

Animal Feeds: What we feed livestock matters

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2020
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Feed Compass

A collaboration focused on:

Accelerating momentum across the animal feed system to act on sustainability.



forumforthefuture.org/feed-compass



CALYSTA.



volac



Waitrose





Fresh clearance eating into forest, Bolivia
Image credit: Mighty Earth



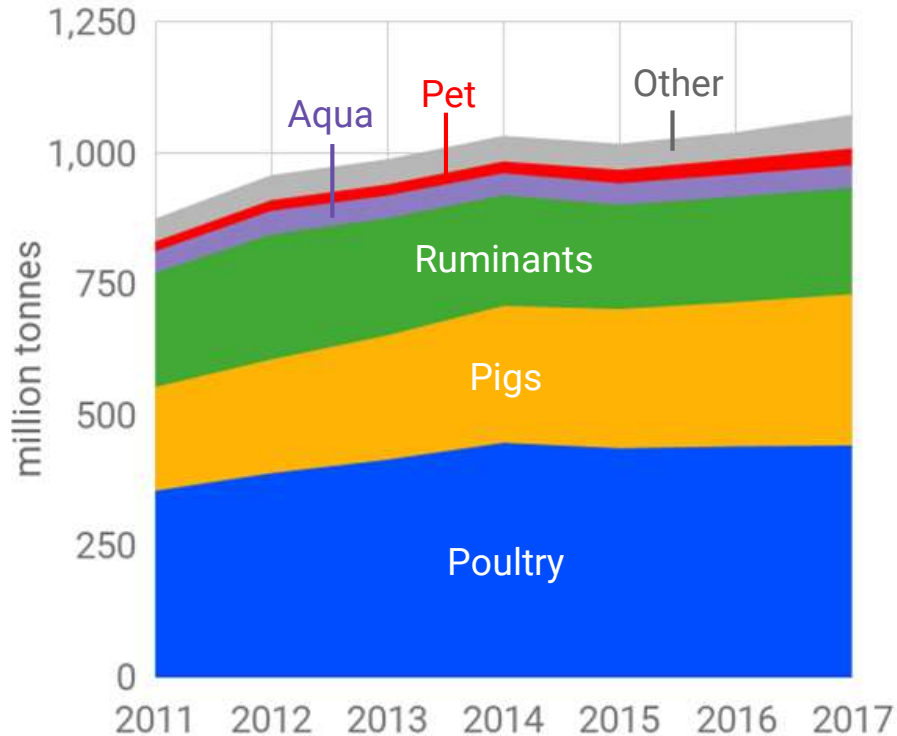






Global feed production use (non-forage)

Data from Alltech Global Feed Surveys (2011-2018)



Common non-forage feed ingredients:

- **Cereals:** corn, wheat, barley, oats, sorghum etc
- **Protein meals:** soybean, rapeseed meal, lupins). Often co-products
- *Plus fats and oils, minerals, feed additives etc.*

What does mainstream industry focus on?

- 1. Food/feed safety:**
Reputation / animal health
- 2. Efficiency:**
Getting the most out of every ounce.
Precision feed, amino acid supplements.
- 3. Price:**
Least cost formulation



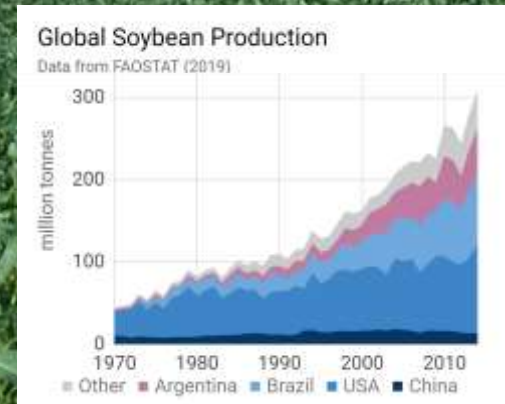
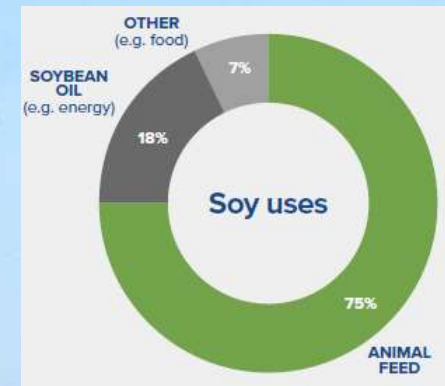


only
£2.43

Soy: a troublesome, cheap and useful protein source

Major focus area for UK retailers, but traction is limited.

- A highly efficient source of protein
- 75% of global production goes to animal feed
- Europe imports ~95% of its soy (mostly S. America).
- In UK ~26% known as from regions free from deforestation
(See *3Keel supermarket supply chain research*)
- Transparency and certification is low.
Globally only ~1-2% is certified.



