No More Cattle? Exploring the Sustainability of Eliminating EU Cattle Farming As a Means of Addressing Climate Change

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ABSTRACT: Anthropogenic climate change is undeniably altering planet Earth, and agricultural emissions are a significant contributor to this crisis. Agriculture, specifically cattle farming, is a key emitter of GHG emissions, accounting for 14.5% of global GHG emissions. This paper thus asks, given that cattle farming contributes a significant amount of total global GHG emissions, if the elimination of cattle farming in the EU is a sustainable way to reduce total GHG emissions. This paper explores the sustainability of cattle farming in the EU and highlights the vital role that EU cattle farming plays in the EU economy and in meeting the global food supply. It also explores the role that beef consumption plays in human diets. By researching the available literature, this paper finds that the complete elimination of cattle farming in the EU would have devastating effects on the EU economy and would leave the global food demand largely unmet. Not to mention that the environmental benefits of eliminating cattle farming become less significant when accounting for the emissions of new economic activity on ex-cattle grazing lands. Thus, this paper highlights the importance of improving cattle management and changing dietary patterns to mitigate GHG emissions in the context of a worsening climate and an increasing global food demand that must be met.

KEYWORDS: European Union, cattle farming, GHG emissions, climate crisis, sustainability analysis

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The looming and ever-present climate crisis does and will continue to have damning consequences on EU agriculture and, consequently, the global food supply. However, this cannot be mentioned without noting the significant impacts that agriculture, specifically cattle farming, has on accelerating the climate crisis.

GHG emissions resulting in climate change could result in significant losses to European agriculture, with up to a 16% loss of farm income in the EU by 2050.[1] Over the past 40 years, losses from climate change have already amounted to over €487 billion in the EU27.[2] These losses will continue to occur from anthropogenically accelerated processes alongside issues such as soil desertification, droughts, and wildfires.

To some degree, the agriculture industry is the author of its own demise, given that it currently generates 19-29% of global greenhouse gas (GHG) emissions[3], with 14.5% of global GHG emissions being attributed to livestock alone.[4] In 2020, agriculture amounted to 11.78% of the EU's total emissions.[5] Given that cattle farming contributes a significant amount of total global GHG emissions, is the elimination of cattle farming in the EU a sustainable way to reduce total GHG emissions? This paper will focus on the feasibility of the complete elimination of cattle farming, specifically in the EU.

With increasing media attention and public awareness about the steep environmental impacts of animal agriculture, especially cattle farming, more people are turning to meat-free diets. In 2023, 43% of Gen-Z respondents in the UK stated that they plan not to eat meat.[6] Additionally, environmental concerns have played a significant role in the growing interest in veganism in the Western world,[7] where now 2% of European respondents aged 18-34 indicate they follow a vegan diet.[8] With an increasing number of young people turning away from meat consumption due to environmental concerns, it is relevant to consider whether these changes could be moved beyond the individual to a more systemic scale.

The EU boasts one of the world's wealthiest economies when measured by GDP and is also a global leader in climate innovation with landmark legislation such as the *European Green Deal*.[9] The EU's financial ability, innovation, and willingness to take strong environmental actions make drastic changes, such as the elimination of cattle farming most feasible in the EU. Thus, this paper explores the possibility of eliminating cattle farming in the EU as they have a higher likelihood of being able to implement such changes.

Although eliminating cattle farming in the EU could serve to reduce EU GHG emissions, this poses issues for the other key factors of food sustainability; social responsibility and economic viability. The elimination of cattle farming is made difficult by its importance to EU farmers and the EUs position as a top global food supplier, which is especially relevant to the overall rise in food demand, including animal foods, across the globe. However, these issues should not be noted without recognizing the health benefits of reducing meat consumption in human diets. This paper aims to assess how the EU can reduce the environmental impacts of its cattle industry without significantly disrupting the EU economy while still meeting global food demands.

The State of Livestock Farming in the EU

The cattle farming industry in the EU is a complex interaction of economic importance, worldwide demand, and ecological impact. It is a vital and multifaceted sector within the EU, playing a crucial role in both the regional economy and global food production.

GHG Emissions from Livestock and Cattle

Agricultural emissions consist primarily of methane (CH4) and nitrous oxide (N2O) gas emissions. This paper will focus on methane emissions, given that they are predominantly emitted from livestock through enteric fermentation (i.e. livestock belches) and from stored manure and organic waste in landfills.[10] Cattle are of exceptionally high concern regarding methane emissions, given their high emissions relative to other livestock. In fact, they can emit 40-80 times more methane than pigs, depending on the type of cattle.[11] In 2018, EU agri-emissions were dominated by livestock farming, with 39% of emissions coming from enteric fermentation, followed by livestock manure at 20%, and manure management making up 6% of EU agri-emissions.[12] However, it is essential to note that these CH4 and N2O emissions do not consider the impact of CO_2 emissions from fossil fuels and associated inputs (e.g. growing cattle feed) that are essential to raising cattle. When considering these emissions, eliminating all animal agriculture, not just cattle, could offset 68% of current anthropogenic CO_2 emissions[13].

