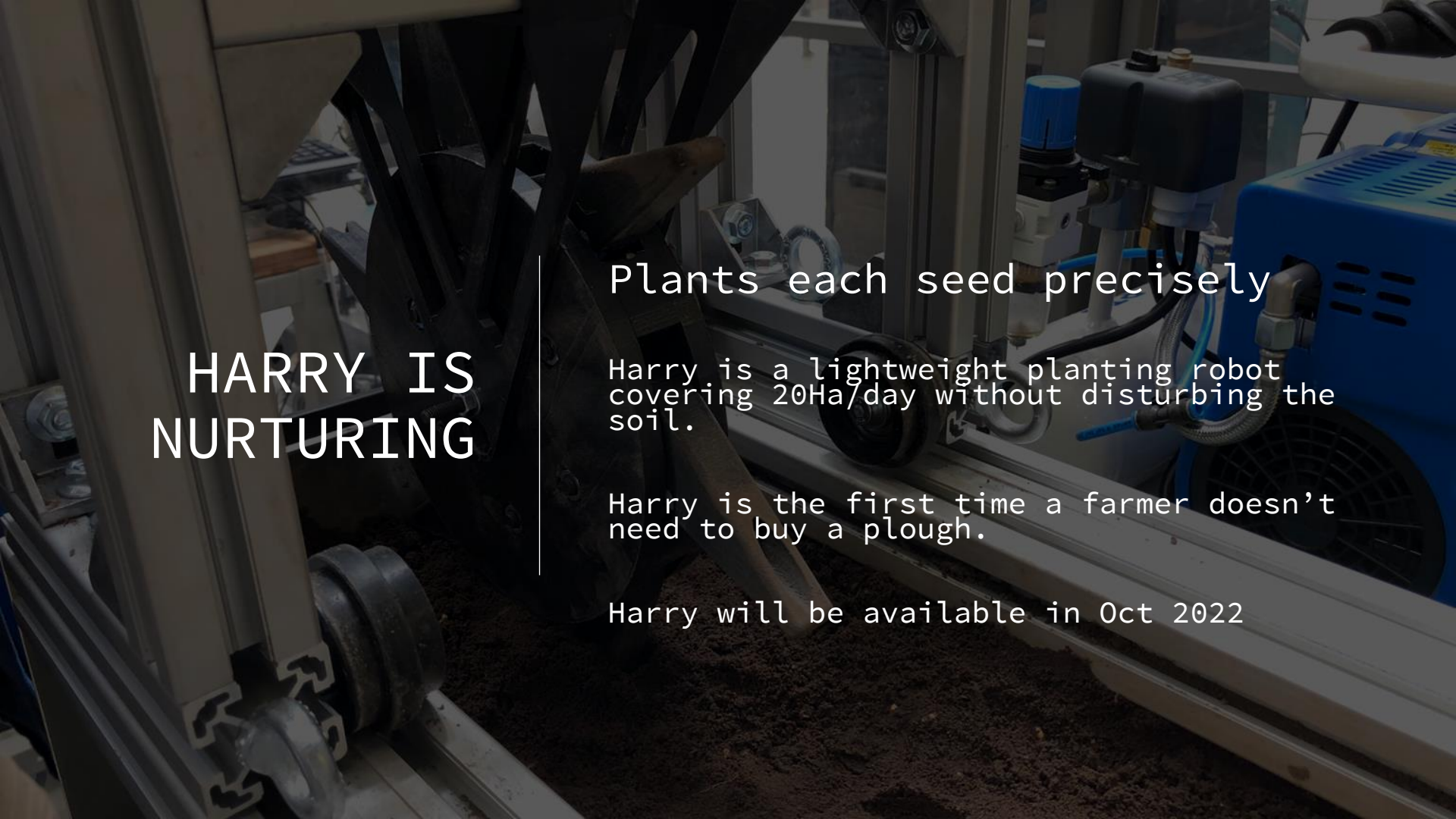


DICK IS RUTHLESS

Kills each weed individually with lightning

Dick uses RootWave’s electric weeding system. He is instructed by Tom’s data and Wilma’s intelligence. Dick is the first time a farmer doesn’t buy a chemical.

Available in Oct 2021



HARRY IS NURTURING

Plants each seed precisely

Harry is a lightweight planting robot covering 20Ha/day without disturbing the soil.

Harry is the first time a farmer doesn’t need to buy a plough.