Novel animal feeds

- Insects
- Algae and seaweed
- Single cell proteins
- Amino acid supplements (less novel)
- Biochar

US: Black soldier fly larvae for poultry gets green light



Norwegian salmon producer trials Skretting's insect based salmon feed



Cows fed charcoal in Grantham to cut emissions

© 0 October 2019



SPECIAL SECTION: FEED SUSTAINABILITY
US methane reduction project sees \$3m investment in domestic seaweed research

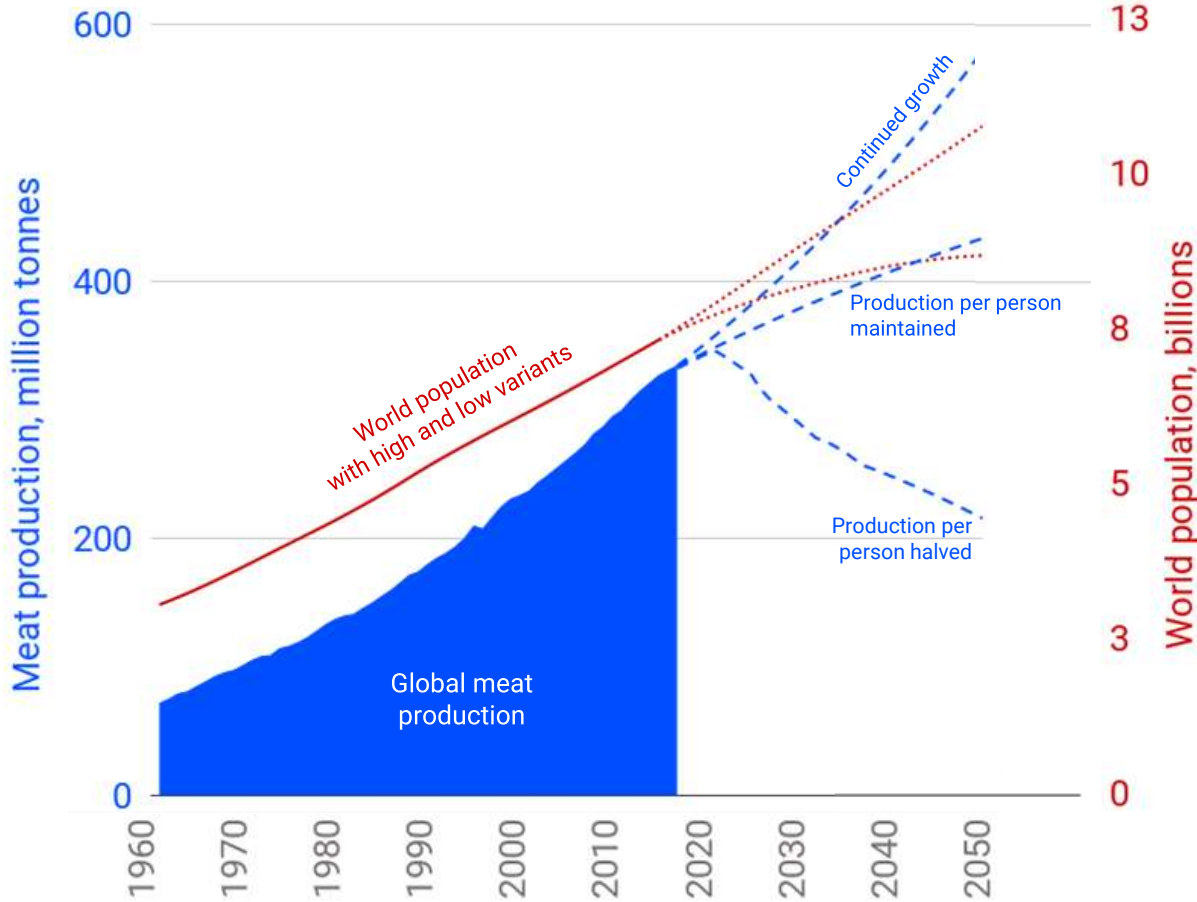
By Aerin Einstein-Curtis [@](#)

12 Nov 2019 - Last updated on 13 Nov 2019 at 10:27 GMT



World Meat Production

Examples of Future Scenarios. Historical data from FAOSTAT (2019)



Meeting future animal feed demands...

~280 million hectares of additional land by 2030

(this is impossible)



Thank you

Samuel Smith

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FORUM
FOR THE
FUTURE

A close-up photograph of a black pig with a silver ear tag, eating several pieces of green lettuce leaves. The pig is standing on dark, mulched ground. The text is overlaid on the image.

Safe leftovers for pigs and other omnivores

**>FEED
BACK**

© Karolina Webb

Karen Luyckx



**>FEED
BACK**



Avoiding food – feed competition

- Co-products



- Food waste



- Marginal grassland



**FEED
BACK**

From: Van Zanten et al. 2018. 'Defining a Land Boundary for Sustainable Livestock Consumption'. *Global Change Biology* 24 (9)





FEED
BACK

chriskingphotography.com



African Swine Fever



**>FEED
BACK**

Making leftovers safe for feed



**FEED
BACK**

Please let me know your views,
comments and questions.

Many thanks

karen@feedbackglobal.org

War-time Advertisement:

“Swill is more appetising when steam-cooked in an Alfa-cooker and the nourishment value is increased. The pigs like it, thrive on it, and it takes less time to prepare. The waste food is sterilized, all bacteria killed, by steam cooking - a big safeguard against Swine Fever, Foot and Mouth diseases, etc.”

**FEED
BACK**

**KEEP
THE PIGS
A-GROWING!**

SWILL is more appetising when steam-cooked in an Alfa-cooker and the nourishment value is increased. The pigs like it, thrive on it, and it takes less time to prepare. The waste food is sterilized, all bacteria killed, by steam cooking—a big safeguard against Swine Fever, Foot-and-Mouth diseases, etc.

The Alfa-cooker has many uses—boiling clothes, heating water for the dairy. Portable, burns wood, coal or coke. Container tips to empty. “I wish I had seen it years ago,” writes a delighted user.

