

Food for Biodiversity



What is biodiversity ?

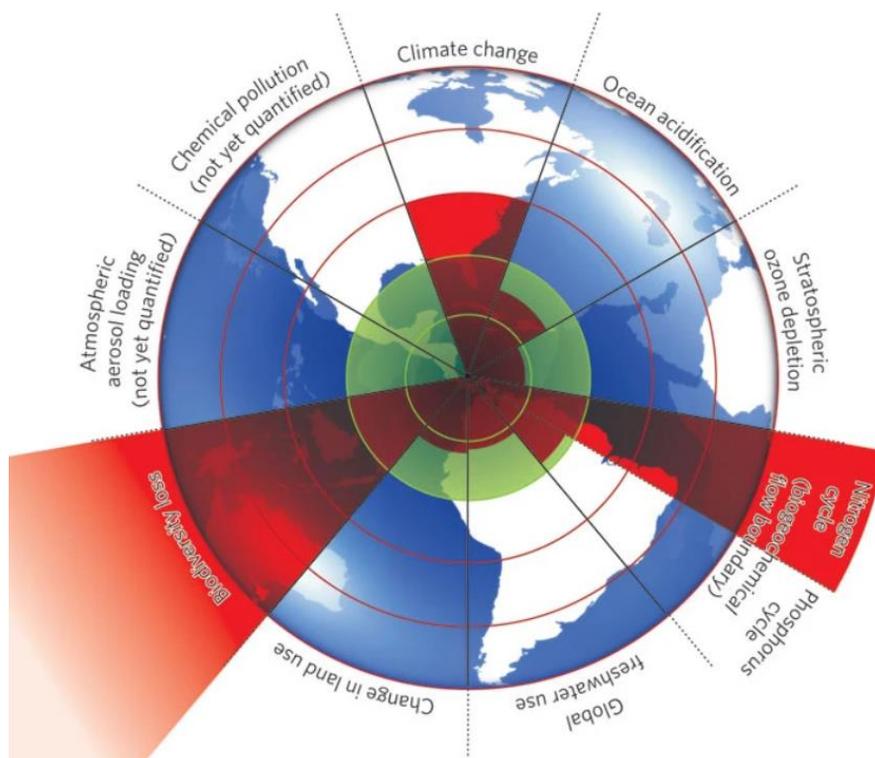
Biodiversity is the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.

A diverse variability among living organisms provides several benefits to humanity. The first benefit is provision. Strong and healthy biodiversity in the soil leads to faster-growing crops and reduces the need for harmful pesticides. Additionally, biodiversity aids in regulating the earth's ecosystem. For instance, 70 out of the top 100 vegetables we consume would cease to exist without bees' pollination. Similarly, biodiversity helps combat climate change. Marine biodiversity is essential for the health of coral reefs around the world. The coral reefs, in turn, play a major role in fighting climate change as they are responsible for absorbing a large portion of our CO₂ emissions.

There are also the cultural aspects to biodiversity. As man evolved alongside animals, many cultures around the world have strong emotional and spiritual connections with various animal species. In Hinduism, for example, monkeys are regarded as sacred and are often worshiped at the Sambhunath temple located in the Valley of Nepal.

With the current state of pollution, the earth's biodiversity is disappearing at an exponentially increasing rate. The acceleration in the decay rate of the earth's biodiversity is caused by cyclical chain of events. For example, as climate change worsens, coral reefs around the world will continue dying at an accelerated rate, leading to less carbon absorption, the effects are climate change worsening once again, and the cycle starting back up.

Another large contributor to this crisis is our food production: Most notably, the production of meat.



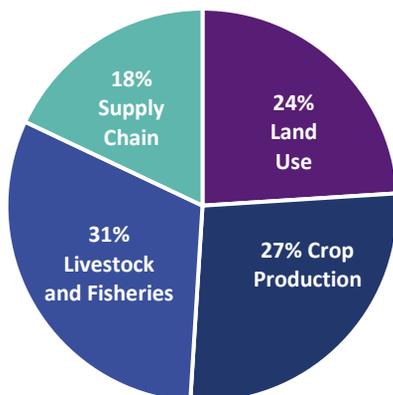
source: Azote for Stockholm Resilience Centre, based on analysis in Persson et al 2022 and Steffen et al 2015

The food industry is crucial

Food is a crucial element of our survival. While we have grown accustomed to food seemingly magically showing up in our local grocery store, current events, including the war in Ukraine, are good reminders of the fragile nature of this business we rely so heavily upon. There is, however, another force that is often overlooked yet continues to threaten food production: the deteriorating state of the earth's biodiversity. One of the main contributors to the decay of the earth's biodiversity is our food production system itself.

The entire supply chain responsible for turning empty fields into the food we eat accounts for 26% of global GHG emissions. Global food GHG emissions can be broken up in the following subcategories:

Global Greenhouse Gas Emissions from Food Production



Land use	16% land used for livestock 8% land used for human food
Crop production	21% crops for human food 6% crops for animal food
Livestock and fisheries	30% livestock and fish farms 1% wild catch fisheries
Supply chain	4% food processing 6% transport 5% packaging 3% retail

source: H. Ritchie, M. Roser (2021). *Environmental Impact of Food Production*. Our World in Data

52% of all GHG emissions produced by agriculture come from the production of meat and dairy products.