Harry will be available in Oct 2022

DELIVERY SCHEDULE – October 2019

Stage 1 –In-lab PoC

HARRY

Stage 2 – Infield trials

DICK

WILMA AI

Stage 3 – Productionisation

TOM

WILMA WEED

WILMA INTERFACE

DELIVERING TO 300Ha GENERATING REVENUE

Stage 4 – Manufacture

THARSUS

DELIVERY SCHEDULE – Jan 2022

Stage 1 –In-lab PoC

PRECISION SPRAYING

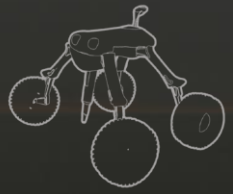
FERTILISER - IRRIGATION

Stage 2 – Infield trials

HARRY

WILMA AI

Stage 3 – Productionisation



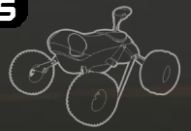
DICK

WILMA CROP HEALTH

GENERATING REVENUE

Stage 4 – Manufacture

THARSUS



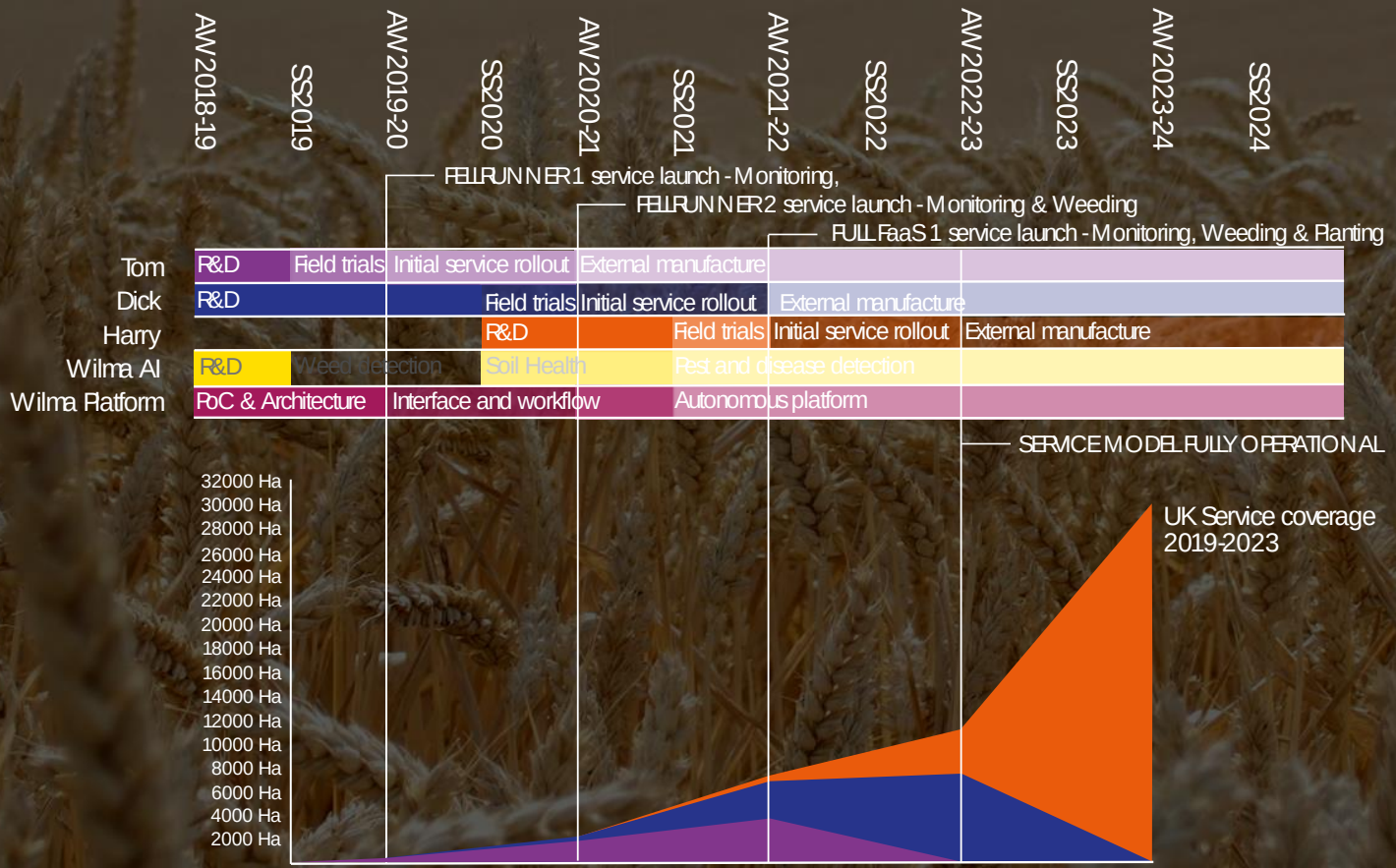
TOM

WILMA WEED

WILMA INTERFACE

OPERATIONAL PROFIT

SERVICE DELIVERY TIMELINE



OUR BUSINESS MODEL

WE KNOW WHAT'S IMPORTANT TO FARMERS

Reliability and price of service. Maintaining or improving yields. Low barrier to entry.

WE KNOW HOW FARMERS BUY

A long term relationship and building of trust. Trialable, gradual adoption.

WE KNOW WHAT FARMERS FEAR

Risk of tech obsolescence. Machinery they can't fix. High level of capital investment.