ALFA COOKER
WILL BOIL OR STEAM



SMILING TREE FARM

Christine Page

Smiling Tree Farm

Why what we feed animals matters

Why Animal Feed Matters



- It affects the **health & wellbeing of the animal**
- It affects the **flavour & nutritional value of their meat or milk**
- How animal feed is produced/grown can either create or destroy **wildlife habitat**
- It can regenerate **soil health** or erode soil
- It can sequester **carbon** or emit it



SMILING TREE FARM

“the health of the soil, plant, animal
and man is one, and indivisible”

~ Sir Albert Howard

Smiling Tree Farm, South Shropshire



- Small-scale 70 acre pastoral farm
 - Steep land (650-1020ft) unsuited to growing arable crops
- Traditional Hereford beef suckler herd
- Cow-calf micro-dairy of Jersey cows
- No routine wormers, medications or vaccinations
 - #AntibioticFree #Homeopathy
- **Feed: diverse pastures & browsing trees**
- Certified organic
- Farm run using holistic management, organic & permaculture principles
- We practice **Regenerative Farming**



Cows are ruminants



- Fossil records show grasses and ruminants co-evolved 50m years ago
- A rumen is a bio-digester: filled with microbes that ferment cellulose
- Cellulose is the most abundant organic compound on the planet
- Cows turn human inedible plants to highly nutritious human edible food
- Starches (grains) negatively impact rumen health



Cows are UPCYCLERS
Through the magic of fermentation they take
human inedible plants and upcycle them to
highly nutrient-dense foods

Nutrients in Milk

Fat-soluble nutrients particularly impacted by diet of cow



There is huge variation in actual micro-nutrient content which depends primarily on the diet of the cow, but also her breed, age, health, stage of lactation & contentedness.

CREAM

FAT SOLUBLE MICRO-NUTRIENTS:

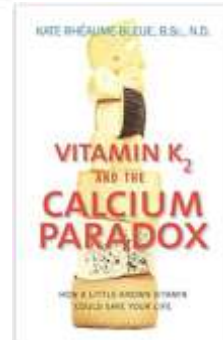
- Omega 3 - the essential DHA form
- CLA - conjugated linoleic acids
- Vitamin A & beta carotene
- Vitamin D
- Vitamin E
- Vitamin K2 - vital nutrient deficient in most

The fat-soluble nutrients are needed for the effective absorption of the water-soluble nutrients - always drink WHOLE milk.

SKIMMED MILK

WATER SOLUBLE MICRO-NUTRIENTS:

- Calcium
- Magnesium
- Phosphorus
- Potassium
- Selenium
- Zinc
- Folate
- Vitamin C
- Vitamin B1, B2, B3, B5, B6, B12



Microbes & nutrition



- A cow is a walking bio-digester!
- When a cow grazes, she is not feeding herself, but the microbes in her rumen
- 1ml of rumen fluid contains around:
 - 25 billion bacteria
 - 10 million protozoa
 - 10 thousand fungi
- Each cow has a quadrillion 1,000,000,000,000,000 rumen microbes!!!
- By-products of microbial action on forage is what nourishes the cow & in symbiosis microbes in cow saliva stimulate plant growth
- BUT what the cow eats directly impacts the balance of microbes & the resultant by-products => nutritional value of her milk or meat
- Changes to rumen pH causes microbial populations to change, below pH 5.4 microbes die, lactic acid builds up => rumen acidosis
- Concentrates like cereals, soya, brewers grains, fodder beet, maize, etc all lower rumen pH => poor cow health, produce impacts human health

Organic more nutritious



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Study finds clear differences between organic and non-organic products

Published on: 16 February 2016

A new study has shown that both organic milk and meat contain around 50% more beneficial omega-3 fatty acids than conventionally produced products.

Largest study of its kind

Analysing data from around the world, the team led by Newcastle University, reviewed [196 papers on milk](#) and [67 papers on meat](#) and found clear differences between organic and conventional milk and meat, especially in terms of fatty acid composition, and the concentrations of certain essential minerals and antioxidants.

Publishing their findings today in the British Journal of Nutrition, the team say the data show a switch to organic meat and milk would go some way towards increasing our intake of nutritionally important fatty acids.



