Solving the Dual Climate and Biodiversity Crises Through a Just Transition to Equitable, Humane and Sustainable Food Systems

A COP30 Brief by the Just Food Transition Network

We are in the midst of the sixth global wildlife extinction crisis. One million wild plant and animal species will face extinction in the coming decades unless action is taken to address the key drivers of biodiversity loss.[1] According to IPBES, land-use change has been the main driver of negative impacts for terrestrial and freshwater ecosystems since 1970, with agricultural expansion being the main form of it.[2] Industrial animal production is a primary driver of threats to terrestrial wildlife, including habitat destruction and degradation (including loss of forests, grasslands and wetlands), greenhouse gas emissions, air and water pollution, drought, disease, and direct threats to imperiled and keystone species.[3] Another factor that has been studied is the notable decrease in aquatic macroinvertebrates in areas affected by livestock farming in different biomes in Colombia, evidencing a deterioration in water quality, as well as an impact on food webs in the ecosystem[4]. Climate change has already increased extinctions, which are predicted to accelerate rapidly if the 1.5 degree Celsius target is not met.[5]

The disappearance of species and habitats poses serious consequences for all life on Earth, from the loss of carbon sinks, crop pollination, soil health, biodiversity and water purification to medical, spiritual and cultural losses. This extinction crisis is driven by multinational corporations and high-income, high-consuming countries that externalize the impacts of industrial animal production onto the Global South, causing environmental injustice issues through destroying irreplaceable ecosystems, displacing Indigenous peoples, exploiting workers and women, and other harms to people and wildlife.

In 2023 more than 200 health journals called on the United Nations and political leaders “to recognize that climate change and biodiversity loss are one indivisible crisis and must be tackled together to preserve health and avoid catastrophe.”[6]

The Loss of Habitat and Carbon Sinks

Industrial animal agriculture is the primary driver of biodiversity loss due to land conversion. Agriculture uses about half of all habitable land on the planet, and 78% of that is used for livestock and feed crops.[7]

Global land-use changes, largely driven by agricultural expansion, are four times greater than previously estimated.[8] In South America and Africa the most significant losses of forests and other native forest cover between 2010 and 2020 occurred mainly because of the conversion of forested land to pasture for livestock and animal feed crops such as soybeans.[9]

Deforestation

Industrial animal production for feed or animal accommodation has caused major deforestation in tropical regions like Brazil and other countries like China, reducing wildlife habitats. Globally, 30% of plant and animal biodiversity has been affected by livestock-associated deforestation.
This biodiversity decline is also seen in agriculture, with just a few animal species and breeds providing most animal products, leading to less genetic diversity, less dietary variety, and increased climate vulnerability.[10]

The Earth has lost two-thirds of its forests, and half of this loss has occurred in the past 50 years. Currently 45% of land that was once forest is now agricultural land. Of this 80% is used for livestock (grazing + animal feed).[11]

While it’s well known that much of the global soy produced is used as feed for farmed animals — making it a major cause of deforestation — there is less awareness that large quantities of grain (barley, corn, wheat and oats) are also fed to animals. In fact, the amount of grain used in animal feed far exceeds the amount of soy used in this way, accounting for around 1.000 million metric tons per year. According to the International Grains Council, 45% of the world´s grain is used as animal feed.[12]

Studies indicate that only 3-25 calories of human-edible grain fed to animals reach people as meat per 100 calories. Similarly, only 5-40 grams of protein from such grain become meat per 100 grams of protein. This inefficiency suggests that using crops directly for humans could potentially feed two billion more people annually.[13]

Beef, soy, and palm oil cause 60% of tropical deforestation. Each year about 5 million hectares (~12.4

million acres) of forest are lost, with 95% in the tropics. Agriculture, mainly for crops, livestock, and products like paper, drives 75% of this loss. Beef expansion is a major contributor, responsible for 41% of tropical deforestation — around 2.1 million hectares (~5.2 million acres) annually — mainly in Brazil, where cattle ranching accounts for 72% of deforestation. Latin America leads in beef-related forest loss, with some impact in Africa. [14]

