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Intensifying and Integrating Cattle Production Systems

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Abstract

Reducing the environmental impact of cattle production is best achieved by increasing production efficiency, followed by processing and distribution. Integrated and intensified systems of beef and dairy farms offer both a high productivity and high profitability model that is best suitable for commercial commodity systems and also for small farmers. This approach to environmental assessment is necessary to avoid the risk of suboptimal solutions, as the two systems are highly interrelated.

Keywords: Food; Global; Impact; Livestock; Sustainability

Introduction

Food is an important aspect of daily human life. Palates link cultures and landscapes, but also have implications for human and environmental health [1]. The various stages of food production, transportation, and consumption have an impact on the environment, as does any other activities in which humans consume resources. In the food production phase, meat and dairy products generate environmental burdens globally and locally [2]. In fact, they release more carbon emissions compared to other foods [3,4].

Local food networks are spreading worldwide and are considered a sustainable food system, although their contribution to greenhouse gas emissions is currently not well understood [5]. Despite this, local production does not always mean lower emission of greenhouse gases. The meaning of "local" should be explained in terms of the link between a community tradition and a geographical area rather than in terms of food miles [6] as the choice of local products or "food miles" is not sufficient to ensure ecologically sustainable food consumption [5,6]. The mode of transport is as important as the distance, with sourcing from close geographical areas resulting in emissions greater than those from farther geographical areas [7,8].

However, transportation is not the only factor that determines how environmental efficient it is to consume local food. Overall, the consumption of local food adapted to the local environment and the use of eco-technologies is certainly a encouraging factor in improving environmental health and sustainability [8]. Reducing food waste can also contribute positively towards multiple sustainable development goals [9]. Gaps in private and public regulations must be reduced to allow for restructuring of distribution channels to provide consumers with local quality beef and dairy products that also come from environmentally friendly practices [10-12]. But a more sophisticated and comprehensive global modeling is needed to understand the global impact of local regulatory changes, as illustrated by the complexity of production and trade responses to changing environmental regulations [12]. The standard narrative that preserving forests and reducing CO_2 emissions is simply too costly to be feasible is outdated [13]. Quantifying energy demand in food production and distribution is key to identifying intensive activities and provides useful information for policy and industry decision makers [14]. The most important factor in reducing the environmental impact of cattle production is increasing production efficiency, followed by processing and distribution [15].

The sustainable production of milk and beef to feed a growing world population has been the subject of critical debate in recent years. To remain sustainable, a production system must make incremental efficiency improvements at the individual farm level that keep farms economically and environmentally viable [16]. It means also that dual purpose systems can advantageous over specialized dairy systems [17]. Increased efficiency can not only decrease the negative environmental impact of cattle production, but also reduce costs to the producer [15].

High nutrient, resource and food production efficiency in dairy farming can be promoted by a more extensive grassland-based management system with low concentrate use [18]. The intensification of grazing and the introduction of more productive forage species can represent new opportunities for adding value, improving the quality of life and conserving sensitive areas found in different environments [19]. Pasture-based livestock production systems with larger ecological, water and carbon footprints show better results on indicators related to human health and environmental protection [19]. However, it must be pointed out that intensification is not the same as industrialization. Intensification refers to an increase in production per unit of input, while industrialization is a particular type of intensification of production characterized by large-scale, high-throughput facilities in which animals are fed controlled feed in enclosed barns [20].

The current intensification of dairy farming systems using significant amounts of human edible crops threatens global food security, has undesirable side effects on the environment and fails to exploit the evolutionary advantage of ruminants [2,18]. Dairy intensification may spare or directly afforest grassland, but may not fully offset emissions caused via indirect land use change and replacement beef production [2,10]. Therefore, environmental efficiency of cattle production systems underscores the need to consider both dairy and beef production and the multiple interrelated environmental burdens in both production systems when designing strategies for sustainable intensification [21]. This integrated approach to environmental assessment is necessary to avoid the risk of suboptimal solutions, as the two systems are highly interrelated [15,17]. Within the range of sustainable agricultural innovations available, integrated systems offer both a high productivity and high profitability model that is particularly scalable due to its suitability for commercial commodity systems [22]. For instance, sugarcane ethanol and beef cattle integration is made technically feasible due to the nutritional value of sugarcane, increasing ethanol production without compromising cattle production or displacing pasture land [23]. Other strategies may include integration to silvopastoral [24] and aquaponics [25] systems. Of the many ways to mitigate climate change, regenerative agriculture - controlled grazing, woodland grazing [26], intercropping, conservation agriculture and farmland restoration - collectively top the list when it comes to sequestering greenhouse gases [1]. By implementing strategies in a coordinated effort between public and private agents, deforestation may be slowed down while efficiency is increased [13]. Indeed, in different regions of the world, intensification and/or integration of beef and dairy production systems are important strategies to significantly reduce environmental impacts and promote healthy economic growth [27,28].

Conclusion

Policy approaches must better account for synergies and trade-offs among the multiple dimensions of livestock impacts. Quality technical assistance to smallholder farmers could help them better meet their production practices to local opportunities, increase household incomes and improve livelihoods, and reduce deforestation pressures. This would require the education of farmers, retailers, consumers and policy makers, as well as a careful assessment of the benefit-cost ratio of integration and intensification of cattle production systems.

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Conflict of Interest

The authors declare that they have no competing interests.