Gillian Butler, Senior Lecturer in animal nutrition at Newcastle University

Grass-fed beef vs Grass-fed 'grain-finished' beef

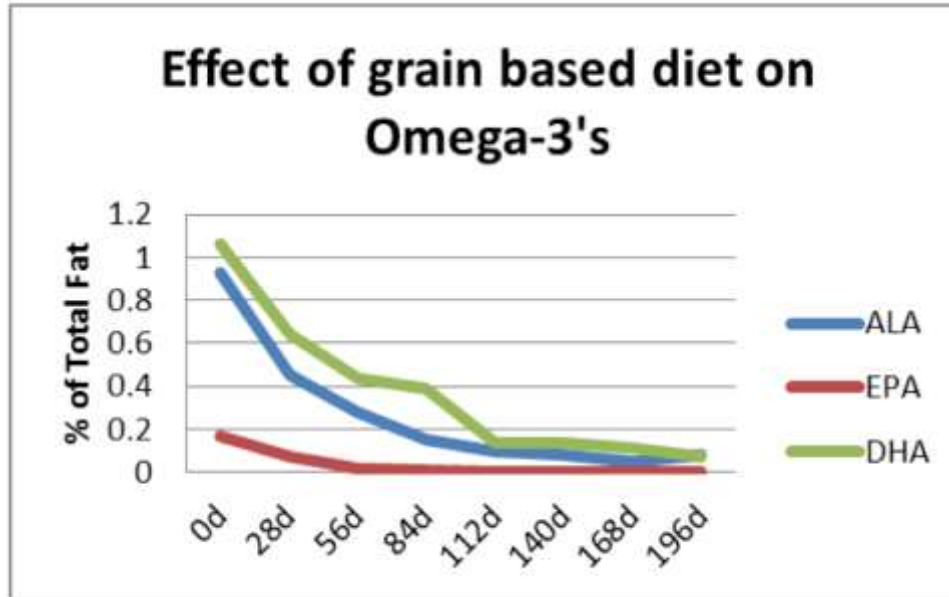


Figure 1: The effect of a grain-based diet on the omega-3 content of beef. (Duckett, S. K., Wagner, D. G., Yates, L. D., Dolezal, H. G., & May, S. G. (1993). Effects of Time on Feed on Beef Nutrient Composition. *Journal of Animal Science*, 71, 2079-2088.)

Pasture diversity

Is vital to the health of soil & cow microbiome
Provides invertebrate & small mammal habitat





NOT just 'grass'-fed: diverse pastures contain many different species of grasses, herbs, forbs, etc. 'Grass-fed' could mean a monoculture of rye grass soaked in chemicals.

Flavour starts in the Soil



- Flavour & nutrition inextricably linked
 - Innate desire to hunt & gather diverse range of foods containing health-giving nutrients
 - Complex nutritional richness creates complex flavour
 - Phytonutrients create a myriad of flavours & aromas
 - Palates corrupted by refined & processed foods
- Plants exchange 'exudates' (liquid carbon/sugar) for nutrients
 - More diverse soil life, deeper roots, more 'solar panels' = more connections & more nutrients available
 - Plants produce phytonutrients (antioxidants & myriad other micro-nutrients) to grow, reproduce, attract pollinators & protect itself from disease or pest attack
 - These phytonutrients health-giving to grazing animals & humans => organic produce more nutritious
 - Plant alkaloids are the medicinal components of food