SO WE INVENTED FaaS

Per hectare, end to end service - hardware and software

No capital outlay with no risk of obsolescence

Great customer service through regional hubs and ongoing, online and on-farm presence

ECONOMICS OF AN ARABLE FARM

Meet Sam of Howle Manor Farm - 450 Ha arable

Sam currently spends

60 ha of wheat. Yield 9t/ha. Price £150/t

Revenue (incl. straw) - £87,600

Seeds / ferts / sprays - £30,600

Labour + Machinery - £31,500

Overheads - £37,000

P/ L - (-£11,500)

With Small Robots, Sam will spend

60 ha of wheat. Yield 9t/ha. Price £150/t

Revenue (incl. straw) - £87,600

Seeds / ferts / sprays - £18,540 (£12,100 saving)

Labour + Machinery - £6,551 (£25,000 saving)

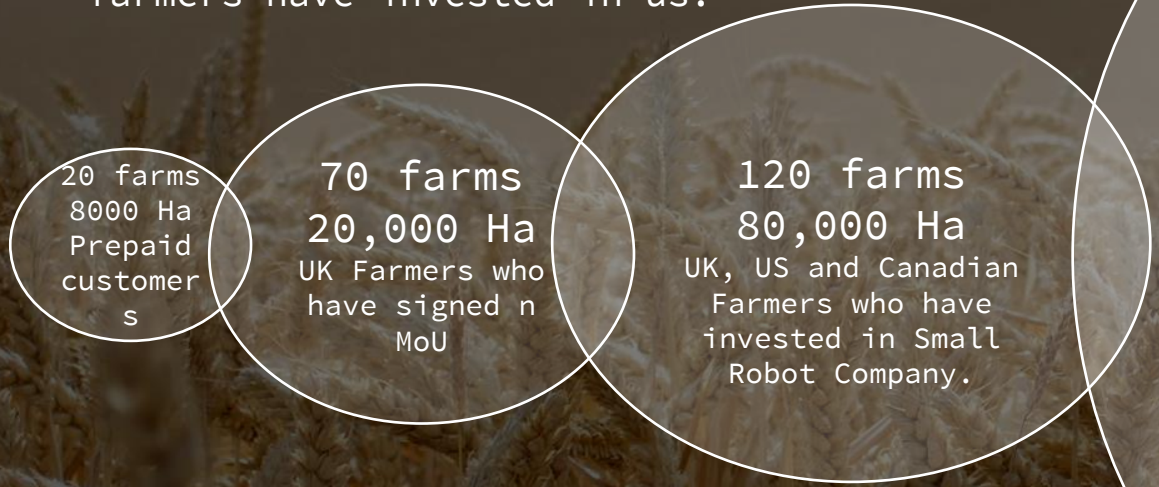
Overheads - £23,000 (£14,000 saving)

Small Robot costs - £24,000

P/ L +£15,509

OUR CUSTOMERS

We are by farmers for farmers. Over 120 farmers have invested in us.



177m arable farms
6.2bn Ha
Total global addressable audience

TARGET 200-1000 Ha arable farms that are using regenerative practices such as no-till.

MARKET

Initially UK, then US and Canadian

OUR TARGET AUDIENCE

We will operate initially in the UK, US and Canada

We aim to capture 1.5% of UK, Kansas, Nebraska Iowa and Saskatchewan arable. This means we will be...

…generating

£169.2m

per year

…operating on

766k

hectares

And we only need

2188

customers

…and we know 120 of them already.

THE COMPETITION

Source - Better Food Ventures AgTech Landscap

WHAT DO WE NEED TO GET RIGHT?
HOW ARE WE DOING AT THEM?

Selling to farmers

Identifying the customer need

Evolving a brand

Building relationships

Answering high tech problems

Forming the right questions

Creating an experience

Setting the right challenges

Building the right team

Production of reliable robotics at scale

Knowing what we can do…

…and what other people do better

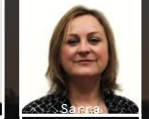
HOW DOES OUR TEAM MAKE THIS HAPPEN?

Selling to farmers

Head of Consulting

Sam Watson-Jones
Co-Founder
4th Gen farmer

CMO



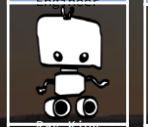
Sarca Mander
Ex-Babel AdMob - ($650m)

Head of Growth

Humpage
Startup CFO
Ex-Foregenix

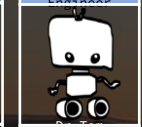
Answering high tech problems

Lead Mechanical Engineer



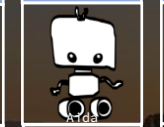
Ray King
Ex-Harper Adams
Ex JCB

Lead Robotic Engineer



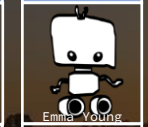
Dr Tom Burrell
ROS and Autonomy

AI Advisor



Aidan Mehonic
Turing Institute
J.P Morgan

Programme Lead

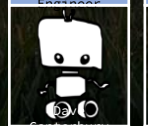


Emma Young
Ex-Qinetic
Ex-Spaceship Co.

