2025 VOLUME 4 ISSUE 1

FOOD BULLETIN

E-ISSN
2979-9848

PRENSIP

FOOD BULLETIN

2025 ● VOLUME 4 ● ISSUE 1

foodbulletin.net — foodbulletin@hotmail.com
prensip.gen.tr — info@prensip.gen.tr

Food Bulletin is a peer-reviewed scientific journal published by ***Prensip Publishing*** twice a year.
Use of any material hereunder requires a citation to ***Food Bulletin***.

FOOD BULLETIN

2025 ● VOLUME 4 ● ISSUE 1

TABLE OF CONTENTS

REVIEW ARTICLES **Pages**

FOOD BULLETIN
http://foodbulletin.net
e-ISSN: 2979-9848
PRENSIP
https://prensip.gen.tr

REVIEW ARTICLE

The Meat Industry and How It Affects Biodiversity

Selin Ozuesen • Gulen Yildiz Turp✉

Ege University, Faculty of Engineering, Department of Food Engineering, İzmir/Türkiye

ARTICLE INFO

Article History
Received: 22.04.2025
Accepted: 27.06.2025
First Published: 30.06.2025

Keywords
Biodiversity loss
Deforestation
Livestock
Meat industry

ABSTRACT

Biodiversity refers to the variety of life in all ecosystems, including diversity within species, between species, and among ecosystems. Its loss is one of the most critical environmental challenges we face today. The main drivers of biodiversity loss are habitat destruction, overuse of resources, pollution and climate change. The meat industry is one of the leading sectors that have contributed to these negative impacts on biodiversity through land occupation, deforestation, greenhouse gas emissions and intensive use of resources. In order to effectively address the loss of biodiversity, there is an urgent need for integrated solutions that combine policy measures, technological innovations, changes in consumer behavior and global cooperation. Sustainable livestock management, monitoring carbon footprints using life cycle assessment tools, changing feeding habits, implementing sustainable livestock systems, and applying zero deforestation policies are promising strategies for reducing damage to biodiversity. However, despite the potential of these approaches, their implementation faces limitations such as economic barriers, traceability issues, and cultural resistance to changing dietary habits. This paper assesses how the meat industry contributes to biodiversity loss through land use, emissions, and invasive species, emphasizing the environmental effects of livestock farming, and reviews recent policy and technological efforts aimed at mitigation.

Please cite this paper as follows:

Ozuesen, S., & Yildiz Turp, G. (2025). The meat industry and how it affects biodiversity. *Food Bulletin*, *4*(1), 1-11. https://doi.org/10.61326/foodb.v4i1.358

1. Introduction

Biological diversity is defined as "the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Mattas et al., 2023). Biodiversity is a vital component of a healthy and thriving planet. It can be thought of as a complex web in which each species, from the tiniest bacterium to the largest whale, performs a specific function. When we lose biodiversity, we weaken this web, making it more vulnerable to collapse. A diverse ecosystem is more resilient and better able to provide essential needs to humanity. Biodiversity is also essential for food security. A wide range of plant and animal species provides us with food and maintaining genetic diversity within these species is essential for developing livestock that are resistant to disease and climate change (Stange et al., 2021; Muluneh, 2021; Scherer-Lorenzen et al., 2022; Arneth et al., 2023). The primary factors contributing to biodiversity loss include habitat loss and degradation, overexploitation of natural resources, pollution, and climate change (Allen & Hof, 2019). The meat industry plays a pivotal role in shaping environmental and biodiversity outcomes across the globe. Meat production and livestock farming often leads to habitat loss and degradation. It creates environmental consequences, such as

✉ Correspondence
E-mail address: gulen.yildiz.turp@ege.edu.tr

promoting high levels of greenhouse gases. It demands such large amounts of water that it puts pressure on dwindling water resources. It is therefore imperative that we consider the consequences of our meat production and food choices (Machovina et al., 2015). Protecting biodiversity is not just an environmental issue; it's essential for our health, wellbeing and the future of our planet.

2. The Impact of Meat Industry on Biodiversity

2.1. The Production of Livestock and Its Ecological Implications

The meat industry is responsible for about 14.5% of global greenhouse gas emissions, releasing approximately 7.1 gigatons of CO_{2e} annually (Raihan, 2023). Livestock production is a major source of potent greenhouse gases such as methane and nitrous oxide, which contribute significantly to climate change. In addition, the storage and spreading of manure from these animals generates greenhouse gas emissions (Grossi et al., 2019). Due to greenhouse gases, the flux of long-wave radiation reaching the Earth's surface increases, which raises the surface temperature. As the surface temperature rises, the rate of evaporation increases, accelerating our planet's water cycle. In the tropics and mid- to high-latitude regions, precipitation increases much more than evaporation, which can lead to increased flood frequency. Conversely, in many arid and semiarid regions, precipitation decreases, and soil moisture is lost, leading to increased drought frequency. Changes in the patterns of seasonal precipitation and runoff will alter the hydrological characteristics of aquatic systems, affecting species composition and ecosystem productivity. Aquatic organisms exhibit sensitivity to alterations in the frequency, duration, and timing of extreme weather events. Precipitation events, including floods and droughts, have been demonstrated to exert an influence on populations of aquatic organisms. These changes also affect water availability on the terrestrial surface. Significant portion of emitted CO_2 dissolves in the ocean water releasing carbonic acid which increases the acidity of the sea water. For instance, rising acidification of the sea water causes a negative effect on crustaceans. The external skeletons of crustaceans are composed of aragonite, a prevalent form of calcium carbonate, which is capable of dissolution in acidic seawater (Manabe, 2019; Prakash, 2021; Shivanna, 2022). The practice of fish aquaculture demands substantial quantities of feed, thereby exerting significant pressure on terrestrial ecosystems, and concurrently generating nutrient emissions from manure and feed spills, with the potential to result in water eutrophication (Crenna et al., 2019). Livestock production is responsible for the consumption of 29% of the world's agricultural water resources, to meet the nutritional requirements of the animals (Lahlou et al., 2021). Table 1 summarizes the human activities involved in breeding different animals and their impact on biodiversity.

Table 1. Relationship between meat production, human interventions and the impact on biodiversity.

Animal	Impacts Generated by Human Interventions	Impact on Biodiversity
Dairy calves	Vegetation clearance and modification altered grazing regimes	Low impact: dairy calves do not graze intensively.
Beef cattle	Large-scale deforestation, overgrazing, methane emissions, habitat loss	High impact; significant land use change and greenhouse gas emissions.
Sheep	Overgrazing, soil erosion, vegetation modification, fencing limiting wildlife movement	Moderate to high impact; especially in fragile ecosystems like grasslands.
Pigs	Land clearance for feed crops (soy, maize), water pollution from manure, habitat fragmentation	Moderate impact: concentrated feedlots and feed production are key concerns.
Poultry	Intensive farming, high feed demand (grains, soy), waste generation, high energy use	Lower land use per kg meat, but indirect pressures from feed crop production can affect biodiversity.
Wild deer	Minimal human intervention when wild-harvested; if farmed, may involve fencing and localized habitat alteration	Low impact when sustainably hunted; moderate if intensively farmed.
Bison	Semi-wild grazing, potential to restore prairie ecosystems if managed ecologically	Can have positive impact; supports biodiversity when managed as part of regenerative systems.