In assessing the sustainability of cattle farming, it is necessary to look at not only how much GHGs EU cattle farming emits, but also at how much GHGs these practices produce in terms of food production and revenue.

EU Cattle Industry Production, Consumption, and Export

Between 2007-2009, animal outputs accounted for 40% of the total value of EU agricultural outputs, making livestock farming a significant producer in the EU food supply.[14] In 2020, there were over 76 million cattle in the EU, with beef production levels reaching 6.8 million tonnes.[15] The EU is the world's third-largest beef producer at these production levels, behind only the US and Brazil.[16] EU beef production is expected to decline by roughly 8% between 2021-2031; however, this is compensated for by increased slaughter weight per animal due to technological advancements.[17]

EU beef consumption is also expected to continue declining, with a 0.9% decline predicted for 2022.[18] However, as the global population rises and incomes increase in some developing countries, there is an anticipated increase in global meat consumption of 1.4% per year.[19] Thus, the globe will need to produce an additional 3.4 million tonnes of meat (poultry and beef) per year to meet the global demand.[20] This context of increasing food demands, especially in developing countries, is marked by staggering figures like an expected 300% increase in beef demand in Asia by 2050.[21] Such increases in demand will place the EU in a critical position when it comes to providing global food security. Related fears about meeting such increased global beef and food supply in the context of rising commodity prices have made economic sustainability an overarching objective of the EU's agricultural policy.[22]

Regarding export, the EU is mainly self-sufficient in beef production, with only 8-10% of EU beef sold for export.[23] Despite the EU being the third largest beef producer, the export market is primarily dominated by the US, Brazil, Australia, New Zealand, and Argentina.[24]

EU Cattle Industry Employment and Revenues

Despite falling cattle production and consumption rates, agriculture remains a significant employer in the EU. In 2020, agriculture employed roughly 4.2% of total employment in the EU, amounting to approximately 8.7 million people.[25] However, agriculture has a significantly higher presence in some EU countries, such as Romania, where roughly one-fifth of the population is employed in agriculture.[26] It should also be noted that these figures do not account for all of the people who work and help out on farms without being employed. Accounting for both paid and unpaid labour, it is found that the EU's overall agricultural workforce is roughly 17 million people.[27] The agricultural industry is also the least productive

in the EU, producing approximately €20,000 per person employed in 2021.[28]

In terms of revenue, agriculture contributed €217 billion or roughly 1.4% to the EU's GDP in 2022[29] It is important to note that the importance of the agri-food system as a whole is likely underrepresented in these data because it only refers to food processing industries. When examining the agricultural output, animals and animal products amounted to roughly 38.5% or €206.7 billion of total agri-outputs.[30] Of that nearly 40%, cattle comprised 6.7% of agricultural output, while milk comprised 14.5% of agricultural production.[31]

The Impacts of Eliminating EU Cattle Farming

When assessing the impacts that eliminating EU cattle farming could have on the EU and the world, there are four primary categories to consider: 1) impacts on the environment, 2) meeting the global food demand, 3) the impacts on employment and revenues, and 4) changes in human diets.

Environmental Impacts

Concerning the environment, eliminating cattle farming would appear to have an immediate benefit given the significant reduction in GHG emissions it would create. Indeed, removing cattle farming could serve to reduce the EU's agricultural emissions of nearly 400,000 kt of CO_2 per year by more than half.[32] However, the removal of cattle also means that a primary source of manure has been eliminated, which could result in fertilizing practices relying on synthetic fertilizers that emit nitrous oxide into the atmosphere (currently, just under the equivalent of 165,000 kilotons of CO_2 is emitted per year in the EU).[33] This would serve to effectively reduce some of the emissions gains made by the removal of cattle farming.