Head of Experience

Ben Scott-Robinson
Co-Founder CD - Sapient

Lead Electronic Engineer



Dev
Canterbury
Robust systems
30 yrs experience

Lead Software Engineer

Daniele LaNave
Enterprise Dev
Geospatial

Head of Robotic

Jo Allnutt
Ex-OS Tech Labs
Ex Qinetic

COO

Catherine Pratt
Ex-SSE Hardware/IoT

Production of reliable robotics at scale

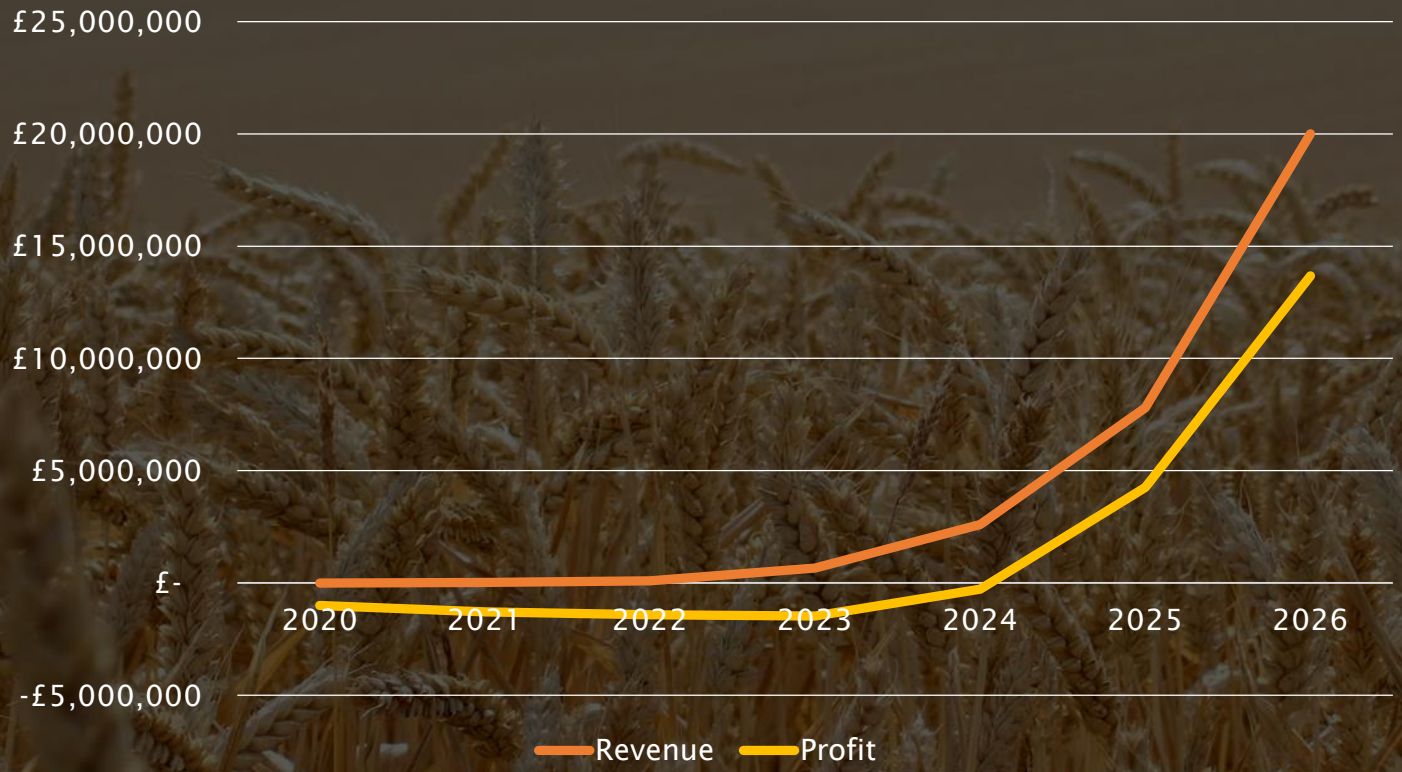
rootwave™
Zaps weeds. Zero chemicals.

P.E.S Technologies

THARSUS

mtc
Manufacturing Technology Centre

Projected Revenues and Profit



EXIT STRATEGY

To become a global Agri Industry player

Why?

We see the market as being ripe for a disruptive challenger brand.

Our ambition is to transform the global agri-industrial landscape.

The ‘big players’ are interested in gradual evolution.

We see the start of the 4th Industrial Revolution.

Who’s done it before?

The groundwork has been done. There have been a number of agritech startups who have made it big in a rapidly changing space.

Climate Corp to Monsanto - £1bn - 2013
Blue River to John Deere - $305m – 2017

Indigo valuation - $3.5bn (2018)
Bioceres listed on NYSE for $233m

WHAT WE HAVE RAISED… AND OUR ASK

We have raised

£1.2m – Crowdcube funding

£1.3m – IUK Grants

£100k – Prepayment

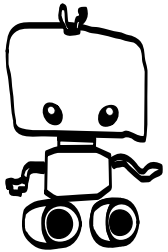
£400k – Other

We are looking for

£2m

To deliver a production ready ‘Tom’ robot and ‘Wilma’ backend, capable of crop monitoring at scale in 2020.