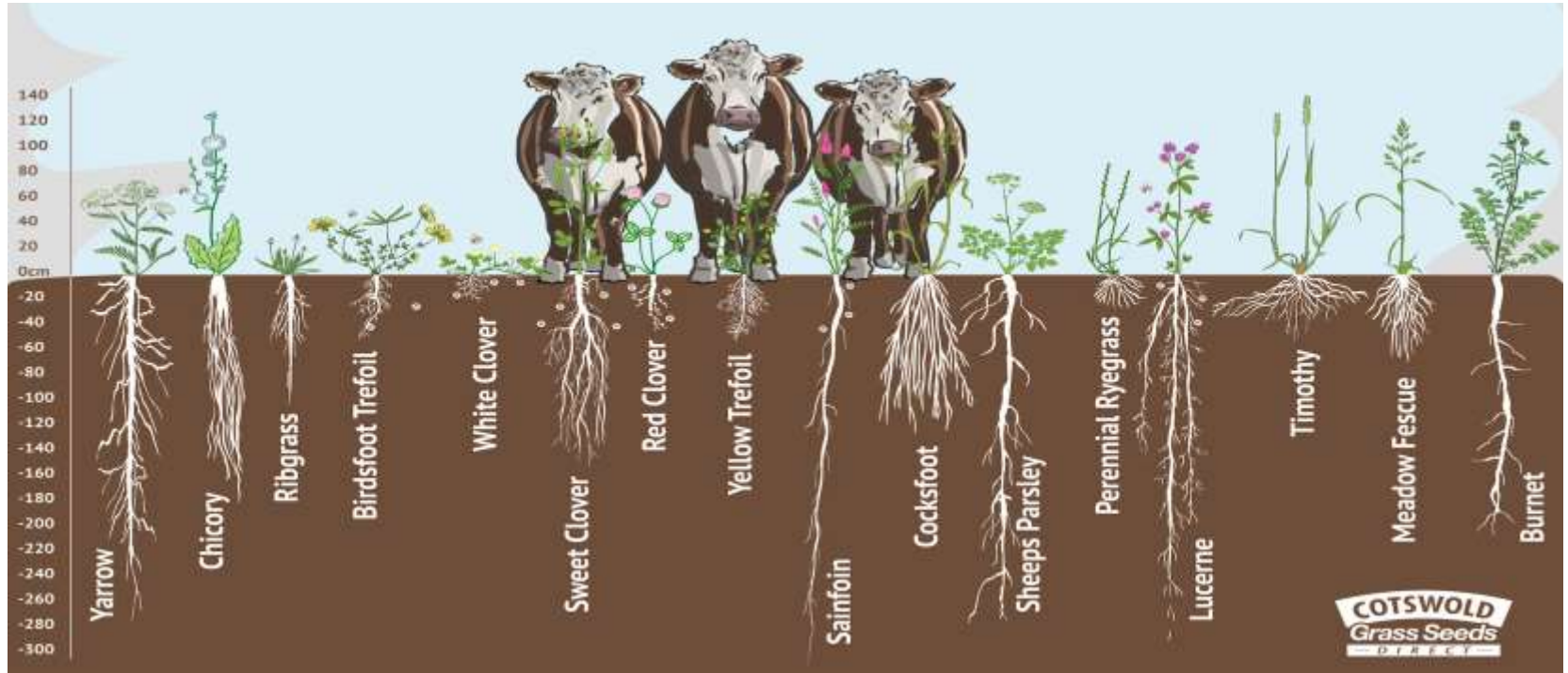
Herbs oversown into pasture

Salad bar beef: some herbs natural anthelmintics

Cattle kept healthy naturally: no need for wormers, vaccinations, etc



Importance of species diversity & root depth



Diverse hedgerows

shelter, shade, browse for cows

more invertebrate & small mammal habitat



Trees as important as pasture

self-medication for cows
more wildlife habitat



Trees as important as pasture

silvopasture



Trees as important as pasture

shelterbelts of over 20 species

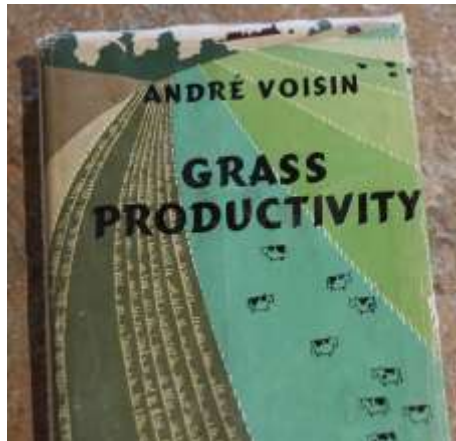


Mob-grazing – nothing new mimicking natural grazing systems



Old saying: *“Never leave the sheep in the same field long enough to hear the church bell ring twice”*

Andre Voisin’s book *Grass Productivity*, written in 1959



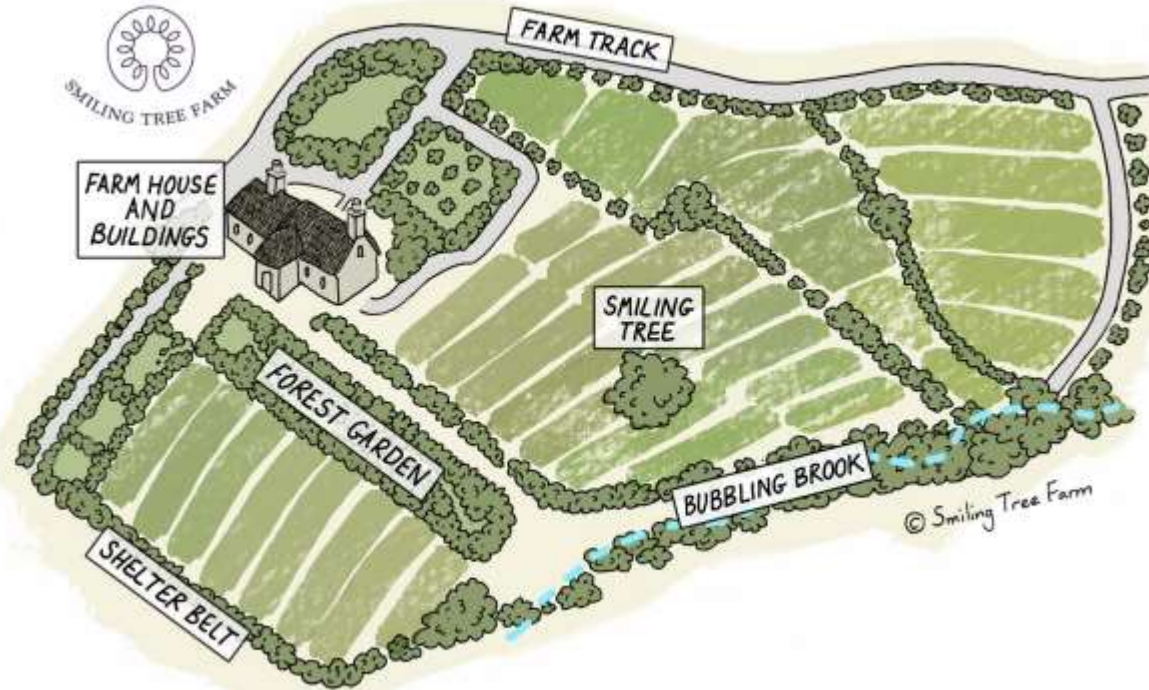
In essays on agriculture from 1777:

In *Essays Relating to Agriculture and Rural Affairs* (1777),¹ James Anderson of Scotland urged farmers to subdivide pastures into smaller paddocks, graze each one for a day, and then keep the animals out so the plants could regrow. Sounds like good grazing management! All this was long before the invention of electric fence, so Anderson had to use stone walls and a lot of labor to create paddocks. Anderson wrote:

To obtain this constant supply of fresh grass, let us suppose that a farmer who has any extent of pasture ground, should have it divided into 15 or 20 divisions, nearly of equal value: and that, instead of allowing his beasts to roam indiscriminately through the whole at once, he collects the whole number of beasts that he intends to feed into one flock, and turns them all at once into one of these division; which, being quite fresh, and of sufficient length of bite, would please their palate so much