Also, it must be considered what economic activity the land that was once used for cattle farming would be used for in the absence of the cattle industry. If this land use is merely shifted from cattle farming to monoculture farming, the reduction in GHG emissions is quickly lost by the increased use of nitrous oxide emitting fertilizers, not to mention the accelerated degradation of ecosystems and topsoil from pesticide and fertilizer application and tillage practices.[34] Although crop-based agriculture is associated with fewer GHG emissions, its environmental impacts should not be overlooked. Agricultural practices and broader land use decisions reduce the

living carbon potential of the Earth and result in; deforestation and biodiversity loss (as a result of land clearing and monoculture practices), soil erosion and a loss of soil organic matter (as a result of tilling and monoculture practices), and soil salinization, coastal water pollution and ocean acidification (as a result of fertilizer and pesticide application).[35] It should be noted that an estimated 71% of the EU's farmland is dedicated to producing livestock feed (all livestock, not just cattle).[36] In the absence of cattle farming, cattle grazing lands may not need to be converted to croplands to meet food demands. In fact, this could mean that more food is produced on less land, where the benefits of improved cropland management could reduce CO_2 emissions by 1.4- 2.3 Gt CO_2 eq/year in the EU.[37]

Although conversion to croplands is not the sole alternative land use option, it is still essential to consider the emissions that will be put out by any economic activity that ex-cattle grazing/farming lands are turned to be used for. Take, for example, a country like France; the most agriculturally developed country in Europe- where 23% of all utilized agricultural area is dedicated to pasture and meadow land (for all livestock, not just cattle).[38] It is unreasonable to assume that all of this land would be left undeveloped in the absence of cattle farming, especially given the economic losses arising from eliminating an entire industry.

Impacts on Global Food Supply

Concerning meeting global food demand, given the high estimated increases in beef demand, not to mention the EU beef demand that would now need to be 100% imported, the elimination of cattle farming in the EU could lead to two possible outcomes. First, the global food demand is unmet, and food scarcity and malnutrition worsen across the globe, especially among impoverished communities. This is clearly a non-option. Or second, the global food demand is met by displacing the production of cattle products to other countries. The latter would mean that all other beef and cattle product-supplying countries need to increase their production levels to bridge the gap in supply.

This second option may not be environmentally advantageous given that less advanced farming techniques regarding cattle breeding, genetics, and nutrition in emerging economies result in less efficient livestock production.[39] In addition, livestock in tropical regions produces less milk and meat due to the climate,[40] meaning that more cows would be needed to make the same amount of beef in developing or tropical countries compared to places such

as the US or the EU.[41] Not to mention that other nations may not have the capacity to fill this increase in cattle product demand.

Impacts on Employment and Revenues in the EU

Eliminating the cattle industry in the EU would mean eliminating roughly €31.8 billion in cattle and milk products.[42] It would also mean the complete disruption of the agriculture industry. As of 2016, there were over 370,000 specialized cattle-rearing and fattening farms in the EU (excluding the UK).[43] Again, the elimination of cattle farming would mean the unemployment of all full-time employees on these farms and a significant reduction in employment for all part-time employees. The loss of this sector would lead to adverse ripple effects that the complete elimination of the beef industry would have on other industries that are input suppliers to the beef industry.[44] These effects would be especially harsh in countries with the most specialized cattle farms, such as France and Spain.[45]

It should be noted that cattle grazing lands could be used for other purposes, such as crop farming, where farmers and other cattle workers could re-employ themselves. However, this would require significant amounts of time and investments to turn all cattle grazing lands and related farm facilities into ones suitable for crop farming or other economic activities. It is worth mentioning that most of the world's pasture lands cannot grow crops.[46]

Changes to Human Diets

Although this paper primarily focuses on the systemic effects of eliminating EU cattle production, an analysis of the topic would not be complete without understanding its impacts on human diets. Consumption of red meat, both processed and unprocessed, has been linked to an increased risk of death from heart disease, stroke, and diabetes.[47] A recommended diet that promotes overall well-being and low risk of major chronic diseases limits red meat intake, especially processed red meat, and prioritizes protein sources from plants, legumes, nuts, fish, and omega-3 alternatives.[48] Such improvements could be significant considering that, as of 2016, Europeans consumed over 400% of the recommended dietary intake of red meat.[49] Thus, if the elimination of EU cattle production is coupled with an overall reduction in red meat consumption, this shift could improve the average European's health. However, it is essential to note that this shift is not reliant upon the elimination of the EU cattle industry. Diets could shift while cattle production remains

active, but the elimination of the EU cattle industry could serve as a catalyst for such dietary changes.

Is This Sustainable?

In short, the complete elimination of cattle farming in the EU cannot be regarded as a sustainable method for reducing the EU's GHG emissions.

Although it may reduce the EU's total agricultural emissions, such a change may only displace these emissions to countries with less efficient cattle management practices, ultimately resulting in higher global emissions than if the EU raised the cattle themselves. As well, if cattle grazing lands are converted to crop farming or other economic activities, there are significant environmental impacts associated with these land conversions that must be considered. Replacing all animal farming with monoculture farming would decrease the net biodiversity of the planet, which is inherently unsustainable as diversity is invaluable to Earth's ecosystems.[50] Also, switching to a monoculture-only system would force crop farming to rely primarily on synthetic fertilizers (given the reduction in natural fertilizers such as manure), which, aside from their associated nitrous oxide emissions, significantly degrade the quality of topsoil.[51] This degradation is significant because a monoculture farming system that over-relies on synthetic fertilizers could destroy the EU's topsoil so much that those lands can effectively no longer produce food.[52] A food system that systematically degrades its resources to the point where it can no longer produce food is, by definition, unsustainable. A change to other economic activities would also sport their own GHG emissions that must be considered.