(van Zanten et al., 2019; Clark et al., 2020; Crippa et al., 2021; Springmann et al., 2021)

2.2. Land Use & Deforestation

Meat production has a significant impact on land occupation; for example, beef requires 30 million square kilometers of land to produce, while pork and poultry each require less than two million square kilometers (IATP, 2018). The correlation between the meat industry and biodiversity loss is exemplified by numerous case studies, which underscore the substantial impacts of land-use practices associated with livestock production. A notable example is evident in South Africa, where grazing practices represent the primary catalyst for land-use modification, resulting in substantial biodiversity losses (Slayi et al., 2024). This phenomenon is characterized by both consumption and production patterns, with significant declines in potential per capita plant loss observed across the region. The demand for meat products in more industrialized countries has been identified as a key driver of environmental degradation in biodiversity hotspots (Sun et al., 2022). Colombia offers a further critical case study in understanding biodiversity loss associated with the meat industry. In this context, livestock-related land use contributes to the largest consumption-related losses within Key Biodiversity Areas, as extensive pastures often displace rich, diverse ecosystems. The widespread impacts of livestock production not only endanger local species but also intensify soil erosion and habitat fragmentation. Indonesia is a pertinent example of production-based impacts resulting from forest management practices for cattle grazing and fodder crops. The region is experiencing a profound decline in biodiversity due to massive deforestation, which is disrupting the habitats of both terrestrial and aquatic species (González-González et al., 2021; Shaihk, 2021; Castro-Nunez et al., 2021; Negret et al., 2021). The Brazilian domestic market accounts for a larger share of beef production and therefore of deforestation risk. However, according to Zu Ermgassen et al. (2020), it is important to note that export markets are also increasingly sourcing from regions at higher risk of deforestation. Zero deforestation commitments made by some Brazilian slaughterhouses cover a significant portion of exports in the Amazon region but have not fully eliminated deforestation risk due to partial implementation, lack of tracking of indirect suppliers, and limited geographic coverage (Zu Ermgassen et al., 2020). This underscores the urgent need for targeted conservation efforts to address the adverse impacts of the meat industry on global biodiversity.

2.3. Invasive Species

The symbiotic relationship between the meat industry and invasive species poses significant challenges to biodiversity, presenting a complex web of ecological interactions driven largely by agricultural practices. The expansion of livestock production has facilitated the spread of both intentional and unintentional invasive species, which can disrupt local ecosystems. Domestically produced beef for instance, represents substantial land use that not only threatens native vegetation but also creates habitat for invasive flora and fauna. These species often outcompete native organisms for resources, subsequently leading to a decline in biodiversity (Sesay et al., 2024). In regions such as the southern United States and South America, for instance, the proliferation of wild boars (*Sus scrofa*) has been intensified by land conversion for livestock grazing. These animals have been shown to thrive in disturbed landscapes, where they compete with native species, trample vegetation, and spread disease, all of which is indirectly supported by the agricultural conditions created for beef production (Bevins et al., 2014). Similarly, in northern Australia, pastures cleared for cattle have created ideal breeding grounds for cane toads *(Rhinella marina*), a species originally introduced to control beetles in sugarcane fields, but which has now expanded into grazing lands. These toxic amphibians have devastated populations of native carnivores such as monitor lizards and snakes, further illustrating the ecological consequences tied to meat production systems (Pettit et al., 2021). These examples highlight the complex and frequently overlooked relationship between livestock agriculture, the demand for meat, and biological invasions.

3. Solution Suggestions

3.1. Tracking Carbon Footprint

The term "carbon footprint" refers to the total volume of greenhouse gas (GHG) emissions that are produced directly and indirectly by a specific individual, organization, event, or product. A multitude of greenhouse gases (GHGs) have been identified, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons and sulfur hexafluoride, among others. Among these gases, CO_2 is the predominant contributor because its emission rate is higher than that of other gases. The monitoring of CF values can serve as a catalyst for both companies and local authorities to initiate action. Life cycle assessment (LCA) is a tool used to evaluate the potential environmental impact of a product throughout its life cycle (Finnveden & Potting, 2014). Expanding the use of tools such as LCA within the meat sector can be applied to identify opportunities to improve the environmental performance of systems. As showed in Table 1, some example studies have employed the life cycle assessment (LCA) method to assess the carbon footprint of meat products.

The Global Livestock Environmental Assessment Model (GLEAM), developed by the FAO, is a robust tool used to evaluate the ecological footprint of livestock value chains. GLEAM quantifies the use of natural resources in the livestock sector using a life cycle assessment approach. It provides estimates of methane, carbon dioxide and nitrous oxide emissions at various stages of production (Global Livestock Environmental Assessment Model, 2025). There are many farm-scale process simulation models that help estimate greenhouse gas emissions and footprints. The DairyGEM, FarmAC, DairyWise, and Holos models use simple data and process-based information for this estimation. These whole-farm tools help farmers and decision-makers understand their farms' environmental impact and develop effective emission reduction strategies. Such tracking systems are currently used on many dairy farms, but they have not become widespread in other livestock activities or in the breeding of beef cattle (Samad et al., 2025). The development of models that monitor GHS emissions on farms and production lines, and that calculate ecological footprints, represents a valuable strategy for reducing the environmental impact of the meat industry. The data from these models will be important tools in understanding the impact of the meat sector on biodiversity.

Table 2. Studies on CF calculations conducted in different countries using the LCA method.

Country	Calculated Area	Product	Scope	Related Standards	CF value	Main source of emissions	Reference
Poland	Industrial meat production	Pork	Scope 1 & 2	IPCC Climate Change Report 2023, GHG Protocol, ISO 14040 (ISO 14040, 2009) and ISO 14044 (ISO 14044, 2009)	**0.497 kg CO_{2eq}/kg product**	Indirect emissions (electricity consumption)	Wróbel-Jędrzejewska et al. (2025)
China	Household consumption	Seafood species	Scope 1 & 2 & 3	PAS 2050	Fish: Max: **4.8103 kgCO_{2eq}/kg** Min: **4.2833 kgCO_{2eq}/kg** Shrimp: Max: **4.6731 kgCO_{2eq}/kg** Min: **4.1657 kgCO_{2eq}/kg**	Breeding And Cooking Process Parameters	Li et al. (2024)
New Zealand	Exported	Beef and Sheep	Scope 1 & 2 & 3	ISO 14040:2006 ISO 14044:2006	Beef exported to USA: **22.08 kgCO_{2eq}/kg meat** Sheep exported to USA: **14.62 kgCO_{2eq}/kg meat**	Animal-sourced (enteric methane — CH_4) Excreta nitrous oxide (N_2O).	Mazzetto et al. (2023)

Pricing policies are political processes that global authorities discuss in order to reduce greenhouse gas emissions, particularly carbon emissions. A carbon tax or carbon price taxes a product or process directly in proportion to its greenhouse gas emissions, measured in metric tons of carbon dioxide equivalent (tCO_{2e}), based on the principle that the polluter should pay. A carbon border tax is a tax applied based on the carbon footprint of imported products. The goal is to align the carbon costs of imported products with those of domestic producers and prevent "carbon leakage". This way, precaution is taken against countries that do not have a carbon pricing system (Eslamipoor & Sepehriyar, 2024; Hua et al., 2024). These pricing policies have the potential to reduce carbon footprints by prompting companies to prioritize the management of their carbon emissions.

3.2. Changing Dietary Patterns

The production of meat has been shown to have an environmental impact that is up to 100 times greater than that of a plant-based diet, which contributes to greenhouse gas emissions, deforestation, and water depletion (Rust et al., 2020). Recent studies have shown that some dietary patterns are based on four health and nutritional sustainability advantages: low environmental impact, rich biodiversity, high socio-cultural food values, and positive local economic returns (Mazzocchi et al., 2019). For instance, poultry meat produces 4000 g/kg of CO_2, whereas seasonal vegetables produce 815 g/kg of CO_2. Vegetables and fruits require less than 1000 L of water and about 3 m2 /kg, whereas beef needs about 19,000 L and 144 m2 /kg (Truzzi et al., 2020). The Mediterranean dietary pattern, being a mostly plant-based diet, which include less meat products, can protect the environment from further losses and can therefore play an important role in supporting biodiversity (Tucci et al., 2021). A reduction in the driving forces affecting biodiversity can be achieved through the modification of dietary habits on a daily basis and the regulation of meat consumption in light of its environmental impact. Table 3 explain the differences in diet and impact on land, water and carbon footprint. Of the three dietary patterns, the Mediterranean diet exhibited the lowest values: 14.8 m^2/day of land use, 2,500 L/day of water use, and 3.9 kg CO_2e/day. The Western diet demonstrated the highest values for all of these.

