FROM FARM TO FORK TO FARMER

The official blog of Regenerative Farming Ireland

"IS IT THE CARBON OR THE NITROGEN?"

by

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The following article was first published in the April 2020 edition of the Agri Insider magazine.

Stuart Meikle asks, why, while there is a consensus that global temperatures are rising, are we not seeing an acceptance by Irish farmers that mitigation means reducing the national ruminant herd?

"Ireland is a carbon efficient producer of foods" is the statement most frequently made by farming lobby groups to counter the demands for change. It is also well known that the GHG emissions picture is distorted by Ireland having little industry and a large ruminant-based farming sector.

Many within farming will argue that progress is being made and that Ireland is becoming a yet more carbon efficient producer of milk and beef. It is all about counting carbon and even the rural development program has been orientated to help. But with the dairy herd's expansion, this has not reduced absolute emissions and that is what is being demanded.

Nonetheless, *carbon efficiency* has had little impact in a debate where the rules have been fixed for the immediate future. Unfortunately, the international political choice is to prioritize emissions reduction over food production. This will mean the imposition of GHG-related fines and a clear economic cost per GHG unit. With such, the priority should then be the value generated per GHG unit; a measure by which Irish agriculture with its emphasis on low-value commodities is weak.

NOT ALL CARBON EMMISSIONS ARE EQUAL

Methane is 28 times more potent a GHG than CO_2. It is a well-recognized figure. Methane does, however, have a shorter atmospheric lifespan than CO_2. Eventually its carbon is cycled back into plants where it remains until death and decomposition or grazing leads to its reconversion back to methane. Lest we forget, methane production is a part of Nature's carbon-cycling mechanisms.

Recently, and very belatedly, the debate has moved on. The rational offered for business as usual now revolves around the fact that Ireland's grass-based systems both emit GHG's and assimilate atmospheric carbon. The existence of the carbon cycle is now being highlighted as a reason why the climate-change impact of Irish, predominately grass-fed, cattle and sheep should be re-evaluated.

IS THE ACCOUNTING METHODOLOGY FLAWED?

Why are farmers being hamstrung by emissions accounting rules that are simply not up to the task?

The science behind climate change is irrefutable. Equally so the presence of the carbon cycle. So why ignore the latter? Saying that we cannot accurately measure the return loops of the carbon cycle operating within agriculture is unsatisfactory. More so given the magnitude of the climate crisis.

Using the wrong key performance indicator can be highly misleading. For example, failing to account for the 'return loop' biases the assessment of animal farming systems away from herbage-based systems in favour of grain-fed, often confined systems. For some holistic systems thinkers, carbon-counting is simply not the best way to identify a sustainable food system, it is far more nuanced.

CARBON CYCLING OR SOIL-CARBON SEQUESTRATION

Within the debate, has the term 'carbon sequestration' been a distraction?

Typically, it is understood to mean the long-term [preferably permanent] storage of carbon within the soil. Even with trees and hedgerows, plant-based storage is only transitory as eventually the carbon becomes stored in the soils under forests or grasslands. They are the sources of carbon that humans have exploited as intensively as fossil-fuel carbon. And they are also as finite.

It is argued that sequestration is too varied to fairly record, after all every farm, nay every field, is different. The soil carbon can also be easily 'ploughed out'. For the foreseeable future, farmers need to accept that carbon sequestration into farmland is not going to be widely used emissions offset.

It is occasionally mooted that farmers should be paid to sequester carbon. If fines are to be paid for emissions, surely payments can be made for sequestration. It has a nice populist ring to it.

Genuine carbon sequestration is difficult to measure. Devising a fair payment system will be equally difficult. And that payment system should also include repayments when soil carbon levels fall. Thus, for farmers carbon sequestration payments mean losing operational control of the land infinitum.

Carbon sequestration will lead to higher soil organic matter levels and healthier, functional soils. It is these that will underpin the future productivity of farmland and farmers should not need rewarding for the good husbandry of their own soils. First and foremost, it is about building real soil fertility.

Sequestered carbon is a carbon cycle residual left in the soil long term. It will lead to a higher soil organic matter percentage within a given volume of soils and, potentially, a greater volume of soil. To achieve such needs a functional soil biome unimpeded by the shocks that may be induced by, for example, excessive applications of artificial fertilizer, pesticides or animal health product residuals. Managing land to rebuild soil organic matter is an art we are only now just rediscovering.