Mob-grazing paddocks

Pasture, a carbon pump, the ultimate perennial crop



Converting to Silvopasture

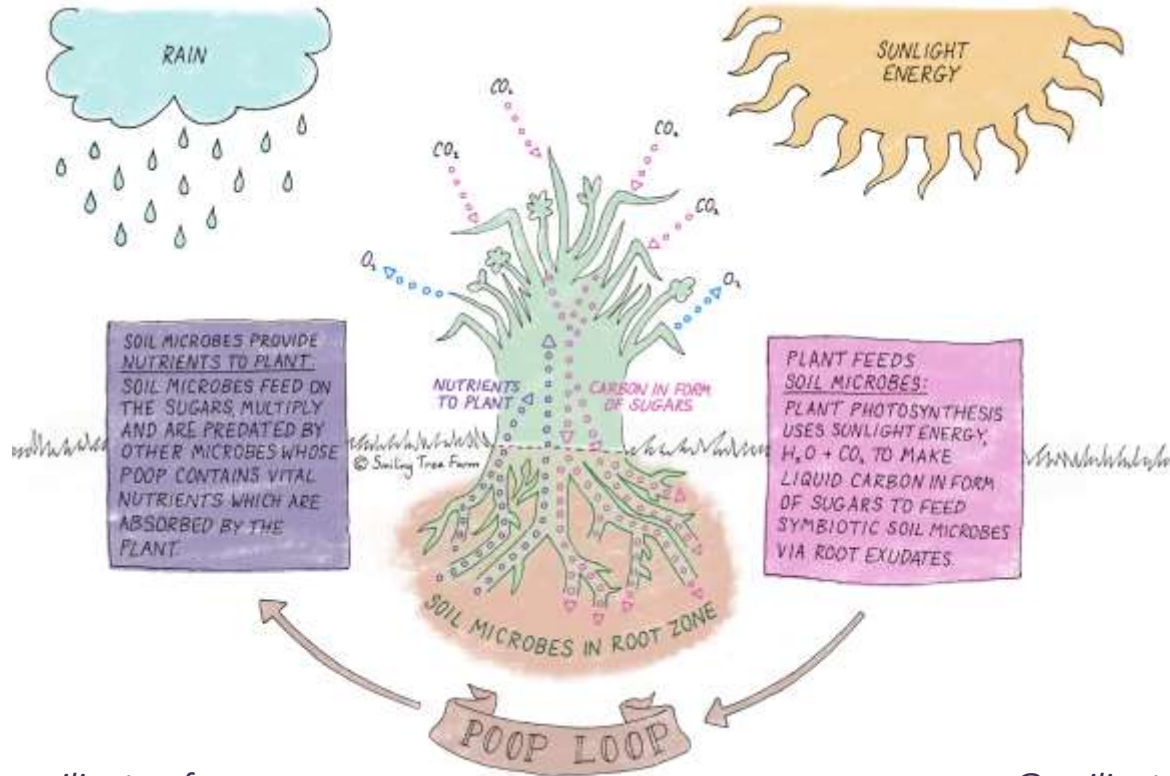




What does this equation represent?



The Poop Loop!