Table 3. Different human diets and their effects on land use, water use and carbon footprint.

Diet Type	Main foods consumed	Land use (m^2/day)	Water use (L/day)	Carbon footprint (kg CO_{2eq}/day)
Mediterranean	Fruits, vegetables, legumes, whole grains, olive oil; moderate fish consumption, low meat intake	14.80	~2,500	~3.9
Western	Processed foods, refined grains, meat and meat products	33.15	~5,000	~6.8
European	Dairy products, meats, grains; reflects local agricultural practices	25.11	~3,800	~5.5

(Mazzocchi et al., 2019; Lorgeril et al., 2020; Belgacem et al., 2021; Eustachio Colombo et al., 2021; Ridoutt et al., 2017)

3.3. Sustainable Livestock Practices

An important step in reducing the main drivers of biodiversity loss is developing more efficient, resource-conserving animal production systems with the help of scientific development. This includes sustainable animal husbandry, organic practices, and certification. There is an urgent need to identify and document Nationally Appropriate Mitigation Actions (NAMA) in the livestock sector. These actions have the potential to significantly reduce greenhouse gas emissions and promote the resilience of rural communities that depend on livestock for their livelihoods (van Dijk et al., 2015). Fostering collaboration and research on bonding policy frameworks can bridge the gap between the aspiration for sustainable livestock practices and their practical implementation. This approach can ultimately conserve biodiversity while meeting the global demand for meat (Ruane & Restrepo, 2024).

On the positive side, livestock contributes to the health and fertility of soil and grasslands. Additionally, some grassland systems have the potential to offset global emissions through biomass (Zubieta et al., 2021). Grazing plays a critical role in maintaining these semi-natural grasslands. Semi-natural grasslands require continuous livestock grazing or traditional haying methods to maintain their biodiversity. The cessation of grazing is predicted to result in the disappearance of species-rich areas, leading to high extinction rates of plants, insects and fungi. The meat sector, therefore, has an important role to play in maintaining important biodiversity, particularly in traditional agricultural landscapes, through sustainable grazing practices (Eriksson, 2021). The debate on grass-fed versus grain-fed beef production is a critical aspect of understanding environmental impact. Grass-fed cattle typically roam on pastures, receiving their nutrients from natural forage. In contrast, grain-fed cattle are often housed in confined animal feeding operations (CAFOs) where they are fed a diet primarily consisting of grains such as corn and soy. This dietary distinction has profound implications for the environmental footprint of beef production. Studies indicate that grass-fed systems may have a lower carbon footprint over their lifespan due to improved soil health and carbon sequestration practices associated with regenerative grazing techniques (Caradus et al., 2024). Although the transition of livestock to grazing systems can synergize with the accretion of soil and grassland biomass, it typically antagonizes indigenous biodiversity (Moran & Blair, 2021).

Nieto et al. (2018) investigated greenhouse gas emissions originating from beef production on farms located in Argentina's semi-arid rangelands. Using statistical methods, they explored how these emissions are influenced by current farm management practices. The study emphasizes that enhancing production efficiency plays a key role in promoting environmental sustainability within the livestock sector. Their analysis revealed that farms implementing improved animal husbandry, rotational grazing systems, and benefiting from technical support exhibited lower emission levels per unit of product. According to the findings of the meta-analysis by Gérard (2025) the smallest recorded carbon footprint value was 9.48 kilograms of CO_{2eq} per kilogram of live weight, while the largest value was 27.30 kilograms of CO_{2eq}. Study emphasized that the reason for this difference is nutrition and feed type. A 10% increase in the amount of grazing in cattle diets has been shown to increase the carbon footprint by 0.85 kg CO_{2eq} per kg of live weight while 10% increase in straw intake has been shown to cause an increase of 1.2 kg CO_{2eq} per kg of live weight (Gérard, 2025).

Using agricultural by-product's that are not suitable for human consumption as part of livestock feed is one method considered to improve the environmental sustainability of livestock production., Using olive byproducts in ruminants' diets reduces production costs and mitigates the environmental burden. Additionally, an improvement in the nutritional value of the derived products is observed (Tzamaloukas et al., 2021). A variety of mitigation strategies have been proposed to reduce enteric methane emissions. These strategies include, but are not limited to, modifications of diet, vaccinations, chemical additives, and genetic selection (Samad et al., 2025). As stated in the review by Pinotti et al. (2021), the utilization of former food products (FFPs) and bakery by-products (BBPs) as animal feed is an important subject of sustainable feeding studies. The findings of the research indicate that the utilization of food losses as sustainable ingredients in feed formulations presents a promising alternative to cereal grains for both monogastric and ruminants. This approach enhances the sustainability of livestock production while reducing competition between animal and human nutrition.

3.4. Zero Deforestation Policies

Zero deforestation policies aim to stop the conversion of natural forests for agriculture or other land uses, and are particularly critical in the meat sector, where livestock production and the cultivation of feed crops (such as soy) are major drivers of forest loss, especially in tropical areas such as the Amazon. Cattle-driven deforestation threatens not only the integrity of the Amazon biome, but also the global climate (Levy et al., 2023). Several public and private sector initiatives have emerged to promote zero deforestation in the meat sector. In Brazil, the 2012 Forest Code requires landowners in the Amazon to conserve 80% of their forest cover (Seymour & Harris, 2019). Major meatpackers have made zero deforestation commitments, pledging not to source cattle from recently deforested lands, particularly under the G4 Agreement (Heilmayr et al., 2020). European Union introduced the EU Deforestation Regulation (EUDR) in 2023, which prohibits the import of products such as beef and soy unless they are certified as deforestation-free and legally produced (European Union, 2023).

4. Limitations

While each of the investigated solutions is intended to be implemented in different ways, various restrictions in practice have been identified.

Carbon pricing solutions are currently widely supported for implementation within green policy frameworks, there are negative aspects that must be considered. Carbon tax would increase the prices of goods and services that are carbon-intensive, such as fuel, electricity, and certain consumer products. People with lower incomes generally spend a larger proportion of their income on basic consumption (such as heating, transportation, and food), all of which often involve carbon emissions. In contrast, higher-income individuals are more likely to save or invest part of their income, which may not be directly affected by the carbon tax. Lower-income households often cannot afford the upfront costs of cleaner, energy-efficient technologies, such as electric vehicles, solar panels, or better-insulated housing. For these reasons, a flat carbon tax disproportionately affects low-income households. While carbon taxes have the potential to reduce emissions, they can exacerbate income inequality if support measures are not in place, such as rebates, targeted assistance for lower-income groups or progressive income taxation (Dietsch, 2024; Gokhale, 2021).

In order to reduce the meat sector's impact on biodiversity, it is essential to implement sustainable livestock farming practices. A significant challenge that must be addressed is the cost of implementing sustainable livestock practices. It is crucial to create accessible resources and develop support policies to reach farmers with limited resources. In many societies, women in smallholder structures are responsible for food processing and producing meat products. Empowering women and innovating women's education have positively changed household diets and nutrition in some rural communities. However, many rural regions still have low levels of women's education and awareness of sustainability. In order to increase sustainable practices in underdeveloped areas, the education of women must be prioritized (Akash et al., 2022).