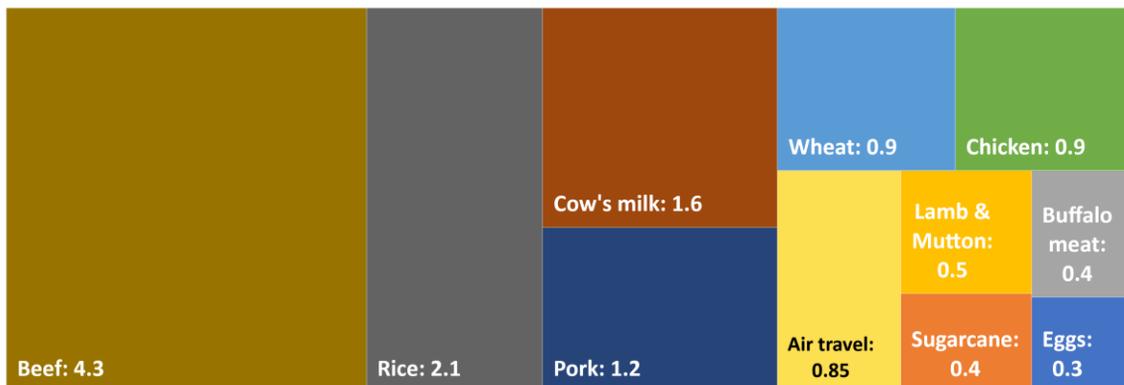
About 31% of food production emissions come directly from the livestock and fish farms themselves. A large contributor to this statistic is ruminant animals, mostly cows, who produce methane as a natural byproduct of their digestive system in a process known as enteric fermentation. The rest of the emissions coming directly from livestock and fish farms are related to manure management, fuel from fishing vessels, and pasture management.

Before the animals are born, the production of livestock has already begun emitting GHG. 16% of global food emissions come from the land used to produce food for livestock. These emissions are a result of food production corporations transforming forests and grasslands into farmland to grow food for their livestock.

Additionally, 6% of food emissions come from the grains grown for animal feed. These emissions are related to agricultural processes such as the release of carbon dioxide from machinery and GHG emissions from fertilizers.

At 18% percent, the supply chain needed to bring food from farms to restaurants and grocery stores seems substantial at first. However, reducing supply chain emissions is not as important as one may initially believe. Modern packaging and transportation methods play a key role in preventing food waste.

Annual Emissions, CO₂-equivalent Gigatonnes



source: Author unknown (2021). *Treating Beef Like Coal Would Make a Big Dent in Greenhouse-gas Emissions*. The Economist

The transformation of non-farmland into pastures for livestock is another reason the production of beef emits 4 times more CO₂ emissions than air travel.

While currently at 50%, the percentage of all habitable land used for agriculture will continue to increase as corporations are continuously deforesting areas to create more farmland. This process, however, is significantly harming the earth's biodiversity as transforming forests and grasslands into farmland eliminates many animals' natural habitats. In fact, out of the 28,000 species threatened by extinction, 24,000 of them are directly affected by our agricultural process.

Of this 50%, 77% of agricultural land is used for livestock. The large percentage of land used to produce meat and dairy makes their production and consumption the major agricultural contributor to the decay of the earth's biodiversity.

Water used in farming also plays a key role in the high CO₂ emissions released during the production of red meats.

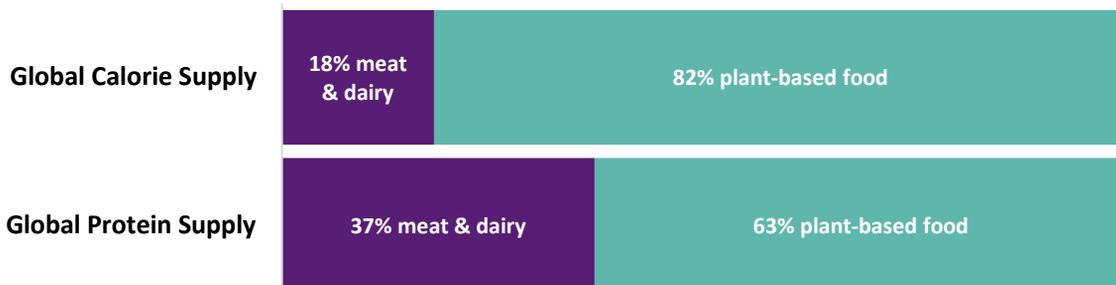
Freshwater is a scarce resource as it represents less than 1% of habitable land. As supplies begin to run out, farmers are forced to drill into underground water reserves in order to continue watering crops, harming many animals' natural habitats.

To observe the impact of a certain food on our water supply, it's best to use a scarcity-weighted metric that puts additional weight on foods produced in dryer areas. Our World in Data created such a metric and revealed that beef is ranked in the top five worst foods to produce and consume in terms of water consumption.