The grave impacts that such a reform may have on the environment are not to mention the significant difficulties that would be faced in attempting to meet an ever-increasing global food demand with fewer suppliers. In an already inefficient food system where one-third of global food produced is wasted, removing one of the world's more efficient cattle producers would only place a more tremendous strain on less efficient producers that simply may not be able to account for the rise in global food demands and the demands now posed by EU consumers who can no longer source their cattle products internally.[53] However, this rise in demand may be mitigated by a reduction in meat consumption in European diets. If global food demands cannot be met, and in the context of already rising commodity prices, impoverished people will suffer the most from

food scarcity and malnutrition. A global food system that, by eliminating more-efficient production sources, can no longer produce enough food for the world cannot be said to be sustainable.

In addition, the nearly €32 billion loss of cattle product outputs would be a substantial loss to the EU economy. Although some of these losses could be recuperated over time by converting cattle grazing lands to crop farming or other uses, this does not account for the associated losses from the complete erasure of the beef industry and the losses in industries (e.g. cattle feed, specialized cattle machinery) that serve as input suppliers to the cattle supply chain.[54] Another main issue is the costly feasibility of converting cattle grazing lands into those suitable for crop farming or other economic uses. The elimination of the beef industry and related employment also means the loss of employment for hundreds of thousands of EU workers, many of whom already make relatively low incomes, with the average EU farmer earning roughly €20,000 per year.[55] Thus, eliminating cattle farming in the EU cannot be seen as economically sustainable given the significant losses in revenue and employment that it would cause, with the only way to recuperate these losses requiring considerable time and financial investments.

Potential Other Solutions

The question then begs to be asked, if the elimination of EU cattle farming is unsustainable, what can be done to reduce the environmental impacts of cattle farming in the EU? This primarily comes down to making cattle management more efficient. Boosting livestock productivity (i.e., producing more beef and milk per cow) through better nutrition can effectively reduce the number of cattle necessary to produce the same output.[56] Cattle nutrition can also positively affect how much emissions a single cow produces. Researchers have found that using 1% of seaweed in a cow's diet can reduce their methane emissions by up to 60% without adverse effects on animal health or productivity.[57] Other practices that can help reduce the emissions produced by cattle farming are improved veterinary care, improved grazing management, and improved manure management through methods such as covering tanks that hold semi-solid waste and using digesters that collect manure and turn it into biogas.[58]

Another solution to reducing GHG emissions associated with cattle is by simply consuming fewer cattle products. The 2023 IPCC report has called for a reduction in meat in peoples' diets as a demand-side measure that can reduce ecosystem conversion, reduce methane

and nitrous oxide emissions, and free up land for reforestation and ecosystem restoration.[59] The report calls primarily on citizens of the global north to reduce their consumption, as they are the individuals with the greatest choice and financial ability to change their consumption patterns.[60] Dietary changes could serve to reduce global emissions by 0.7 to 8.0 Gt CO_2 eq/year.[61]

Conclusion

The immediate emissions reductions made by eliminating EU cattle farming cannot be deemed sustainable given the chilling effects that this could have on global food scarcity and malnutrition and the deficits this would cause to both revenues and employment in the EU. Also, when accounting for the increased emissions from other countries that would supplement the beef supply, it is not evident that the elimination of EU cattle farming would result in a net emissions reduction across the globe.

This paper highlights the crucial role that cattle management and dietary change have in addressing the climate crisis and the role of the cattle industry in feeding the planet. It is also important to note the limitations of this paper. This paper does not account for GHG emissions, beyond those directly emitted by cattle, that are more broadly associated with the EU food system. This paper also does not consider how GHG calculations are made or assigned, which countries can manipulate based on their primary emissions use and the emissions accounting systems they use to calculate this. Furthermore, this analysis does not address the feasibility or timeline of eliminating the EU cattle industry. However,, given the unsustainability of this idea, it need not be heavily weighed.

As the climate crisis worsens and global food demand rises, it will be essential that cattle management is made more efficient and less emission-intensive. Given the diversity of climatic and economic conditions across the globe, the question of *how* to improve cattle management will require nuance. A one size fits all solution will simply not be feasible for improving cattle management in developed versus developing versus emerging economies.

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