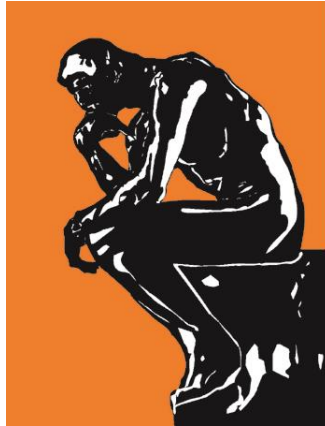


Environmental Impact of Natural Grass-Based Livestock Farming

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The study conducted by O'Brien and their colleagues aimed to assess the impact of three methods for diversifying environmental risk [1] on multiple cattle farms in Ireland. These three methods, as highlighted in the study, include:

- 1) The combination of grass and white clover (referred to as GWC),
- 2) Organic farming (referred to as OFS), and
- 3) An approach involving both agriculture and forestry (referred to as AGF), with a specific focus on the technique of combining perennial crops, grazing pastures, and harvesting for storage (known as Silvopasture).

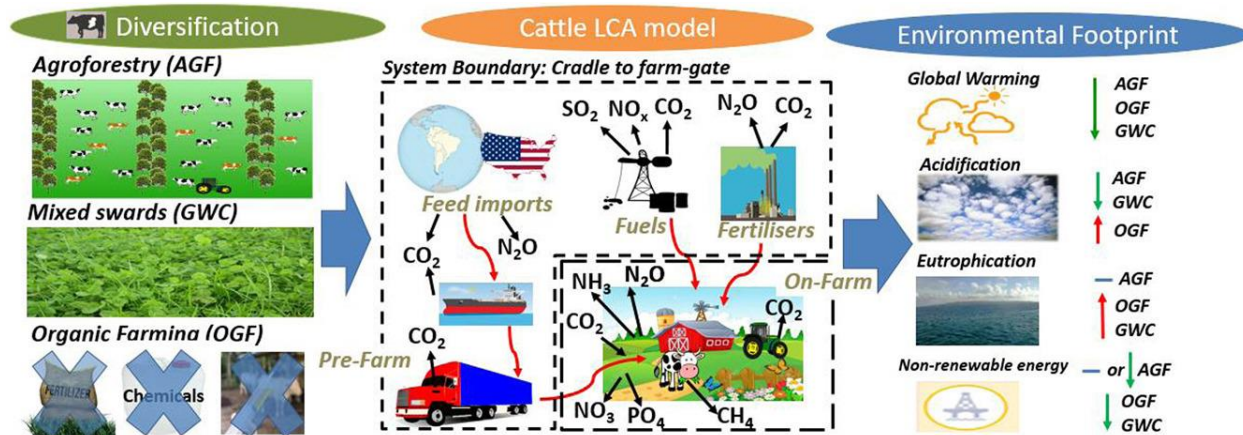


Figure. The research approach, encompassing these three options, requires verification, as detailed in [1].

While there are various other options available for diversifying livestock production sources, the three methods mentioned above are representative of livestock systems primarily based on natural grass. The study covers the entire life cycle of both dairy and beef cattle, from calf age to maturity, spanning the three years from 2017 to 2019, making it highly representative of Ireland.

The environmental impact is assessed using the life cycle assessment (LCA) methodology, encompassing the entire impact assessment spectrum from raw material extraction to the consumption of milk and meat at the farm, essentially from birth to export beyond the farm gate.

The environmental impact is evaluated through simulations of six key factors: global warming potential (GWP), deficit in non-renewable energy sources (NRE), land area requirements (LO), acidification potential (ACP), and the potential for harmful effects related to nutrient formation leading to freshwater/marine water source damage (eutrophication) expressed as FEP/MEP.

The impact measures considered include land area and fat- and protein-adjusted milk production (FPCM) for both dairy and beef cattle (measured in carcass weight: CW).

Based on the simulation results, it is observed that:

The GWC method reduces the GWP risk associated with dairy products by 9% and beef by 3%. Additionally, it decreases ACP by approximately 4%-5%, NRE deficit by 13%-19%, and land occupation by 6%-7%. However, it increases the risk of MEP by 5%-12%.

The GWC method, when applied to meat farming, results in higher yields compared to traditional methods but tends to increase environmental impact. On the other hand, opting

for organic farming displays the least environmental impact, primarily in terms of reducing GWP and limiting NRE intensity.

Nonetheless, without sequestration measures, organic farming has an adverse impact on the GWP of FPCM milk and leads to increased ACP and MEP per unit of finished product. As organic farming yields decrease, environmental impact increases, along with heightened land use impacts (LO) relative to traditional livestock farming methods.

Furthermore, converting a portion of the land to the agroforestry option (AGF), allocating about 10%-20% of grassland to combined land (Silvopasture), reduces milk and meat production but slightly improves the environmental impact. Carbon capture in Silvopasture soils surpasses that in grass soils, although this effect requires further analytical evidence.

These results hold significant importance in promoting awareness regarding the utilization and exploitation of land, water, and ecological resources for farming while also considering environmental impacts. This aligns closely with the assessment of the environmental surplus value for residents [2].

However, one relatively under-discussed factor is the profitability of the agricultural product system, especially transactions that occur "outside the gate." This factor cannot be overlooked, as it represents the path to the market where economic values are ultimately realized [3]. Neglecting this factor may give the impression that all issues can be resolved solely within the farm boundaries.

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