SHOULD WE FOCUS UPON THE CYCLED CARBON?

A correct assessment of food systems can only be made if we understand the carbon flows.

If emissions are to be penalized, they should be net emissions. The merits of different food systems cannot be compared without understanding the nutrient cycles involved, be they N, P, K or carbon. They cannot be properly assessed by ignoring half the carbon cycle. And that is happening.

In Ireland, there is now a debate raging over how methane from cattle is assessed. Should it be considered within the context of the carbon cycle. Yes, it should be.

Methane does take years to cycle and it is a potent GHG so the instant return from ruminant herd reduction is attractive as a quick fix. But will we really address our other fossil-fuel guzzling habits in the short window of time that such will buy? On that there is reason to be skeptical.

The second part of the methane debate relates to its derivation, is it biological or from fossil fuels? It is early days, but within a three to five-year time frame, methane may well be differentiated thus within the carbon accounting rules and farming systems evaluation adapted accordingly.

Further, biological methane from ruminants is a vital part of the carbon cycle for many farming systems and its complete removal is not wise. In the context of rebuilding soil health [where soils have been stripped of their carbon], methane emissions from GRAZING livestock are essential to building a truly sustainable food system. It remains a difficult concept for some to grasp.

It has been alluded that farmers should be paid for the carbon cycled by growing grass. It is, however, not the same thing as long-term carbon storage. Yes, the return loop of the carbon cycle should be accounted for within the carbon assessment but making payments for such, no.

FARMED RUMINANTS ARE A STRATEGIC RESOURCE

There is a grave danger that we will compromise the future of our food systems by the over-zealous and simplistic assessment of the GHG emissions from farming with ruminants, not least if one sees that soil degradation is the greatest single threat to the food supplies of a growing global population.

We should also remember that ruminants provide *fully biodegradable* materials for clothing and insulation; crucial in an era where we begin to understand the full impact of man-made alternatives. They also provide a natural gas that is all too rarely fully harnessed as a source of bioenergy.

To quote from my own *Soils first farming and food policy* [www.farmtoforktofarmer.com]:

"Ruminants are a strategic resource that we must husband and use with care. How and where we use them must become the central pillar to farming and food policy… If there is a universal panacea for our soils and, henceforward, our food systems, it lies with how we manage farmed livestock hereon. 'Eat less meat and dairy and eat better' is a positive approach, at least for the overly-nourished, but by 'better' we must recognize that the core principle of 'better' is that the food comes from farming systems that eventually fully restore soil health and fertility".

USING ARTIFICIAL NITROGEN TO FUEL THE CARBON CYCLE

The Achilles heel of the Irish grass-based farming system is its reliance on artificial nitrogen usage. And according to Teagasc National Farm Survey the Sustainability Report (2017) Nitrogen Use efficiency on cattle farms was under 25%. This is an Achilles heel that will sooner rather than later render its carbon-based environmental credentials, null and void.

If we argue that farming system evaluation should consider biological [cyclable] and fossil-fuel emissions [non-cyclable], there needs to be consideration of what drives the biological emissions.

Artificial fertilizers require fossil-fuel consumption for manufacture [including methane] or mining and transport. When they are used one cannot claim that the methane generated when nitrogen-fed grasses are broken down by microbes is entirely of 'natural' origin. The additional carbon being assimilated by the growing plant results from the use of fossil fuels, period.

It is said that more nitrogen fertilizer equates to more carbon draw down, thus mitigating climate change. It can only be the case if the soil's organic matter percentage and/or the soil volume rises. Long-term carbon sequestration is nonetheless not that straightforward. As an argument is will also likely fail when the broader environmental impacts associated with the fertilizer are assessed.

NITROUS OXIDE, AMMONIA AND NITRATES

Carbon emissions have made the headlines. In Ireland agriculture emissions are a major issue because of its relative size and the dominance of its grass-based ruminant farming. And the latter is greatly disadvantaged when emissions-only carbon accounting takes place. The consequence is that ruminant herd reduction is seen as a major climate-change mitigation opportunity.

Meanwhile, the country's water systems are being polluted by nitrates and its air by ammonia. The situation with both is well documented. There is also non-recyclable nitrous oxide going into the atmosphere, a GHG ten times more potent than methane.