As industrial animal agriculture expands, it both increases emissions from greater numbers of livestock and destroys carbon sinks that are critical to mitigating climate change. Even when forests are protected, expansion of animal agriculture into other unprotected ecosystems, such as grasslands, still erases considerable potential for carbon storage,[15] which cannot be counteracted through practices like managed grazing.[16]

While land-based agriculture is the dominant driver of terrestrial land conversion, aquatic food systems also contribute to ecosystem loss through the destruction of blue carbon habitats. Industrial aquaculture, especially shrimp farming, has led to widespread clearing of mangroves, seagrasses, and tidal marshes, which are vital carbon sinks and biodiversity hotspots.[17] These aquatic ecosystems play a similar role to forests and grasslands in storing carbon and supporting ecological integrity, yet they are increasingly sacrificed for feed-intensive aquaculture.

Habitat Degradation and Pollution

Removing or reducing livestock can play a critical role in making land less vulnerable to climate change.[18] In contrast, overgrazing of native grasses by livestock can spur the spread of invasive grasses that are highly flammable, contributing to increased wildfire risk.[19]

Agriculture uses about 70% of all water, with cattle farming being especially water-intensive — cow meat requires 10 times more water per kilogram than cereals. Much of this is green water (rainfall), so caution is needed when assessing livestock water use. Animal feed production, which accounts for 40% of global cereal use, puts significant strain on water resources and is linked to intensive livestock systems. Additionally, industrial farming causes 57% of water pollution, with wastewater often containing blood, feces, hair, and high nitrogen levels that can damage soil and water quality.[20]

Cattle Cannot Replace Native Grazers

Claims about replacing native grazers with non-native, domesticated livestock typical of industrial animal production systems fail to consider crucial differences between cattle and native herbivores and their roles in different ecosystems. This includes movement patterns, clustering behaviors in sensitive riparian habitats, how and which plants they graze, and herd sizes. Livestock management and slaughter disrupt natural life cycles such as predator-prey relationships and carcasses that support biodiversity and ecosystem function. Furthermore, ecosystem integrity relies on a diversity of coexisting grazers, which cannot be replaced by a single non-native species.[21]

The presence of cattle creates a wide range of threats to wildlife from habitat degradation and competition to disease and direct killing by ranchers. A meta-analysis of 109 studies found that removal of grazing livestock increased abundance and diversity across all wild animals.[22] Even practices like rotational grazing that claim to mimic the behaviors of native grazers are similarly detrimental to plants, soils, water, and the climate as conventional grazing systems,[23] and any reduced impacts are likely due to goal-setting and monitoring rather than ecological principles.[24] In the United States, which is the largest beef producer in the world,[25] existing pastureland could only support 27% of the beef supply on an entirely grass-fed system.[26] Reducing the threats to biodiversity from beef production requires drastically reducing production and consumption in high-consuming countries.

Bioeconomy: Further Entrenching the Commodification of Nature

The bioeconomy is an economy aiming to replace fossil fuel with biomass as a source of energy, reducing nature, plants, animals, and microorganisms to a resource for human use. It promotes an optimistic narrative that technology can solve global problems like climate change and hunger, while sidelining proven equitable, humane and sustainable approaches such as agroecology and Indigenous knowledge, food justice, and the rights of nature. Focused on production and efficiency rather than human rights and biodiversity, the bioeconomy faces major challenges: land competition for agrofuels, ethical issues around genetic engineering, and unclear strategies for food security. It also risks worsening global inequalities by exploiting the Global South for raw materials and driving deforestation through the expansion of monocultures with serious social and environmental impacts.[27] Animal agriculture in bioeconomy mainly refers to the use of livestock manure to produce energy via anaerobic digestion.[28] However, this approach increases pollution and incentivizes the large-scale production of manure, while promoting a misleading image of circularity within an industrial system that often relies on imported feed.[29]

Policy Solutions to Address the Dual Crises Through a Just Transition

The majority of conservation efforts have co-benefits for climate mitigation, including preventing deforestation and forest degradation, restoring habitats (including reforestation), protecting larger portions of the planet with wildlife corridors, reducing pollution from excess nutrients, and securing land rights, from a gender approach, to peasantry, Indigenous Peoples and other groups like Afro-descendants.[30] A just transition away from industrial animal agriculture toward equitable, humane, and sustainable food systems is not only aligned with these efforts, but necessary to achieve them.[31]