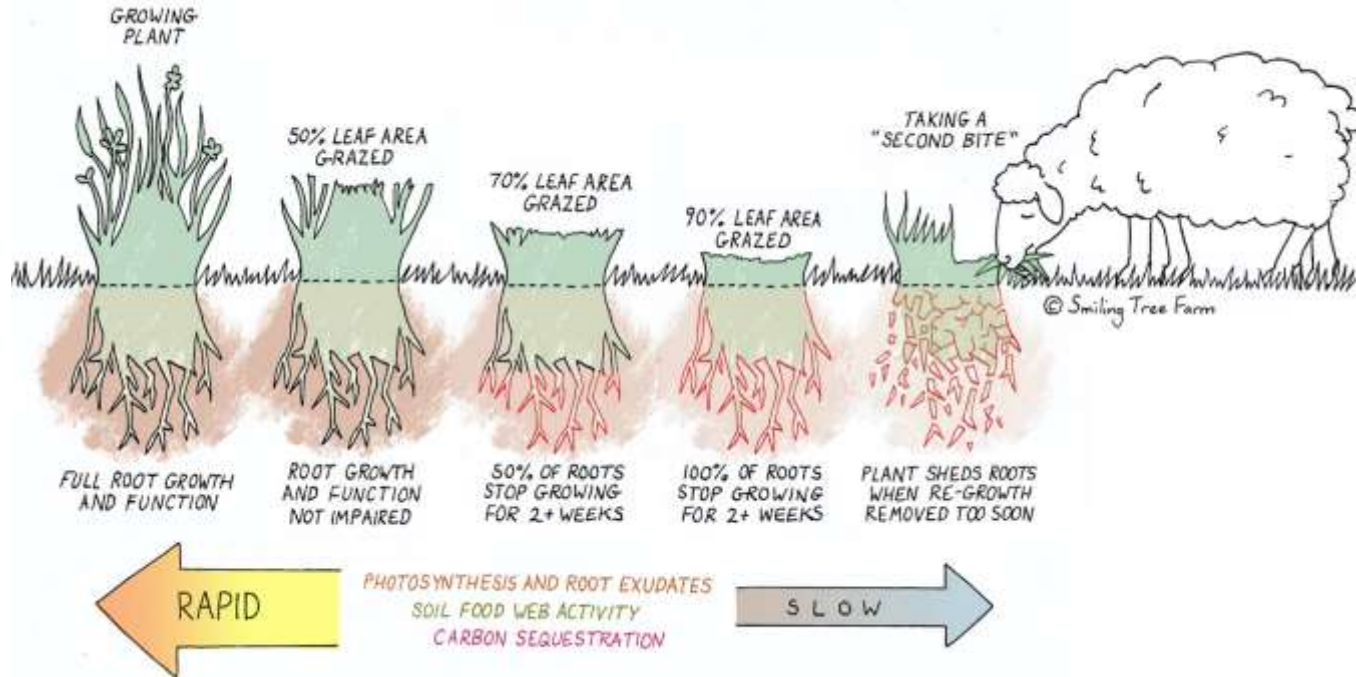




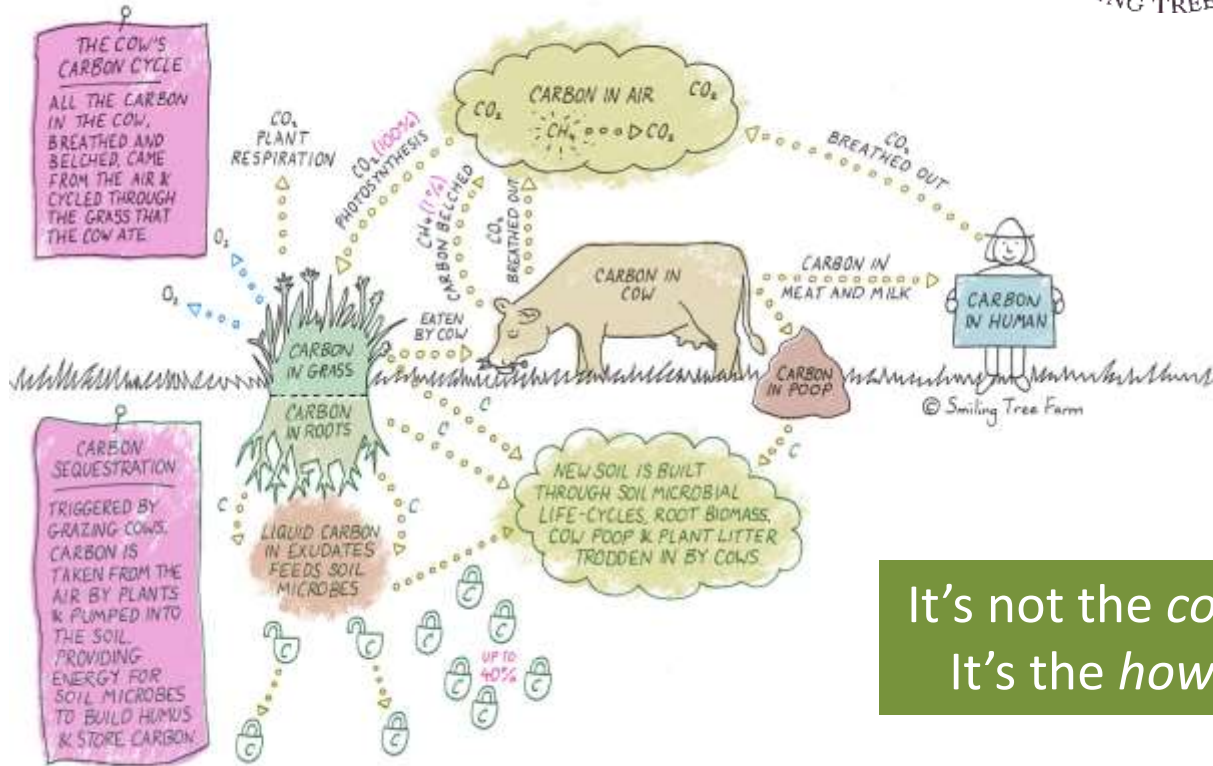
Regenerative Agriculture
starts with a focus on supporting the
“Poop Loop”
to **maximise photosynthesis &**
root exudates
and
provide plants with **micro-nutrients**

Grazing impact on plant roots

Carbon sequestration, soil health, water retention...



Carbon moooves...



It's not the cow
It's the *how*

Regenerative Agriculture

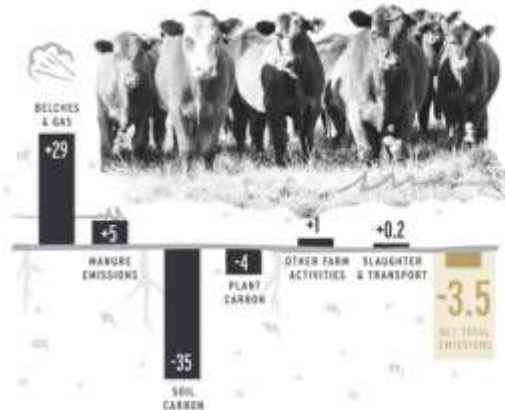
Sequesters more carbon than it emits



WHITE OAK PASTURES BEEF SEQUESTERS MORE CARBON THAN IT EMITS

Emissions breakdown for every pound of
White Oak Pasture's beef produced:

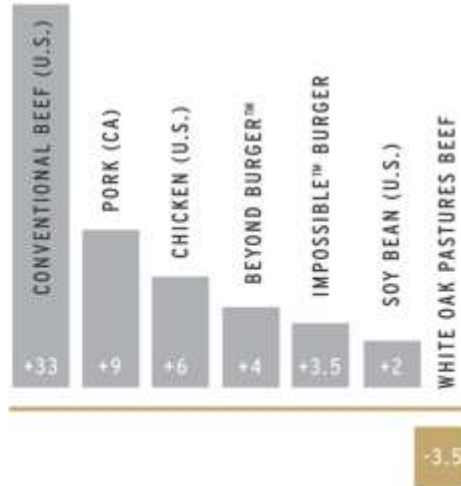
(POUNDS OF CO₂ EQUIVALENT)



NET TOTAL EMISSIONS

WHITE OAK PASTURES VS OTHER PROTEINS

(PER POUND OF PRODUCT)



Carbon in soil



For every gramme of carbon stored in the soil, the soil can hold an extra 8 grammes of water

1g carbon = 8g water held in soil

Tillage, bare fallows, synthetic fertilisers, 'cides (killers: herbicides, fungicide, etc) all release that carbon turning CO₂ sinks into sources

Carbon is fertility



The annual costs of soil degradation in England & Wales are between £0.9 and £1.4 billion, with a central estimate of £1.2 bn. These costs are mainly linked to loss of organic content of soils (47% of total cost), compaction (39%) and erosion (12%).