Is beef production needed?

While 77% of all agricultural land is used for livestock only 18% of global calorie intake comes from meat and dairy products. In other words, more land is needed to produce 1 calorie of meat compared to one calorie of plant-based food. The same is true for global protein intake; while more resources are devoted to livestock production, only 37% of the global protein supply comes from meat and dairy farms. These statistics illustrate how inefficient it is to eat meat.

Global Calorie and Protein Supply



source: H. Ritchie, M. Roser (2021). *Environmental Impact of Food Production*. Our World in Data

From a GHG emissions perspective, the consumption of meat and dairy products continues to be inefficient. While more than half of agricultural GHG emissions come from the production of livestock and dairy, less than a quarter of global calory intake emerges as a result. Similarly, the 37% of global protein intake from meat and dairy does not justify the amount of GHG emissions released in their production.

Reducing the food industrie's carbon footprint

Many individuals falsely believe that eating locally is an essential step for lowering global carbon emissions from food production. However, while transportation does play a role in global food emissions, it is negligible compared to many other aspects of food production.

The best way for someone to reduce their food carbon footprint is to focus on what they are eating rather than where their food is coming from.

For example, only 1% of carbon emissions associated with the consumption of beef come from transportation. Regardless of where in the world the beef came from, a red meat dinner will have a large carbon footprint than a vegetable dinner grown across the world because of the GHG emission factors discussed above.

In fact, since transportation accounts for only 6% of global food emissions, in a hypothetical scenario where everyone on earth began growing their food locally, total food emissions would only fall by 6%.

A study published in *Environmental Science & Technology* by Christopher Weber and Scott Matthews in 2008 further illustrates this point. They showed that if everyone went red meat free one day per week, we would achieve the same reduction in carbon emissions as if everyone ate locally grown food seven days a week.

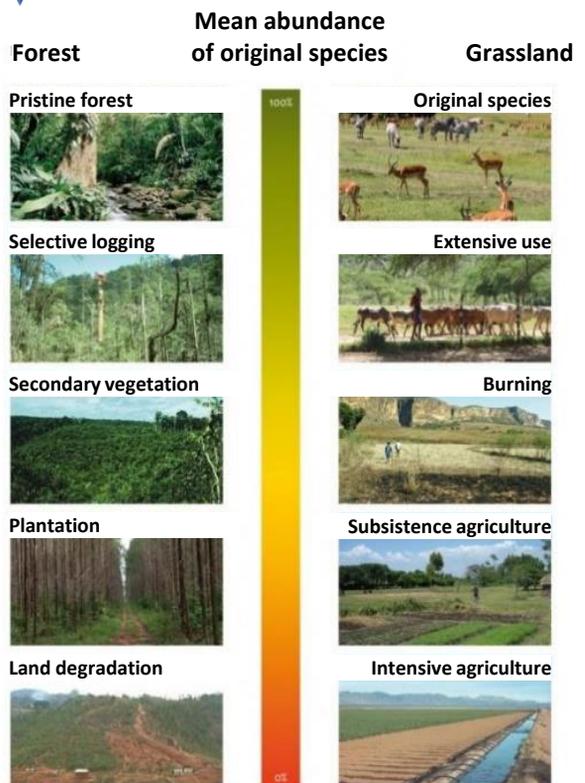
How to empirically measure biodiversity impact ?

Ossiam uses Iceberg Data Lab's Means Species Abundance (MSA) metric to empirically measure the food industry's effects on the earth's biodiversity.

Iceberg Data Lab is a fintech firm that specializes in the development of metrics used to measure environmental impacts along global supply chains.

Their MSA metric works as follows: a score of 100% equates to the entire area in question being filled with pristine nature while a score of 0% equates to the entire area being a concrete parking lot with 0 natural species remaining. Therefore, a country that receives an MSA of 60% would be equivalent to the country being comprised of 40% parking lot and 60% pristine nature.

For the development of humankind to be sustainable, the earth's measure should be 4% higher than its current 68% score. By 2050, estimates conclude that the earth's MSA score will fall another 10% to 58%, bringing it well below the desired 72%.



source: photographic illustration of MSA variation for forest and grassland ecosystems (GLOBIO, 2019).

Solutions require fundamental changes in habits

Finding a solution to this global disaster may prove to be one of the greatest challenges our generation will face. Unlike other industries, there isn't a clear solution to reducing carbon emissions for the agricultural sector of the economy.

As the world's population continues to rapidly expand, demand, and therefore production, of food will follow suit. Consequently, farmers will have to continue using harmful pesticides and fertilizers to keep up, aggravating the situation further.

Unquestionably, individuals will need to reduce their consumption of red meat. However, for this objective to be feasible, more plant-based alternatives need to be invented and scaled to meet the current large demand for red meats.

As a financial professional, it may seem tough to enact change. One way, however, is to screen companies for their biodiversity impact and engage with the laggards. Many different types of corporations can have a substantial impact on the future sustainability of the food industry, therefore, investing and enacting change in the right companies may prove crucial for our future.

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