Changing dietary habits is challenging because they are deeply intertwined with cultural, social, and psychological factors. Studies show that people's daily dietary preferences are influenced by various factors, including automaticity of habits, taste, accessibility, and social environment, as well as individual consciousness and environmental concerns (Dagevos & Verbeke, 2022). A meta-analysis by Cheng et al. (2024) demonstrated that consumers' intention to purchase green food (food with a reduced environmental impact or that is labeled as sustainable) is positively influenced by eight key factors, including environmental and health awareness, green attitudes, knowledge about green products, social norms, price sensitivity, perceived behavioral control, and perceived usefulness. When it comes to deep-rooted habits such as meat consumption, behavioral change can be limited even when environmental and health benefits are known (Hartmann & Siegrist, 2017). An experiment conducted by Hughes et al. (2023) among meat eaters in the UK found that a pictorial warning label on a meal containing meat significantly reduced the choice of meat meal compared to an unlabeled control group. Climate change labels reduced the choice of meat consumption by 7.4%. Kukowski et al. (2023) found evidence that people who individually support reducing climate change are more likely to support policies that reduce meat consumption. As a result, concern about climate change and environment was identified as a persuasive factor in switching to alternatives. To influence people to change their food choices and dietary habits, consumption advertising campaigns, environmental education, promote Mediterranean diet's positive sides can be beneficial tools. Modified portion sizes and the use of alternative menu options promote diets with a smaller environmental impact, such as flexitarian, vegetarian, and vegan lifestyles can make effective changes (Moran & Blair, 2021). Although the environment can be an effective motivator for changing eating habits, overcoming cultural influences and past experiences is still not easy.

Zero deforestation policies (ZDC) initiatives aim to protect forests around the world, especially the Amazon. However, challenges remain in terms of implementation and traceability (Vallim & Leichsenring, 2025). Smallholder farmers' capacity to adapt to Zero-deforestation policies is constrained by several factors. These include limited education, financial constraints, uncertain land ownership. This dynamic has the potential to exclude producers with limited financial and educational capacity, thereby exacerbating existing inequalities in rural land use, livelihoods, and poverty rates (Grabs et al., 2021). However, a meta-analysis by Busch and Ferretti-Gallon (2023) indicated that deforestation is associated with greater accessibility of land (e.g., slope areas affected less) and higher economic returns from agriculture, livestock, and timber, as well as not associated with the level of deforestation, education, and gender (Busch & Ferretti-Gallon, 2023). It is imperative to identify the fundamental factors influencing the efficiency of ZDC through the findings of more extensive research.

Verifying, monitoring, auditing, and reporting are essential to reducing deforestation through ZDCs. This requires traceability, or knowing product origins, and transparency, or sharing this information, across supply chains. Although tools like satellite monitoring, Trase data, the Internet of Things (IoT), and blockchain technology support this, they are not ideal or complete solutions. While the palm oil sector is making progress toward transparent zero deforestation policies, the meat sector is still falling behind (Bager et al., 2022; Bager & Lambin, 2022).

5. Conclusion

The meat industry faces an unprecedented challenge: meeting the demand for animal protein while reducing resource use and impact on biodiversity. This issue is closely linked to processes such as habitat destruction for animal feed production, increased greenhouse gas emissions, and water pollution. Meat production exerts profound impacts on ecosystems through land use and deforestation (particularly due to the extensive land required for cattle farming), greenhouse gas emissions (notably the release of potent gases such as methane and nitrous oxide), and the spread of invasive species (resulting from agricultural activities that disrupt natural habitats). Various solutions have been proposed to mitigate these negative impacts. Among these are the widespread adoption of carbon footprint monitoring tools by companies and local authorities to improve environmental performance, using instruments such as Life Cycle Assessment (LCA) and the Global Livestock Environmental Assessment Model (GLEAM), as well as the implementation of pricing policies like carbon taxes. Furthermore, promoting dietary shifts towards plant-based or Mediterranean diets, alongside sustainable livestock practices (including resource-efficient systems, organic farming, Nationally Appropriate Mitigation Actions (NAMAs), pasture management, and the use of food waste in animal feed), holds significant potential for alleviating pressure on biodiversity. Zero-deforestation policies also play a critical role by preventing the conversion of forests into agricultural or other land uses. However, the implementation of these solutions faces notable limitations. Carbon pricing mechanisms may disproportionately affect low-income households, exacerbating income inequality. The high costs of sustainable livestock practices and the difficulty of reaching farmers with limited resources present considerable challenges. Moreover, altering dietary habits is hindered by cultural, social, and psychological barriers, such as deeply rooted traditions and taste preferences. In addition, the full implementation of zero-deforestation commitments remains problematic due to shortcomings in monitoring indirect suppliers and geographic coverage limitations. Socio-economic dilemmas also arise, such as the unequal distribution of sustainability benefits among communities and the threat that reducing demand for animal products may pose to local economies. Despite these challenges, robust and effective government policies and corporate initiatives are essential for conserving biodiversity and reducing the environmental impacts of the meat sector. It is necessary to approach habitat conservation as a complex system encompassing the interactions among all living components. Existing initiatives, such as current zero-deforestation commitments and the European Union's "Farm to Fork" strategy, represent important steps; however, shortcomings in implementation must be addressed. To strengthen future actions, it is crucial to better define the boundaries of comprehensive changes aimed at biodiversity conservation, to explore their implementation through multidisciplinary teams from different perspectives, and to enhance overall awareness. As consumer awareness of the environmental impacts of food choices increases, demand for sustainable meat production is expected to continue driving innovation within the meat industry. At the same time, the overall impact of production systems on biodiversity must be thoroughly assessed. In this context, the development, implementation, and systematic monitoring of national policies are of great importance.

Compliance with Ethical Standards

This study does not involve the use of animals or animal experimentation. Therefore, no specific ethical approval was required regarding animal welfare.

Conflict of Interest

The authors declare no conflict of interest.

References

Akash, M. H., Mondal, S., & Adusumilli, S. (2022). Sustainable livestock production and food security. In S. Mondal & R. L. Singh (Eds.), *Emerging issues in climate smart livestock production* (pp. 71-90). Academic Press. https://doi.org/10.1016/B978-0-12-822265-2.00011-9

Allen, A. M., & Hof, A. R. (2019). Paying the price for the meat we eat. *Environmental Science and Policy*, *97*, 90-94. https://doi.org/10.1016/j.envsci.2019.04.010

Arneth, A., Leadley, P., Claudet, J., Coll, M., Rondinini, C., Rounsevell, M. D. A., Shin, Y. J., Alexander, P., & Fuchs, R. (2023). Making protected areas effective for biodiversity, climate and food. *Global Change Biology*, 29(14), 3883-3894. https://doi.org/10.1111/gcb.16664

Bager, S. L., & Lambin, E. F. (2022). How do companies implement their zero-deforestation commitments. *Journal of Cleaner Production*, *375*, 134056. https://doi.org/10.1016/j.jclepro.2022.134056

Bager, S. L., Singh, C., & Persson, U. M. (2022). Blockchain is not a silver bullet for agro-food supply chain sustainability: Insights from a coffee case study. *Current Research in Environmental Sustainability*, *4*, 100163. https://doi.org/10.1016/j.crsust.2022.100163

Belgacem, W., Mattas, K., Arampatzis, G., & Baourakis, G. (2021). Changing dietary behavior for better biodiversity preservation: A preliminary study. *Nutrients*, *13*(6), 2076. https://doi.org/10.3390/nu13062076

Bevins, S. N., Pedersen, K., Lutman, M. W., Gidlewski, T., & Deliberto, T. J. (2014). Consequences associated with the recent range expansion of nonnative feral swine. *BioScience*, *64*(4), 291-299. https://doi.org/10.1093/biosci/biu015

Busch, J., & Ferretti-Gallon, K. (2023). What drives and stops deforestation, reforestation, and forest degradation? An updated meta-analysis. *Review of Environmental Economics and Policy*, *17*(2), 217-250.