A consequence of the focus upon carbon, carbon counting and improving the efficiency of milk and meat production per unit of carbon emitted, is that we have been looking the wrong way?

If we consider how nutrients are cycled or not by the mechanisms created by Nature, will we end up with different priorities? Surely it is the correct approach to evaluating our food production systems.

It is probable that such an approach will emphasis nitrogen usage and its leakages into the environment. If so, for the many farmers who operate with a nitrate derogation it is the proverbial Sword of Damocles. Hence, farming's dependence on artificial nitrogen must be reviewed, urgently.

THE URBAN POPULATION'S DEPENDENCY ON NITROGEN

To place this in a broader context, urbanization has been facilitated by artificial nitrogen. The Haber-Bosch manufacturing process [and plant breeding] has transformed the lives of billions. It has come at a great cost to the Planet through the externalized impacts of artificial nitrogen [and phosphate] leakage. It is exacerbated by the poor recycling of 'waste' nutrients from urban conurbations back to the land. Micro-plastics and pharmaceutical residues mixed with that waste only makes it worse.

Given the above, we must now identify how we operate farming systems that more efficiently utilize the nutrients needed for plant growth. Minimizing seepage is imperative. It is a massive challenge given the dysfunctional relationship between people and the land that feeds them.

The 'urbanization' of farm animals has only made the situation worse, and worse again where human food waste is not even used to feed local, urbanized, farm animals. A future buzz phrase will be *local feeds for local animals*. We must transport the final products, not the animal feeds.

Artificial nitrogen can now only be a stop-gap solution with a finite future. It is fossil-fueled, an emitter of fossil-fuel-derived methane when produced, and nitrous oxide when applied. With its relative-to-tillage poor nitrogen usage efficiency one can expect that the greater scrutiny will fall upon how we use nitrogen in grazing livestock systems.

Thankfully, nitrogen is abundant above every agricultural field and we must utilize it directly. To do so must become a primary objective when designing and operating our farming systems.

In farming circles, the forgotten nutrient is carbon. Globally, soil carbon has been seriously depleted over the last 150 years as crops are removed and little returned. Excessive tillage is partly to blame. As with nitrogen, we must now draw carbon from the atmosphere to rebuild soil carbon. It is not about offsetting GHG emissions, it is about regenerating the soils that produce our food.

Compost will have a role to play but It is increasingly evident that regenerating soils requires the careful management of grazing livestock and an understanding of the carbon cycle. It is about creating carbon-cycle surpluses within the soil. It is what regenerative agriculture is all about.

RESILIENT FOOD SYSTEMS WORK WITH NATURE

We will only build food system resilience if they operate with the nutrient cycles designed by Nature. And that will not happen if the rules imposed upon farming ignore the way ecosystems function.

Henceforth, we must recognize that the primary environmental crisis in Ireland is not GHG emission *per se*. With those we must focus upon agriculture's fossil-fuel derived emissions. The greater crisis is caused by nitrogen seepage. And we are being distracted from that by the emphasis on carbon.

Future food production will be about work with Nature and understanding complex ecological systems and how to work with them, bit against them. It used to be so. Now we must do so and feed a global, urbanized population that for a century has grown with little regard for how it feeds itself. It is the legacy of the Haber-Bosch process. And it is a legacy that now makes the challenges facing the World's agriculturalists so much greater, albeit that few in Society yet recognize the scale of it.

About the author

Stuart Meikle is a farm business economist, a writer and a farming/food advisor. He was brought up with agriculture and studied at the then World-renown Wye College, University of London. Upon graduating with First Class Honours he joined the faculty at Wye and taught agricultural and horticultural business management. His last 30 years have seen him advising and working for governments, the World Bank and the IFC, NGOs, universities and private businesses in places as far afield as South East and Central Asia, the Caucuses, the Levant, Central Europe and the United Kingdom and now Ireland. In recent years he has been working on rural regeneration in agriculture-reliant, often remote-to-the-market, regions that are also environmentally important and where the future is about linking farming to high-value food products to enhance farming and rural incomes and to sustain and preserve the biodiversity-rich, farming-created landscapes. Apart from being an advisor, there has been times within his career when Stuart Meikle has been directly involved in farm and agribusiness management. Most recently, he established a water buffalo milk production and processing business located within Transylvania's stunning natural beauty, where he was also the British Honorary Consul. Nowadays he and his family reside in County Wexford.