The total costs of soils degradation in England & Wales, Cranfield University (2015)

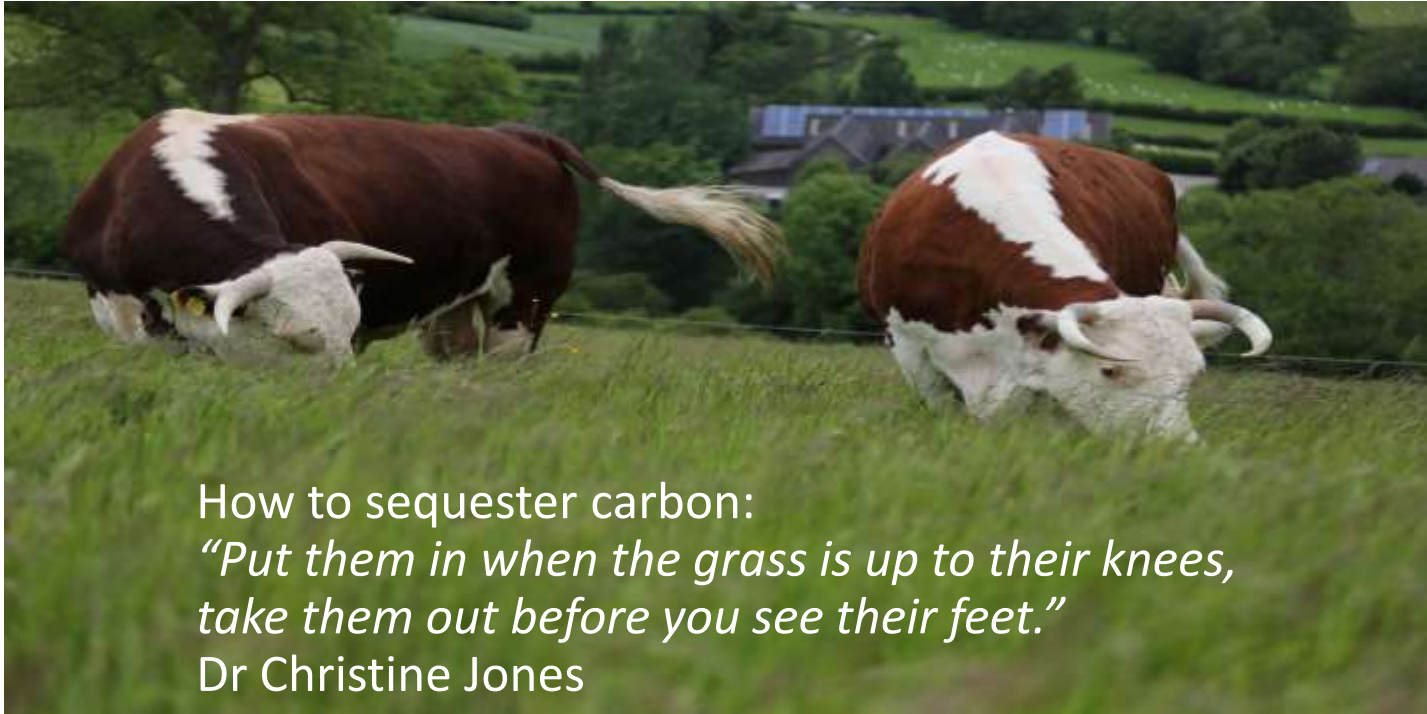


The UK has lost 84% of its fertile topsoil since 1850, with the erosion continuing at a rate of 1cm to 3cm a year.

The Committee on Climate Change (CCC) report (2015)

Grazing tall grass

Each bite primes the carbon pump



How to sequester carbon:

*"Put them in when the grass is up to their knees,
take them out before you see their feet."*

Dr Christine Jones

Enteric vs fossil methane



Food Climate Research Network
@FCRNetwork



Replying to [@FCRNetwork](#) and [@freerangedairy](#)

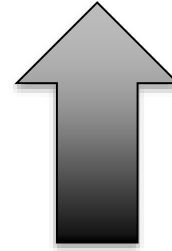
The difference between fossil methane and livestock methane is when the methane breaks down to CO₂: with fossil methane, that CO₂ is additional to the atmosphere, but with livestock methane, the CO₂ is not additional to the atmosphere.

1:03 PM · Aug 9, 2019 · [Twitter Web App](#)

Cycling vs adding carbon



Cows fed perennial polycultures cycle & recycle carbon (including methane) using sunlight & rain



Any food or feed grown, harvested & transported using fossil fuels ADDS carbon

Carbon in, carbon out



www.smilingtreefarm.com



@smilingtreefarm

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So feed cows:



- Perennial polycultures of
 - Diverse pastures
 - Browsing hedgerows & trees
- Use holistic/mob grazing practices to
 - Stimulate photosynthesis & carbon sequestration
 - Build soil health, fertility & water retention
 - Integrate wildlife & food production

Future challenges/opportunities



Challenges:

- Reconnecting the consumer with food production
- Overcoming the perception that 'cheap food' is cheap
- How to beat the \$\$\$\$ driven food propaganda!

Opportunities:

- More and more enlightened consumers are looking for high quality, ethically produced food, they appreciate its value and wish to support small-scale, local producers



Thank you

Christine Page

www.smilingtreefarm.com

Twitter & Instagram: @smilingtreefarm