Caradus, J. R., Chapman, D. F., & Rowarth, J. S. (2024). Improving human diets and welfare through using herbivore-based foods: 1. Human and animal perspectives. *Animals*, *14*(7), 1077. https://doi.org/10.3390/ani14071077

Castro-Nunez, A., Buritica, A., Gonzalez, C., Villarino, E., Holmann, F., Perez, L., ... & Quintero, M. (2021). The risk of unintended deforestation from scaling sustainable livestock production systems. *Conservation Science and Practice*, *3*(9), e495. https://doi.org/10.1111/csp2.495

Cheng, L., Cui, H., Zhang, Z., Yang, M., & Zhou, Y. (2024). Study on consumers' motivation to buy green food based on meta-analysis. *Frontiers in Sustainable Food Systems*, *8*, 1405787. https://doi.org/10.3389/fsufs.2024.1405787

Clark, M. A., Domingo, N. G. G., Colgan, K., Thakrar, S. K., Tilman, D., Lynch, J., Azevedo, I. L., & Hill, J. D. (2020). Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*, *370*(6517), 705–708. https://doi.org/10.1126/science.aba7357

Crenna, E., Sinkko, T., & Sala, S. (2019). Biodiversity impacts due to food consumption in Europe. *Journal of Cleaner Production*, *227*, 378-391. https://doi.org/10.1016/j.jclepro.2019.04.054

Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F. N., & Leip, A. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, *2*(3), 198-209. https://doi.org/10.1038/s43016-021-00225-9

Dagevos, H., & Verbeke, W. (2022). Meat consumption and flexitarianism in the Low Countries. *Meat Science*, *192*, 108894. https://doi.org/10.1016/j.meatsci.2022.108894

Dietsch, P. (2024). A fairer and more effective carbon tax. *Nature Sustainability*, *7*, 1584-1591. https://doi.org/10.1038/s41893-024-01429-0

Eriksson, O. (2021). The importance of traditional agricultural landscapes for preventing species extinctions. *Biodiversity and Conservation*, *30*, 1341-1357. https://doi.org/10.1007/s10531-021-02145-3

Eslamipoor, R., & Sepehriyar, A. (2024). Promoting green supply chain under carbon tax, carbon cap and carbon trading policies. *Business Strategy and the Environment*, *33*(5), 4901-4912. https://doi.org/10.1002/bse.3721

European Union. (2023). Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation, and repealing Regulation (EU) No 995/2010. *Official Journal of the European Union*, *L 150*, 206–247. https://eur-lex.europa.eu/eli/reg/2023/1115/oj

Eustachio Colombo, P., Milner, J., Scheelbeek, P. F. D., Taylor, A., Parlesak, A., Kastner, T., Nicholas, O., Elinder, L. S., Dangour, A. D., & Green, R. (2021). Pathways to "5-a-day": Modeling the health impacts and environmental footprints of meeting the target for fruit and vegetable intake in the United Kingdom. *The American Journal of Clinical Nutrition*, *114*(2), 530-539. https://doi.org/10.1093/ajcn/nqab076

Finnveden, G., & Potting, J. (2014). Life cycle assessment. In P. Wexler (Ed.), *Encyclopedia of toxicology* (pp. 74-77). Academic Press. https://doi.org/10.1016/B978-0-12-386454-3.00627-8

Gérard, M. (2025). Cattle diet and the carbon footprint of beef: A meta-analysis. Retrieved Jun 24, 2025, from https://chair-energy-prosperity.org/wp-content/uploads/2025/02/2025_Cattle-diet-and-the-carbon-footprint-of-beef_WP.pdf

Global Livestock Environmental Assessment Model. (2025). *What is GLEAM?* https://www.fao.org/gleam/en/

Gokhale, H. (2021). Japan's carbon tax policy: Limitations and policy suggestions. *Current Research in Environmental Sustainability*, *3*, 100082. https://doi.org/10.1016/j.crsust.2021.100082

González-González, A., Villegas, J. C., Clerici, N., & Salazar, J. F. (2021). Spatial-temporal dynamics of deforestation and its drivers indicate need for locally-adapted environmental governance in Colombia. *Ecological Indicators*, *126*, 107695. https://doi.org/10.1016/j.ecolind.2021.107695

Grabs, J., Cammelli, F., Levy, S. A., & Garrett, R. D. (2021). Designing effective and equitable zero-deforestation supply chain policies. *Global Environmental Change*, *70*, 102357. https://doi.org/10.1016/j.gloenvcha.2021.102357

Grossi, G., Goglio, P., Vitali, A., & Williams, A. G. (2019). Livestock and climate change: Impact of livestock on climate and mitigation strategies. *Animal Frontiers*, *9*(1), 69-76. https://doi.org/10.1093/af/vfy034

Hartmann, C., & Siegrist, M. (2017). Consumer perception and behaviour regarding sustainable protein consumption: A systematic review. *Trends in Food Science & Technology*, *61*, 11–25. https://doi.org/10.1016/J.TIFS.2016.12.006

Heilmayr, R., Rausch, L. L., Munger, J., & Gibbs, H. K. (2020). Brazil's Amazon soy moratorium reduced deforestation. *Nature Food*, *1*(12), 801-810. https://doi.org/10.1038/s43016-020-00194-5

Hua, J., Wang, K., Lin, J., & Qian, Y. (2024). Carbon Tax vs. Carbon Cap-and-Trade: Implementation of carbon border tax in cross-regional production. *International Journal of Production Economics*, *274*, 109317. https://doi.org/10.1016/j.ijpe.2024.109317

Hughes, J. P., Weick, M., & Vasiljevic, M. (2023). Impact of pictorial warning labels on meat meal selection: A randomised experimental study with UK meat consumers. *Appetite*, *190*, 107026. https://doi.org/10.1016/j.appet.2023.107026

IATP. (2018). *Emissions impossible: How big meat and dairy are heating up the planet*. https://grain.org/en/article/5976-emissions-impossible-how-big-meat-and-dairy-are-heating-up-the-planet

Kukowski, C. A., Bernecker, K., Nielsen, K. S., Hofmann, W., & Brandstätter, V. (2023). Regulate me! Self-control dissatisfaction in meat reduction success relates to stronger support for behavior-regulating policy. *Journal of Environmental Psychology*, *85*, 101922. https://doi.org/10.1016/j.jenvp.2022.101922

Lahlou, F. Z., Mackey, H. R., & Al-Ansari, T. (2021). Wastewater reuse for livestock feed irrigation as a sustainable practice: A socio-environmental-economic review. *Journal of Cleaner Production*, *294*, 126331. https://doi.org/10.1016/j.jclepro.2021.126331

Levy, S. A., Cammelli, F., Munger, J., Gibbs, H. K., & Garrett, R. D. (2023). Deforestation in the Brazilian Amazon could be halved by scaling up the implementation of zero-deforestation cattle commitments. *Global Environmental Change*, *80*, 102671. https://doi.org/10.1016/j.gloenvcha.2023.102671

Li, H., Hu, S., & Tong, H. (2024). Carbon footprint of household meat consumption in China: A life-cycle-based perspective. *Applied Geography*, *169*, 103325. https://doi.org/10.1016/j.apgeog.2024.103325

Lorgeril, M., Salen, P., & Zalvan, C. H. (2020). The mediterranean diet: A healthy diet for the modern times. In C. H. Zalvan (Ed.), *Laryngopharyngeal and gastroesophageal reflux* (pp. 409-434). Springer. https://doi.org/10.1007/978-3-030-48890-1_40

Machovina, B., Feeley, K. J., & Ripple, W. J. (2015). Biodiversity conservation: The key is reducing meat consumption. *Science of the Total Environment*, *536*, 419-431. https://doi.org/10.1016/j.scitotenv.2015.07.022

Manabe, S. (2019). Role of greenhouse gas in climate change. *Tellus, Series A: Dynamic Meteorology and Oceanography*, *71*(1), 1620078. https://doi.org/10.1080/16000870.2019.1620078

