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
“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

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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.

**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.

**CREAM**

**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

A new study has shown that both organic milk and meat contain around 50% more beneficial omega-3 fatty acids than conventionally produced products.
Grass-fed beef vs Grass-fed ‘grain-finished’ beef

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

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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:

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?

6CO2 + 6H2O + sunlight => C6H12O6 + 6O2
All life depends upon

PHOTOSYNTHESIS:

$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

Carbon + water + sunlight => liquid + oxygen

dioxide sugar

The “liquid carbon pathway” (Dr Christine Jones)
Pumping carbon via plant root exudates into the soil

Every bite primes the carbon pump

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The Poop Loop!

**RAIN**

**SUNLIGHT ENERGY**

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**POOP LOOP**

**SOIL MICROBES PROVIDE NUTRIENTS TO PLANT:**

SOIL MICROBES FEED ON THE SUGARS, MULTIPLY AND ARE PREDATED BY OTHER MICROBES WHOSE POOP CONTAINS VITAL NUTRIENTS WHICH ARE ABSORBED BY THE PLANT.

**PLANT FEEDS SOIL MICROBES:**

PLANT PHOTOSYNTHESIS USES SUNLIGHT ENERGY, \( H_2O + CO_2 \) TO MAKE LIQUID CARBON IN FORM OF SUGARS TO FEED SYMBIOTIC SOIL MICROBES VIA ROOT EXUDATES.

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

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Grazing impact on plant roots
Carbon sequestration, soil health, water retention...

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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

NET TOTAL EMISSIONS
WHITE OAK PASTURES VS OTHER PROTEINS
(PER POUND OF PRODUCT)

Emissions breakdown for every pound of White Oak Pasture's beef produced:
(Pounds of CO2 equivalent):

- CONVENTIONAL BEEF (U.S.)
- PORK (CA.)
- CHICKEN (U.S.)
- BEYOND BURGER™
- IMPOSSIBLE™ BURGER
- SOY BEAN (U.S.)
- WHITE OAK PASTURES BEEF

+33
+9
+6
+4
+3.5
+2
-3.5
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

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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

Solar-powered Perennial poly-culture
CARBON IN

Fossil fuel powered Annual mono-culture
CARBON OUT

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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

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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

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