Key Actions to Protect Biodiversity and Mitigate Climate Change Include:

- Phase out industrial animal production by 2050 and immediately end all land conversion for pasture and feed crops.
- Prioritize sustainable food policies that promote agroecology and advance diets within planetary and social boundaries, including plant-rich diets in high-consuming countries, with policies such as shifting direct and indirect subsidies from industrial meat and dairy production to agroecological practices that protect biodiverse natural habitats and adopting sustainable national dietary guidance and procurement policies.
- Increase Indigenous and community control over lands, including through increased funding for land access and ownership for impoverished farmers, returning stolen land to Indigenous peoples, establishing land co-ops, and implementing or strengthening participatory land and territory management and land-sharing agreements.
- Protect and restore wildlife habitat, including increased funding for conservation programs through ecosystem and biocultural approaches, species recovery efforts, pollution mitigation, land restoration and rewilding projects, and strengthening and enforcing environmental regulations for industrial animal operations.
- Establish clear biodiversity metrics for food and agriculture policies and programs based on measurable, science-based goals for protecting and promoting native plants and animals and ecosystem health.
- Immediately stopping wildfires in South America, triggered by industrial agriculture, with a particular focus on soybeans and cattle ranching.
- Reject carbon or biodiversity offsetting schemes, including carbon markets, and moreover, market approaches that shift the harm caused by industry to marginalized communities while destroying irreplaceable ecosystems and accelerating climate change.
- Prioritize low trophic species in aquaculture while restoring blue carbon ecosystems such as mangroves, seagrasses, and tidal marshes.
- Phase out wild-fish-based and soy-derived feeds through incentives for algae and microbial protein alternatives.

References

IPBES. (2019_. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E.S. Brondizio, J. Settele, S. Diaz, and H.T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. doi: http://doi.org/10.5281/zenodo.3831673

[2] IPBES. (2019_. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E.S. Brondizio, J. Settele, S. Diaz, and H.T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. doi: http://doi.org/10.5281/zenodo.3831673

[3] De Schutter, O., Jacobs, N., Clément, C., & Ajena, F. (2019). Towards a Common Food Policy for the European Union: The Policy Reform and Realignment That Is Required to Build Sustainable Food Systems in Europe. IPES-Food. Adopted by the IPES-Food panel in February 2019. CFP_FullReport.pdf (ipes-food.org)

[4] Ramírez, YP., Giraldo, LP., Chará, J., et al. (2018) Cattle raising influence over the aquatic macroinvertebrates in microbasins of central Andes, Revista de Biología Tropical vol.66 n.3 San José. https://www.scielo.sa.cr/scielo.php?script=sci_arttext&pid=S0034-77442018000301244

[5] Urban, M. (2024). Climate Change Extinctions. Science 386,1123-1128.

[6] Abbasi, K., Ali, P., Barbour, V., Benfield, T., Bibbins-Domingo, K., et al. (2023). Time to Treat the Climate and Nature Crisis as One Indivisible Global Health Emergency. American Medical Association. JAMA. 2023-10-25.

[7] Ritchie, H. and Roser, M. (2019). Land Use. Our World in Data. September 2019. https://ourworldindata.org/ land-use.

[8] Winkler, K., Fuchs, R., Rounsevell, M. et al. (2021). Global land use changes are four times greater than previously estimated. Nat Commun 12, 2501. https://doi.org/10.1038/s41467-021-22702-2

[9] FAO. (2020). Global Forest Resources Assessment 2020 – Key findings. Rome. https://doi.org/10.4060/ca8753en

[10] World Health Organization. (2023). Red and processed meat in the context of health and the environment: many shades of red and green Information brief. World Health Organization. http://www.jstor.org/stable/resrep56541

[11] Hannah Ritchie (2021) - The world has lost one-third of its forests, but an end to deforestation is possible. Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/world-lost-one-third-forests'

[12] Compassion in World Farming (2025). Food not feed. How to stop the world's biggest form of food waste. Compassion in World Farming.

[13] Compassion in World Farming (2025). Food not feed. How to stop the world's biggest form of food waste. Compassion in World Farming.