Mattas, K., Raptou, E., Alayidi, A., Yener, G., & Baourakis, G. (2023). Assessing the interlinkage between biodiversity and diet through the mediterranean diet case. *Advances in Nutrition*, *14*(3), 570-582. https://doi.org/10.1016/j.advnut.2023.03.011

Mazzetto, A. M., Falconer, S., & Ledgard, S. (2023). Carbon footprint of New Zealand beef and sheep meat exported to different markets. *Environmental Impact Assessment Review*, *98*, 106946. https://doi.org/10.1016/j.eiar.2022.106946

Mazzocchi, A., Leone, L., Agostoni, C., & Pali-Schöll, I. (2019). The secrets of the mediterranean diet. Does [only] olive oil matter? *Nutrients*, *11*(12), 2941. https://doi.org/10.3390/nu11122941

Moran, D., & Blair, K. J. (2021). Revies: Sustainable livestock systems: Anticipating demand-side challenges. *Animal*, *15*(Supplement 1), 100288. https://doi.org/10.1016/j.animal.2021.100288

Muluneh, M. G. (2021). Impact of climate change on biodiversity and food security: A global perspective—a review article. *Agriculture and Food Security*, *10*, 36. https://doi.org/10.1186/s40066-021-00318-5

Negret, P. J., Maron, M., Fuller, R. A., Possingham, H. P., Watson, J. E., & Simmonds, J. S. (2021). Deforestation and bird habitat loss in Colombia. *Biological Conservation*, *257*, 109044. https://doi.org/10.1016/j.biocon.2021.109044

Nieto, M. I., Barrantes, O., Privitello, L., & Reiné, R. (2018). Greenhouse gas emissions from beef grazing systems in semi-arid rangelands of central Argentina. *Sustainability*, *10*(11), 4228. https://doi.org/10.3390/su10114228

Pettit, L., Crowther, M. S., Ward-Fear, G., & Shine, R. (2021). Divergent long-term impacts of lethally toxic cane toads (*Rhinella marina*) on two species of apex predators

(*Varanus spp*.). *PLoS ONE*, *16*(7), e0254032. https://doi.org/10.1371/journal.pone.0254032

Pinotti, L., Luciano, A., Ottoboni, M., Manoni, M., Ferrari, L., Marchis, D., & Tretola, M. (2021). Recycling food leftovers in feed as opportunity to increase the sustainability of livestock production. *Journal of Cleaner Production*, *294*, 126290. Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2021.126290

Prakash, S. (2021). Impact of climate change on aquatic ecosystem and its biodiversity: An overview. *International Journal of Biological Innovations*, *3*(2), 312-317. https://doi.org/10.46505/ijbi.2021.3210

Raihan, A. (2023). The influence of meat consumption on greenhouse gas emissions in Argentina. *Resources, Conservation & Recycling Advances*, *19*, 200183. https://doi.org/10.1016/j.rcradv.2023.200183

Ridoutt, B. G., Hendrie, G. A., & Noakes, M. (2017). Dietary strategies to reduce environmental impact: A critical review of the evidence base. *Advances in Nutrition*, *8*(6), 933-946. https://doi.org/10.3945/an.117.016691

Ruane, J., & Restrepo, L. (2024). *Proceedings of the FAO global conference on sustainable livestock transformation: 25-27 September 2023*. Food & Agriculture Organization.

Rust, N. A., Ridding, L., Ward, C., Clark, B., Kehoe, L., Dora, M., ... & West, N. (2020). How to transition to reduced-meat diets that benefit people and the planet. *Science of the Total Environment*, *718*, 137208. https://doi.org/10.1016/j.scitotenv.2020.137208

Samad, H. A., Kumar Eshwaran, V., Muquit, S. P., Sharma, L., Arumugam, H., Kant, L., Fatima, Z., Sharun, K., Aradotlu Parameshwarappa, M., Latheef, S. K., Chouhan, V. S., Maurya, V. P., Singh, G., & Kaniyamattam, K. (2025). Sustainable livestock solutions: Addressing carbon footprint challenges from Indian and global perspectives. *Sustainability*, *17*(5), 2105. https://doi.org/10.3390/su17052105

Scherer-Lorenzen, M., Gessner, M. O., Beisner, B. E., Messier, C., Paquette, A., Petermann, J. S., Soininen, J., & Nock, C. A. (2022). Pathways for cross-boundary effects of biodiversity on ecosystem functioning. *Trends in Ecology and Evolution*, *37*(5), 454-467. https://doi.org/10.1016/j.tree.2021.12.009

Sesay, R. E. V., Sesay, F., Azizi, M. I., & Rahmani, B. (2024) Invasive species and biodiversity: Mechanisms, impacts, and strategic management for ecological preservation. *Asian Journal of Environment & Ecology*, *23*(9), 82-95. https://doi.org/10.9734/ajee/2024/v23i9600

Seymour, F., & Harris, N. L. (2019). Reducing tropical deforestation. *Science*, *365*(6455), 756-757. https://doi.org/10.1126/science.aax8546

Shaikh, S. (2020). *Deforestation in Brazil as a consequence of urbanisation* (Master's Thesis, Sheridan College).

Shivanna, K. R. (2022). Climate change and its impact on biodiversity and human welfare. *Proceedings of the Indian National Science Academy*, *88*(2), 160-171. https://doi.org/10.1007/s43538-022-00073-6

Slayi, M., Zhou, L., & Thamaga, K. H. (2024). Land degradation in Southern Africa: Restoration strategies, grazing management, and livelihoods. *Agriculture*, *14*(10), 1849. https://doi.org/10.3390/agriculture14101849

Springmann, M., Clark, M. A., Rayner, M., Scarborough, P., & Webb, P. (2021). The global and regional costs of healthy and sustainable dietary patterns: A modelling study. *The Lancet Planetary Health*, *5*(11), e797–e807. https://doi.org/10.1016/S2542-5196(21)00251-5

Stange, M., Barrett, R. D. H., & Hendry, A. P. (2021). The importance of genomic variation for biodiversity, ecosystems and people. *Nature Reviews Genetics*, *22*(2), 89-105. https://doi.org/10.1038/s41576-020-00288-7

Sun, Z., Behrens, P., Tukker, A., Bruckner, M., & Scherer, L. (2022). Shared and environmentally just responsibility for global biodiversity loss. *Ecological Economics*, *194*, 107339. https://doi.org/10.1016/j.ecolecon.2022.107339

Truzzi, M. L., Puviani, M. B., Tripodi, A., Toni, S., Farinetti, A., Nasi, M., & Mattioli, A. V. (2020). Mediterranean diet as a model of sustainable, resilient and healthy diet. *Progress in Nutrition*, *22*(Supplement 1), 00-00. https://doi.org/10.23751/pn.v22i1-S.8632

Tucci, M., Martini, D., Del Bo', C., Marino, M., Battezzati, A., Bertoli, S., Porrini, M., & Riso, P. (2021). An italian-mediterranean dietary pattern developed based on the EAT-lancet reference diet (EAT-IT): A nutritional evaluation. *Foods*, *10*(3), 558. https://doi.org/10.3390/foods10030558

Tzamaloukas, O., Neofytou, M. C., & Simitzis, P. E. (2021). Application of Olive By-Products in Livestock with Emphasis on Small Ruminants: Implications on rumen function, growth performance, milk and meat quality. *Animals*, *11*(2), 531. https://doi.org/10.3390/ani11020531

Vallim, D., & Leichsenring, A. (2025). The effect of the beef zero deforestation commitment in the Brazilian Amazon: A spatial panel data analysis. *Ecological Economics*, *230*, 108503. https://doi.org/10.1016/j.ecolecon.2024.108503

van Dijk, S., Robinson, T. P., Thornton, P. K., & Ericksen, P. J. (2015). Livestock, livelihoods and the environment: Understanding the trade-offs. *Current Opinion in Environmental Sustainability*, *1*, 1-10. https://doi.org/10.1016/j.cosust.2009.10.003

van Zanten, H. H. E., van Ittersum, M. K., & de Boer, I. J. M. (2019). The role of farm animals in a circular food system. *Global Food Security*, *21*, 18-22. https://doi.org/10.1016/j.gfs.2019.06.003