We will then require a Series A round of £10m-£15m



Small Robot Company

Winners - Europas Best AgriTech Startup
Winners - CogX AgriTech Innovation Award
Winners - Drum Social Purpose - Best Use of Technology Award
Winners - BT Tech4Good Connected Society Award

@smallrobotco

THE FUTURE OF FOOD 2040

Andrea Graham

Head of Policy Services

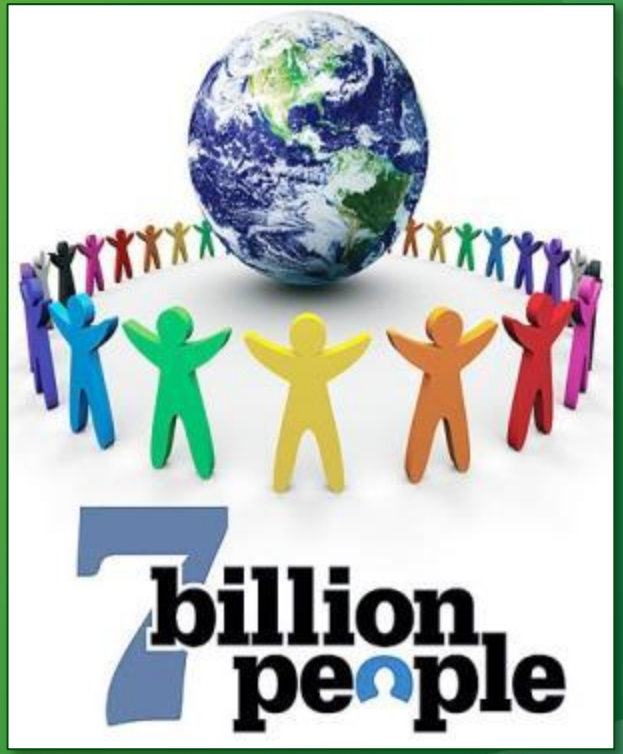
OUR FOOD
OUR FUTURE
#NFU19

NFU supported by NFU Mutual

NFU CYMRU

NFU

OUR FOOD
OUR FUTURE
#NFU19



Facts…..

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OUR FUTURE
#NFU19

OUR FOOD
OUR FUTURE
#NFU19

NFU supported by
NFU Mutual
NFU CYMRU
NFU

1. DIET:

WHAT WE'LL BE EATING

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- Ageing and more urban population
- Growth of convenience
- Health and personalisation
- Diets will change……but slowly

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OUR FUTURE
#NFU19

- Online and frictionless
- Home stocking systems
- More competition
- Food “theatre”
- Demand for transparency

OUR FOOD
OUR FUTURE
#NFU19

2. PRODUCTION:

HOW WE'LL BE PRODUCING IT

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- Robotics
- Electric vehicles
- Vertical farming
- Nanosensors
- Biotechnology

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OUR FUTURE
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Robotic pickers, virtual fencing and autonomous crop-care……..

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OUR FUTURE
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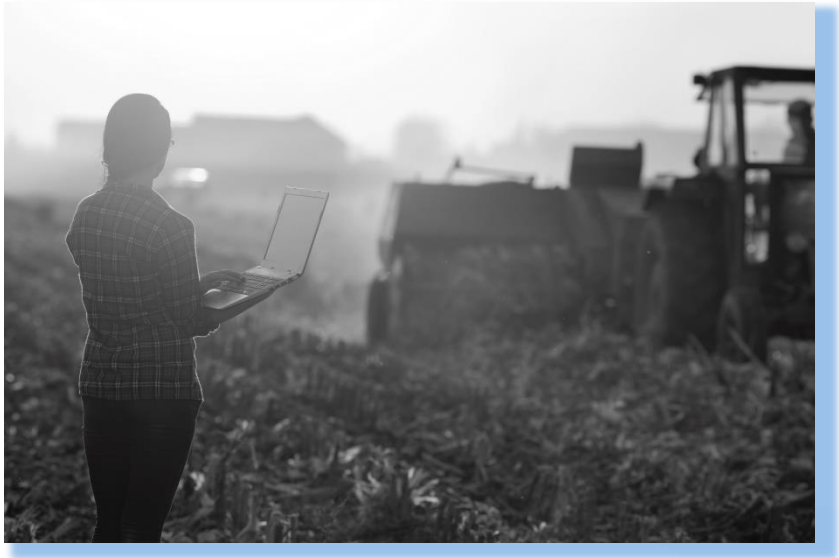
Big Data meets Big Biology…..



3. IMPACT:

WHAT IT MEANS FOR BRITISH FOOD & FARMING

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OUR FUTURE
#NFU19

- More diverse farm business structures
- Greater integration
- Emphasis on skills and training

OUR FOOD
OUR FUTURE
#NFU19

- More diverse farm business structures
- Greater integration
- Emphasis on skills and training
- Managing risk

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OUR FUTURE
#NFU19

4. OPPORTUNITIES:

EXPLORING NEW MARKETS

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“Public Money for Public Goods”