References

1. Provenza FD, Kronberg SL, Gregorini P (2019) Is grassfed meat and dairy better for human and environmental health? Front Nutr 6: 26.
2. Soteriades AD, Foskolos A, Styles D, Gibbons JM (2019) Diversification not specialization reduces global and local environmental burdens from livestock production. Environ Int 132:104837.
3. Aggarwal S (2019) Food and climate change. Jindal Glob Law Rev 10(1):121-127.
4. Angerer V, Sabia E, König von Borstel U, Gauly M (2021) Environmental and biodiversity effects of different beef production systems. J Environ Manage 289.
5. Vitali A, Grossi G, Martino G, Bernabucci U, Nardone A, et al. (2018) Carbon footprint of organic beef meat from farm to fork: a case study of short supply chain. J Sci Food Agric 98(14): 5518-5524.
6. Bazzani C, Canavari M (2017) Is local a matter of food miles or food traditions? Ital J Food Sci 29(3): 505-517.
7. Coley D, Howard M, Winter M (2011) Food miles: Time for a re-think? Br Food J 113(7): 919-934.
8. Coelho FC, Coelho EM, Egerer M (2018) Local food: Benefits and failings due to modern agriculture. Sci Agric 75(1): 84-94.
9. Chen C, Chaudhary A, Mathys A (2020) Nutritional and environmental losses embedded in global food waste. Resour Conserv Recycl 160: 104912.
10. Styles D, Gonzalez-Mejia A, Moorby J, Foskolos A, Gibbons J (2018) Climate mitigation by dairy intensification depends on intensive use of spared grassland. Glob Chang Biol 24(2): 681-693.
11. Dragicevic AZ (2021) Emergence and Dynamics of Short Food Supply Chains. Networks Spat Econ 21(1): 31-55.
12. Waroux Y le P de, Garrett RD, Graesser J, Nolte C, White C, et al. (2019) The Restructuring of South American Soy and Beef Production and Trade Under Changing Environmental Regulations. World Dev 121: 188-202.
13. Stabile MCC, Guimarães AL, Silva DS, Ribeiro V, Macedo MN, et al (2020) Solving Brazil's land use puzzle: Increasing production and slowing Amazon deforestation. Land use policy 91: 104362.
14. Ladha-Sabur A, Bakalis S, Fryer PJ, Lopez-Quiroga E (2019) Mapping energy consumption in food manufacturing. Trends Food Sci Technol 86: 270-280.
15. Hessle A, Kumm KI, Bertilsson J, Stenberg B, Sonesson U (2017) Combining environmentally and economically sustainable dairy and beef production in Sweden. Agric Syst 156: 105-114.

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16. Holden LA (2020) Understanding the environmental impact of global dairy production. J Anim Sci 98(1): 1-2.

17. Vellinga TV, de Vries M (2018) Effectiveness of climate change mitigation options considering the amount of meat produced in dairy systems. Agric Syst 162: 136-144.

18. Dentler J, Kiefer L, Hummler T, Bahrs E, Elsaesser M (2020) The impact of low-input grass-based and high-input confinement-based dairy systems on food production, environmental protection and resource use. Agroecol Sustain Food Syst 44(8): 1089-1110.

19. Dick M, Abreu da Silva M, Franklin da Silva RR, Lauz Ferreira OG, de Souza Maia M, et al (2021) Environmental impacts of Brazilian beef cattle production in the Amazon, Cerrado, Pampa, and Pantanal biomes. J Clean Prod. (June): 127750.

20. Mason RE (2019) Cattle and the climate: Why industrial production is not the solution to emissions from beef and dairy farms. 1-24.

21. Mazzetto AM, Bishop G, Styles D, Arndt C, Brook R, et al. (2020) Comparing the environmental efficiency of milk and beef production through life cycle assessment of interconnected cattle systems. J Clean Prod 277: 124108.

22. dos Reis JC, Rodrigues GS, de Barros I, Ribeiro Rodrigues R de A, Garrett RD, et al (2021) Integrated crop-livestock systems: A sustainable land-use alternative for food production in the Brazilian Cerrado and Amazon. J Clean Prod 283: 124580.

23. de Souza NRD, Fracarolli JA, Junqueira TL, Chagas MF, Cardoso TF, et al (2019) Sugarcane ethanol and beef cattle integration in Brazil. Biomass and Bioenergy 120: 448-457.

24. Mancera KF, Zarza H, de Buen LL, García AAC, Palacios FM, et al. (2018) Integrating links between tree coverage and cattle welfare in silvopastoral systems evaluation. Agron Sustain Dev 38(2).

25. Gallegos Rivero AR, Daim T (2017) Technology roadmap: Cattle farming sustainability in Germany. J Clean Prod 142(P4): 4310-4326.

26. Clay N, Garnett T, Lorimer J (2020) Dairy intensification: Drivers, impacts and alternatives. Ambio 49(1): 35-48.

27. Gerssen-Gondelach SJ, Lauwerijssen RBG, Havlík P, Herrero M, Valin H, et al (2017) Intensification pathways for beef and dairy cattle production systems: Impacts on GHG emissions, land occupation and land use change. Agric Ecosyst Environ 240: 135-147.

28. van Selm B, de Boer IJM, Ledgard SF, van Middelaar CE (2021) Reducing greenhouse gas emissions of New Zealand beef through better integration of dairy and beef production. Agric Syst 186: 102936.

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