Wróbel-Jędrzejewska, M., Włodarczyk, E., & Przybysz, Ł. (2025). Carbon footprint analysis for Scope 1 and 2 in meat production - Case study of polish plants. *Food and Bioproducts Processing*, *151*, 327-336. https://doi.org/10.1016/j.fbp.2025.04.003

Zu Ermgassen, E. K. H. J., Godar, J., Lathuillière C. , M. J., Löfgren, P., Gardner, T., Vasconcelos D. A., & Meyfroidt, P. (2020). The origin, supply chain, and deforestation risk of Brazil's beef exports. *Proceedings of the National Academy of Sciences*, *117*(50), 31770-31779. https://doi.org/10.1073/pnas.2003270117

Zubieta, Á. S., Savian, J. V., de Souza Filho, W., Wallau, M. O., Gómez, A. M., Bindelle, J., & de Faccio Carvalho, P. C. (2021). Does grazing management provide opportunities to mitigate methane emissions by ruminants in pastoral ecosystems? *Science of the Total Environment*, *754*, 142029. https://doi.org/10.1016/j.scitotenv.2020.142029

AIMS & SCOPE

Food Bulletin aims to create an environment for researchers to introduce, share, read, and discuss recent scientific progress and adopts the policy of providing open access to the readers who may be interested in recent scientific developments. *Food Bulletin* publishes papers in the categories of research articles, review articles, short communications, and letters to the Editor.

Research areas include but not limited to:

- Food
- Agriculture
- Aquaculture
- Horticulture
- Crop protection
- Bio systems
- Food additives
- Food economics
- Food biotechnology
- Food nutrition
- Food processing
- Basic sciences

And closely related life sciences, as well as engineering topics.

AUTHOR GUIDELINES

Manuscripts must be submitted to the journal in electronic version through online submission system at https://prensipjournals.com/ojs/index.php/food/author-guidelines following the Author Guidelines of the journal.

Types of Paper

Research articles, review articles, short communications, and letters to the Editor.

- Research articles: original full-length research papers which have not been published previously and should not exceed 7500 words or 25 manuscript pages (including tables and figures).
- Review articles: on topical subjects and up to 10000 words or 25 manuscript pages (including tables and figures).
- Short communications: describing work that may be of a preliminary nature or a case report; preferably no more than 3000 words or 10 manuscript pages (including tables and figures).
- Letters to the Editor: should be included on matters of topical interest and not exceeding 2000 words or 10 manuscript pages (including tables and figures).

Page Charges

This journal has no page charges.

Preparation of Manuscripts

Papers must be written in English or Turkish (If Turkish, it should contain English abstract and title). Prepare your text using a word-processing software and save in ".doc" or ".docx" formats. Manuscripts must be structured in the following order:

- ***Title Page File***
  - Title (Concise and informative. Avoid abbreviations and formulae)
  - Author names and affiliation addresses (Full names should be given, no abbreviations. The corresponding author should be identified with an asterisk. Each affiliation address should include institution, faculty/school, department, city, and country)
  - ORCID numbers for all authors.
  - Corresponding author's e-mail, telephone number, and address
  - Acknowledgements (if applicable. Keep these to the absolute minimum)
  - Compliance with Ethical Standards
    - Conflict of Interest Statement
    - Statement on the Welfare of Animals (if applicable)
    - Statement of Human Rights (if applicable)
- ***Main File***
  - Title
  - Abstract (Should be between 150 and 400 words. References and abbreviations should be avoided)
  - Keywords (Minimum 3, Maximum 6 keywords)
  - Introduction
  - Materials and Methods
  - Results
  - Discussion (Can be combined with Results section if appropriate)
  - Conclusion
  - References
  - Table(s) with caption(s) (on appropriate location in the text)
  - Figure(s) with caption(s) (on appropriate location in the text)
  - and appendices (if any)

Manuscript Formatting

Use a 12-point Times New Roman font, including the references, table headings and figure captions, double-spaced and with 25 mm margins on all sides of A4 size paper throughout the manuscript. The text should be in single-column format.

- Each page must be numbered with Arabic numerals, and lines must be continuously numbered from the start to the end of the manuscript.
- Use italics for emphasis.
- Use only SI (international system) units.
- Use "dot" for decimal points.
- Use italics for species name.

References

Food Bulletin uses APA style (7th edition). Accordingly, authors must format their references as per the guidelines below. Please ensure that each reference cited in the text is also presented in the reference list. Authors should always supply DOI or URL of the work cited if available.

In-text citation (Narrative):

…The results of Bliss (2022) support…
…Sönmez and Taştan (2020) indicated that…
…According to the method of Öztürk et al. (2021)…

In-text citation (In parenthesis):

…It was found to be isometric (Öztürk, 2018)…
…is highly susceptible to diseases (Doma & Craig, 2019)…
…have been studied (Kale et al., 2020)…

Two or more works in the same parenthesis:

…extremely toxic for the environment (Sönmez, 2018, 2019; Öztürk et al., 2020a; Kadak & Taştan, 2021)…

Citation in the reference list:

References should be listed first alphabetically and then further sorted chronologically at the end of the article. The citation of all references should conform to the following examples:

Article:

Lastname, N., Lastname, M., & Lastname, O. (Year). Title of the work. *Title of the Journal*, *Volume*(Issue), Page numbers. DOI

Tort, S. (1998). Stress and immune modulation in fish. *Developmental & Comparative Immunology*, *35*(12), 1366-1375. https://doi.org/10.1016/j.dci.2011.07.002

Kasumyan, A. O., & Døving, K. B. (2003). Taste preferences in fishes. *Fish and Fisheries*, *4*(4), 289-347. https://doi.org/10.1046/j.1467-2979.2003.00121.x

Özçelik, H., Taştan, Y., Terzi, E., & Sönmez, A. Y. (2020). Use of onion (*Allium cepa*) and garlic (*Allium sativum*) wastes for the prevention of fungal disease (*Saprolegnia parasitica*) on eggs of rainbow trout (*Oncorhynchus mykiss*). *Journal of Fish Diseases*, *43*(10), 1325-1330. https://doi.org/10.1111/jfd.13229

Article by DOI (early access):

Salem, M. O. A., Salem, T. A., Yürüten Özdemir, K., Sönmez, A. Y., Bilen, S., & Güney, K. (2021). Antioxidant enzyme activities and immune responses in rainbow trout (*Onchorhynchus mykiss*) juveniles fed diets supplemented with dandelion (*Taraxacum officinalis*) and lichen (*Usnea barbata*) extracts. *Fish Physiology and Biochemistry*. https://doi.org/10.1007/s10695-021-00962-5

Book:

Lastname, N., Lastname, M., & Lastname, O. (Year). *Title of the work*. Publisher.

Oidtmann, K., Xao, Q., & Lloyd, A. S. (2018). *The food need by the year 2050*. Elsevier.

Book Chapter:

Lastname, N., Lastname, M., & Lastname, O. (Year). Title of the chapter. In N. N. Lastname, A. Lastname & B. Lastname (Eds.), *Title of the book* (pp. Page numbers). Publisher.

Pickering, A. D. (1993). Growth and stress in fish production. In G. A. E. Gall & H. Chen (Eds.), *Genetics in Aquaculture* (pp. 51-63). Elsevier. https://doi.org/10.1016/b978-0-444-81527-9.50010-5

Dissertation or Thesis:

Lastname, N. (Year). *Title of dissertation/thesis* (Doctoral dissertation/Master's thesis, Name of Institution).

Sönmez, A. Y. (2011). *Karasu ırmağında ağır metal kirliliğinin belirlenmesi ve bulanık mantıkla değerlendirilmesi* (Doctoral dissertation, Atatürk University).