Net Zero

Business focus

Transparency

Risk management

Productivity

Environment

Volatility

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OUR FUTURE
#NFU19

THE FUTURE OF FOOD 2040

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OUR FUTURE
#NFU19

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NFU CYMRU
NFU

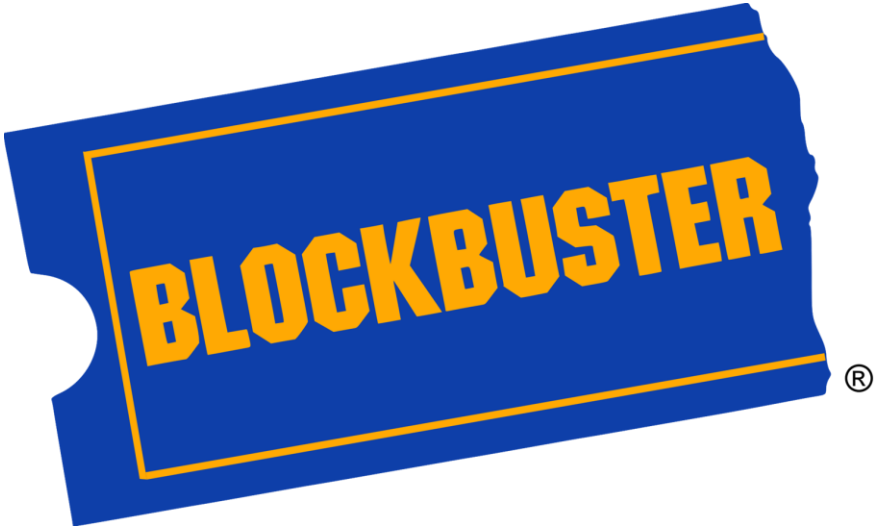
AgriWebb

Simple tech making an impact on farm.


CHANGE


NOKIA
09:40am
Thu 11-11


iPhone



NETFLIX / VIDEO STREAMING

Neither RedBox nor Netflix are even on the radar screen in terms of competition.

JIM KEYES
CEO of Blockbuster

Speaking to Motley Fool in 2008.

Changing demands

British Cattle Movement Service

“If you take care of your sheep, they will take care of you and your family”

Innovation on farm

PRG 1435/1/55


CT 110

New Tools

Rainfall Gauges

FARMBOT
MONITORING SOLUTIONS

Feed on Offer

cibolabs

Why, What & How?

> Results indicate … gains of $14 to **$118 in Gross Margin/Ha**
>
> Meat and Livestock Australia