[14] Hannah Ritchie (2021) - "Not all forest loss is equal: what is the difference between deforestation and forest degradation?" Published online at OurWorldinData.org. Retrieved from: https://ourworldindata.org/deforestation-degradation

[15] Popp, A. et al. Land-use protection for climate change mitigation. 2014.. *Nat. Clim. Change* **4**, 1095–1098. https://www.nature.com/articles/nclimate2444

[16] Chang, J., Ciais, P., Gasser, T., Smith, P., Herrero, M., Havlík, P., ... & Zhu, D. (2021). Climate warming from managed grasslands cancels the cooling effect of carbon sinks in sparsely grazed and natural grasslands. *Nature Communications*, *12*(1), 118.

[17] Glaser, M. (2016). Coastal aquaculture, mangrove deforestation and blue carbon emissions: Is REDD+ a solution? *Marine Policy, 66,* 58–66. https://doi.org/10.1016/j.marpol.2016.01.007

[18] Beschta, R., Donahue, D., Dellasala, D., and Rhodes, J. (2012). Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates. Environmental Management 51(2). DOI:10.1007/s00267-012-9964-9

[19] Williamson, M.A., Fleishman, E., Mac Nally, R.C. *et al.* Fire, livestock grazing, topography, and precipitation affect occurrence and prevalence of cheatgrass (*Bromus tectorum*) in the central Great Basin, USA. *Biol Invasions* **22**, 663–680 (2020). https://doi.org/10.1007/s10530-019-02120-8.

[20] World Health Organization. (2023). *Red and processed meat in the context of health and the environment: many shades of red and green Information brief*. World Health Organization. http://www.jstor.org/stable/resrep56541

[21] Mwasi, S., Van Wieren, S., Heitkonig, I., and Prins, H. (2013). Seasonal resource use and niche breadth in an assemblage of coexisting grazers in a fenced Park. Open Journal of Ecology, Vol. 3, No. 6.

[22] Filazzola, A., Brown, C., Dettlaff, M. A., Batbaatar, A., Grenke, J., Bao, T., ... & Cahill Jr, J. F. (2020). The effects of livestock grazing on biodiversity are multi-trophic: a meta-analysis. *Ecology Letters*, *23*(8), 1298-1309.

[23] Augustine, D. J., Derner, J. D., Fernández-Giménez, M. E., Porensky, L. M., Wilmer, H., & Briske, D. D. (2020). Adaptive, multipaddock rotational grazing management: a ranch-scale assessment of effects on vegetation and livestock performance in semiarid rangeland. *Rangeland Ecology & Management*, *73*(6), 796-810.
[24] Carter, J., Jones, A., O'Brien, M., Ratner, J., and Wuerthner, G. (2014). Holistic Management: Misinformation on the Science of Grazed Ecosystems. International Journal of Biodiversity. Vol. 2014. https://doi.org/10.1155/2014/163431.
[25] Our World in Data. (2023). Meat and Dairy Production. https://ourworldindata.org/meat-production
[26] Hayek, M. and Garrett, R. (2018) Nationwide shift to grass-fed beef requires larger cattle population. *Environ. Res. Lett.* **13** 084005
[27] T. Fatheuer, Centre for Research and Documentation Chile-Latin America (2015). The bioeconomy controversy - Considering the bioeconomy from a development policy perspective FDCLFDChttps://www.fdcl.org/wp-content/uploads/2018/05/The-Bioeconomy-Controversy.pdf
[28] Dourmad et al., 2019
[29] MADELRIEUX S., COURTONNE J.Y., GRILLOT M., HARCHAOUI S., 2022. Bioeconomy and circular economy: critical reading and place of the livestock sectors. INRAE Prod. Anim., 36, 7430. https://doi.org/10.20870/productions-animales.2023.36.1.7430
[30] Shin,Y-J., et al. (2022). Actions to Halt Biodiversity Loss Generally Benefit the Climate. Global Change Biology. 2022;28:2846-2874
[31] Just Food Transition Network. (2024). Analysis: Global Agreements Must Include a Just Transition Away From Industrial Animal Production to Succeed. Available at: JustFoodTransitionNetwork.com.