Taştan, Y. (2018). *Tatlısu kerevitindeki (Astacus leptodactylus) siyah solungaç hastalığı etkeni mantar Fusarium oxysporum'un PCR yöntemi ile teşhisi* (Master's thesis, Akdeniz University).

Conference Proceedings:

Lastname, N., Lastname, M., & Lastname, O. (Year). *Title of the work*. Title of the Conference. City.

Ken, A., & Kumar, S. (2020). *A new statistical model for fuzzy logic evaluation*. 3rd International Congress on Statistics. İstanbul.

Institution Publication:

Institution name. (Year). *Title of the work*. URL

FAO. (2020). *Fishery and aquaculture statistics 2018*. http://www.fao.org/3/cb1213t/CB1213T.pdf

Internet Source:

Lastname, N. (Year). *Title of the work*. Retrieved May 15, 2020, from URL

Perreault, L. (2019). *The future of agriculture: Polyculture*. Retrieved January 12, 2020, from https://www.agriculture.com

Table(s)

Tables, numbered in Arabic, should be in separate pages with a short descriptive title at the top. Place footnotes to tables below the table body and indicate them with superscript lowercase letters (or asterisks for significance values and other statistical data).

Figure(s)

All illustrations should be labelled as 'Figure' and numbered in consecutive Arabic numbers, Figure 1, Figure 2 etc. in the text. If panels of a figure are labelled (a, b, etc.) use the same case when referring to these panels in the text. Figures are recommended to be in electronic formats such as PNG, JPEG, TIFF (min. 300 dpi). All figures or tables should be presented in the body of the text.

Online Manuscript Submission
Authors are requested to submit manuscripts via the journal's online submission system at https://prensipjournals.com/ojs/index.php/food/about/submissions

Submission Checklist
- Author Guidelines of the journal has been read and adhered
  - **Title Page File**
    - Title
    - Full names, e-mails, and affiliation addresses of all authors
    - ORCID numbers of all authors
    - Corresponding author's e-mail, telephone number, and address
    - Ethical statements
  - **Main File**
    - Continuous page numbers
    - Continuous line numbers
    - Blinded document (no personal information is present)
    - Title
    - Abstract (150-400 words)
    - Keywords (3-6 keywords)
    - All figures and tables are numbered and cited in order in text
    - Completeness and accuracy of the references have been checked
    - References have been edited as per the Journal guidelines

Publication Frequency
The journal includes original scientific articles on a variety of different subjects and is being published twice a year in June and December.

Publication Fees
Food Bulletin is an open access journal. No submission or publication charges are collected. All authors and readers have free access to all papers.

PUBLICATION ETHICS
Details about Publication Ethics can be found at https://prensipjournals.com/ojs/index.php/food/policy

OPEN ACCESS POLICY
Details can be found at https://prensipjournals.com/ojs/index.php/food/open-access

REVIEW PROCESS
Double-Blind Review and Evaluation Process
Double-Blind Review is a method applied for publishing scientific publications with the highest quality. This method forms the basis of an objective evaluation of scientific studies and is preferred by many scientific journals.

The views of referees have a decisive place in the publication quality of a Journal. *Food Bulletin* uses the double-blind review method, which means that both the reviewer and author identities are concealed from the reviewers, and vice versa, throughout the review process, in the evaluation process of all studies. For this reason, the authors are asked to blind their manuscripts before submitting. All the studies submitted to *Food Bulletin* are evaluated by double-blind review method according to the following steps.

1. Initial Evaluation Process
The studies submitted to *Food Bulletin* are first evaluated by the editor. At this stage, studies that are not in line with the aim and scope of the journal, are weak in terms of language and narrative rules in English, contain scientifically critical mistakes, are not original worthy, and cannot meet publication policies are rejected. Authors of rejected studies will be notified within one month at the latest from the date of submission. Eligible studies are sent to the field editor to which the study is relevant for pre-evaluation.

2. Pre-Evaluation Process
In the pre-evaluation process, the field editors examine the studies, introduction and literature, methods, findings, results, evaluation and discussion sections in detail in terms of journal publication policies, scope and authenticity of study. Study which is not suitable as a result of this examination is returned to the author with the field editor's evaluation report within four weeks at the latest. The studies which are suitable for the journal are passed to the referee process.

3. Referee Process
The studies are sent to the referees according to their content and the expertise of the referees. The field editor examining the study may propose at least two referees from the pool of *Food Bulletin* Advisory Board or referee pool according to their field of expertise or may propose a new referee appropriate to the field of study. The editors evaluate the referee's suggestions coming from the field editor and the studies are submitted to the referees. Referees are obliged to guarantee that they will not share any process or document about the study they are evaluating.

4. Referee Evaluation Process
The period given to the referee for the evaluation process is 15 days. Proposals for corrections from referees or editors must be completed by the authors within 1 month according to the "correction instruction". Referees can decide on the suitability of the study by reviewing the corrections and may also request multiple corrections if necessary.

Referee Reports
Referee evaluations are based in general on the originality of the studies, the method used, and the conformity with the ethical rules, the consistent presentation of the findings and results, and the examination of the literature.

This review is based on the following elements:

1. Introduction and Literature: The evaluation report contains the presentation and purpose of the problem addressed in the study, the importance of the topic, the scope of the relevant literature, the timeliness and the originality of the study.

2. Methodology: The evaluation report includes information on the suitability of the method used, the choice and characteristics of the research group, validity and reliability, as well as on the data collection and analysis process.

3. Findings: The evaluation report includes opinions on the presentation of the findings obtained in the frame of the method, the correctness of the analysis methods, the aims of the research and the consistency of the findings, the presentation of the required tables, figures and images and the conceptual evaluation of the tests used.

4. Evaluation and discussion: The evaluation report includes the opinion on the subject based on findings, relevance to research questions and hypotheses, generalizability and applicability.

5. Conclusion and suggestions: The evaluation report contains the opinion on the contributions to the literature, future studies and recommendations for the applications in the area.

6. Style and narration: The evaluation report includes compatibility of the title with the content, appropriate use of English in the study, refers and references in accordance with the language of the study and APA rules.

7. Overall evaluation: The evaluation report contains opinion on the authenticity of the study as a whole, its contribution to the educational literature and the applications in the area. The journal considers that scientists should avoid research which kills or damages any species of animal which, using IUCN criteria, is regarded as threatened or is listed as such in a Red Data Book appropriate for the geographic area concerned. In accordance with this view, papers based on such research will not be accepted by the Journal, unless the work had clear conservation objectives.

Plagiarism Detection

In agreement with publishing policies of *Food Bulletin*, plagiarism check is required for each study that has undergone the "Review Process". The Turnitin plagiarism checker software is used for plagiarism detection.

Proofs

Proof documents will be sent to the corresponding authors via e-mail. Proofs should be checked immediately and responses should be returned back within 15 working days. It is the responsibility of the authors to check carefully the proofs. No changes will be allowed after this stage.

DISCLAIMER

The Publisher and Editors cannot be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher and Editors.

Editor or members of the editorial board are not responsible for the author's opinions and manuscript contents. Authors are responsible for the ethical originality of and possible errors in their manuscripts.

This journal is available online at http://foodbulletin.net/

Kindly visit website to search the articles and register for table of contents e-mail alerts.

LICENCE

INDEXING

Food Bulletin is currently indexed by

- Crossref
- Scilit
- Index Copernicus
- EuroPub
- ROAD
- Google Scholar

PUBLISHER

PRENSIP

Prensip Publishing and Consultancy Ind. Trade. Co. Ltd.
Kuzeykent mah. Orgeneral Atilla Ateş Paşa cad. No: 15CD, İç Kapı No:31, Merkez/Kastamonu, 37150, TÜRKİYE
https://prensip.gen.tr
info@prensip.gen.tr

FOOD BULLETIN

PRENSIP