Changing demands

British Cattle Movement Service

Herd Book

Medicine Usage

Flock Book

Pasture & Slurry

BCMS & EID Cymru

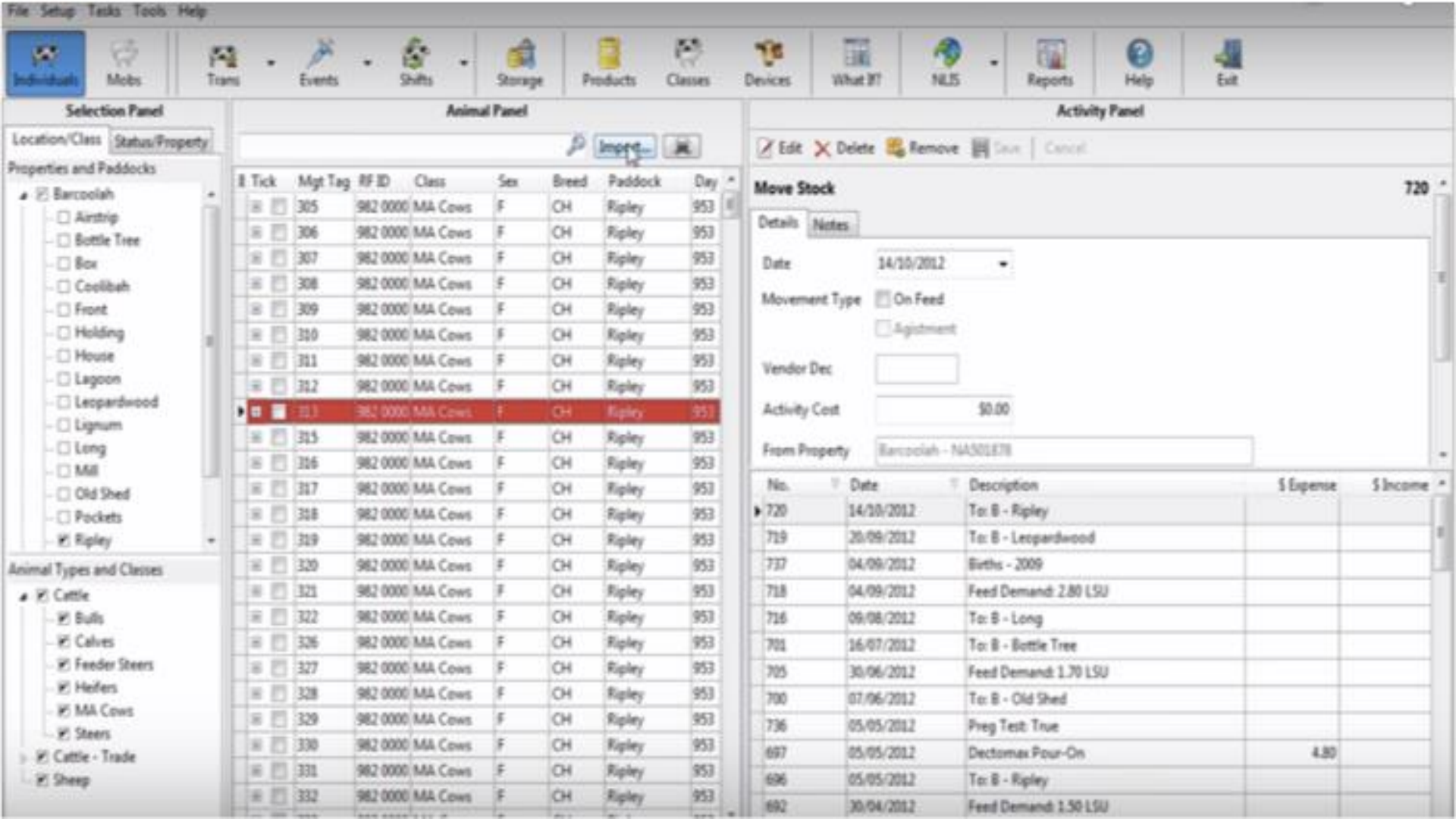
Cross-Compliance

Unique farms, common challenges.

Start With the Challenge

- Cross-Compliance?
- Data-driven decisions?
- Planning for the future?
- Farm efficiency?


I’ve been supplied with?


File Setup Tasks Tools Help
Individuals
Mobs
Trans
Events
Shifts
Storage
Products
Classes
Devices
What If?
NLIS
Reports
Help
Exit
Selection Panel
Location/Class
Status/Property
Properties and Paddocks
Barcoolah
Airstrip
Bottle Tree
Box
Coolibah
Front
Holding
House
Lagoon
Leopardwood
Lignum
Long
Mill
Old Shed
Pockets
Ripley
Animal Types and Classes
Cattle
Bulls
Calves
Feeder Steers
Heifers
MA Cows
Steers
Cattle - Trade
Sheep
Animal Panel
Import...
Tick
Mgt Tag
RF ID
Class
Sex
Breed
Paddock
Day
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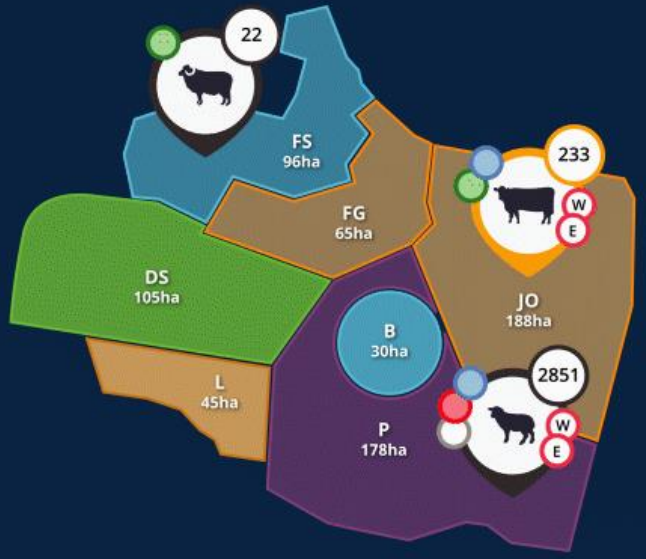
Activity Panel
Edit
Delete
Remove
Save
Cancel
Move Stock
720
Details
Notes
Date
14/10/2012
Movement Type
On Feed
Agistment
Vendor Dec
Activity Cost
$0.00
From Property
Barcoolah - NAS01878
No.
Date
Description
$ Expense
$ Income
720 14/10/2012 To: B - Ripley
719 20/09/2012 To: B - Leopardwood
717 04/09/2012 Births - 2009
718 04/09/2012 Feed Demand: 2.80 LSU
716 09/08/2012 To: B - Long
701 16/07/2012 To: B - Bottle Tree
705 30/06/2012 Feed Demand: 1.70 LSU
700 07/06/2012 To: B - Old Shed
736 05/05/2012 Preg Test: True
697 05/05/2012 Dectomax Pour-On 4.80
696 05/05/2012 To: B - Ripley
692 30/04/2012 Feed Demand: 1.50 LSU

“We’ve always done it that way.”

Simple solutions to solve complex farm problems

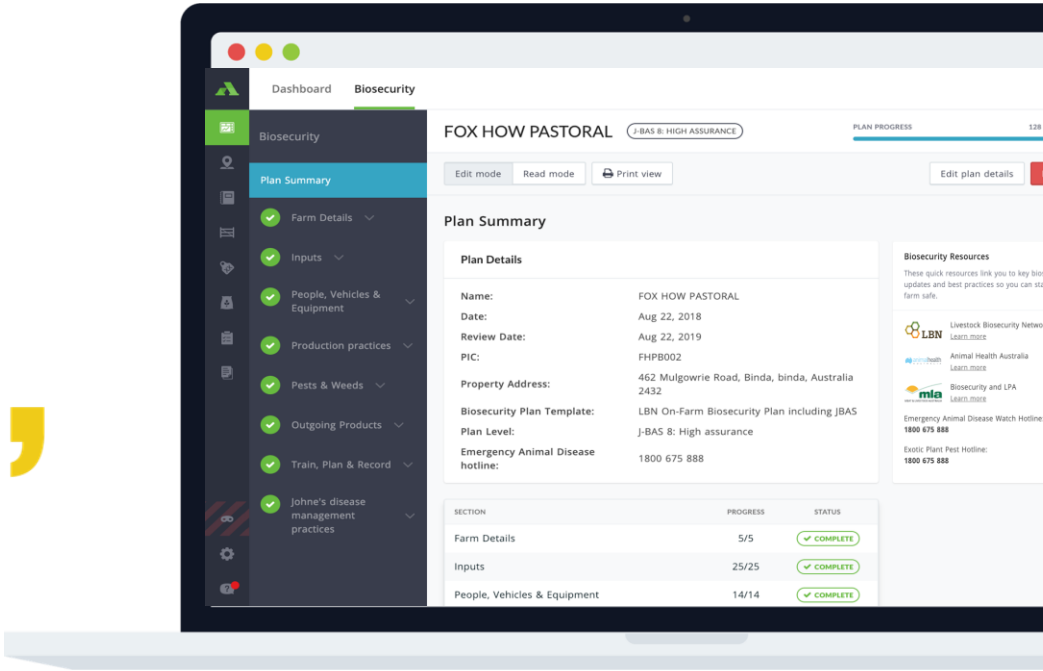


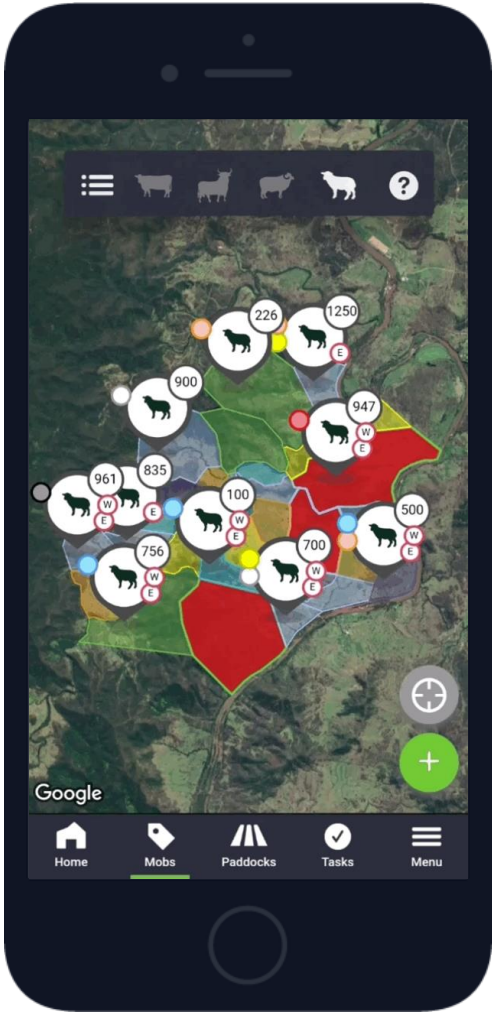
“It’s just the reward and insight for minimal input effort”

Michael Cobiac
South Australia

I moved my shearing date and saw my scanning %’s increase by 15%!

Edward Legge
Tasmania

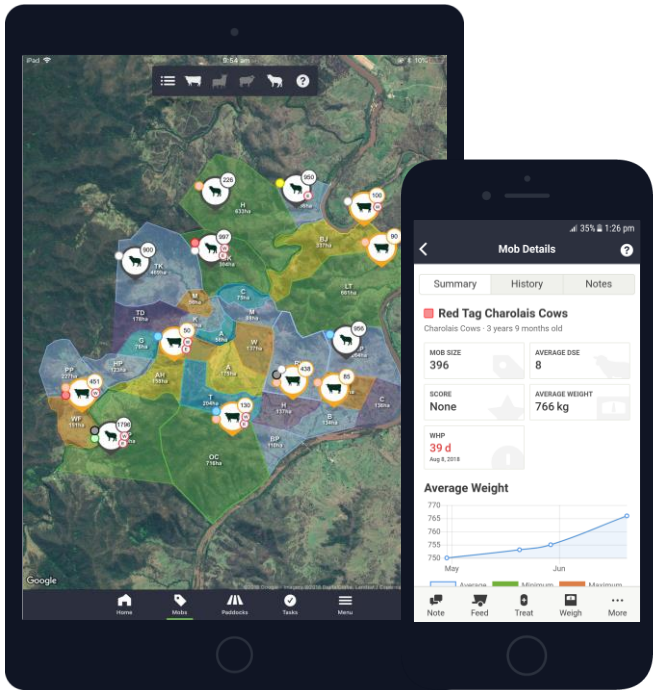




"I think if you asked my wife she would say I used to be stressed for a week before an audit."

Sulwyn Jenkins
West Wales

Quick Recap



Farming Innovation

Farmers always have been and always will be innovative. The next version of that is to leverage tech.

Find what works for you

You may not need the latest and greatest piece of technology. Find what can help your farm.

You're not alone

Everyone's farm is unique and yet the challenges you're facing day-to-day are similar. Ask what's working for someone else.


AgriWebb
www.agriwebb.co.uk
@CMauchan
@AgriWebb


WELSH FARMING:
NEW HORIZONS
#NFUCymru19