

**Forum:** United Nations Environment Programme

**Issue:** Encouraging Innovation in the Food Industry

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## **Introduction:**

Contemporary climate change is chiefly driven by greenhouse gas emissions. In 2019, Emissions due to food production comprised 17 billion tons— one-third of total emissions. Animal agriculture contributes to the majority of these 17 billion tons: farm animals release copious amounts of greenhouse gases and feces, contributing to both air and water pollution. Animal agriculture also employs large amounts of land and consumes much of the world’s supply of water. Thus, innovation to ensure sustainable agriculture and food consumption is key in curtailing climate change.

Existing and proposed endeavors into mitigating the impact of animal agriculture include research into plant-based and synthetic (lab-grown) meat alternatives, investment into agricultural technology with the aim of enhancing crop yields and reducing land use, and transitioning to the consumption of more resource-efficient meat sources, such as fish. There are hurdles to the implementation of these solutions, however; the expense and feasibility of such innovations, especially in LEDCs, are a concern. Although most research and innovation occurs in MEDCs, LEDCs still contribute significantly to emissions and are more likely to suffer from consequences if the current agricultural situation persists.

## **Definition of Key Terms:**

1. **Animal agriculture:** The branch of agriculture pertaining to the raising of domesticated animals for meat, milk and other products.
2. **Greenhouse gas:** A gas that traps heat on Earth, allowing it to enter but not leave the atmosphere. Greenhouse gases include carbon dioxide, methane and nitrous oxides.
3. **Enhanced greenhouse effect:** The global rise in surface temperature caused by increased concentrations of greenhouse gases due to the prevalence of polluting energy production and agriculture.
4. **Plant-based:** The quality of being derived solely from non-animal sources.

5. **Synthetic:** The quality of being made in a laboratory through chemical reactions as opposed to being a natural substance.
6. **Eutrophication:** The process by which a surplus of nutrients in a water body leads to the growth of excess plant life; this leads to an increase in plant consuming bacteria that respire off the dissolved oxygen in the water body, reducing the availability of oxygen for other marine life.
7. **GMO:** Genetically modified organism, an organism with genetic material that has been altered to effect a change that would not naturally occur.

## Background Information

### Environmental impact of meat

Meat is responsible for nearly 60% of emissions due to food production. Some emissions are due to the bodily processes of farmed animals, for example cows' releasing methane: the rest stem from productive processes themselves. Land must be cleared to make room for both pastures and farm plots for growing animal feed. This often occurs through the indiscriminate burning of parts of rainforests, releasing huge amounts of carbon dioxide into the atmosphere and destroying animals' habitats. Although the production of plant-based foods also requires land to be cleared, consuming plants indirectly through meat is particularly land and energy inefficient: An average of 70kg of greenhouse gas emissions is required to produce 1kg of meat, while only 2.5kg are required to produce 1kg of wheat.

### *Trends in global meat consumption*

Meat consumption has historically been associated with wealth. As LEDCs have industrialised their share of global meat consumption and production has increased, placing greater strain on resources; meat consumption in Asia is today more than 15 times what it was in 1960. Marked differentials in per capita consumption remain, however— consumption is particularly high in North America and Australia, and lowest in India. Although meat consumption as a proportion of total food consumption is decreasing, rapid global population growth means that it is still increasing in absolute terms.

### **The impact of milk**

Dairy cow feed consists of a large amount of ammonia. Manure with high ammonia concentrations can pollute waterways, potentially leading to eutrophication, where increased growth of algae on the waters due to high levels of ammonia leads to an increase in aquatic bacteria. In turn, these bacteria respire off dissolved oxygen, reducing the availability of oxygen in the water, killing off marine life as a result. Moreover, the production of milk is an inefficient process: it takes over 1,000 liters of water to produce one liter of milk.

### **The impact of non-animal products**

Although crop production is considerably less polluting than animal agriculture, the environmental impact of some crops should be noted. A single almond, for example, takes nearly 50 liters of water to produce; almond derived products like almond milk are considerably less energy-efficient than alternatives, such as soy milk. Furthermore, nitrogen fertilizers involved in the production of most crops can release nitrogen oxides, a particularly toxic group of greenhouse gases, into the atmosphere. Nitrogen runoff into waterways can also lead to eutrophication.

## **Current Situation**

### **Plant-based meat alternatives**

Plant-based meat alternatives have recently gained both commercial popularity and international attention. In 2018, the UNEP awarded US based companies Impossible Foods and Beyond Food for their respective “breakthrough alternatives to meat-based food products.” Plant-based meat alternatives mix potatoes, wheat, and coconut oil, among other ingredients, to engineer sustainable alternatives to meat. Some meat alternatives are also genetically modified to alter their tastes. Impossible Foods, for example, extracts the heme molecule from genetically modified soy plants and infuses it into their products. The benefits and drawbacks of using GMOs should be weighed when devising measures to encourage food innovation— some consumers are hesitant to consume GMO products. Moreover, some researchers have raised the question of whether the development of alternative meat is necessary at all; the carbon footprints of

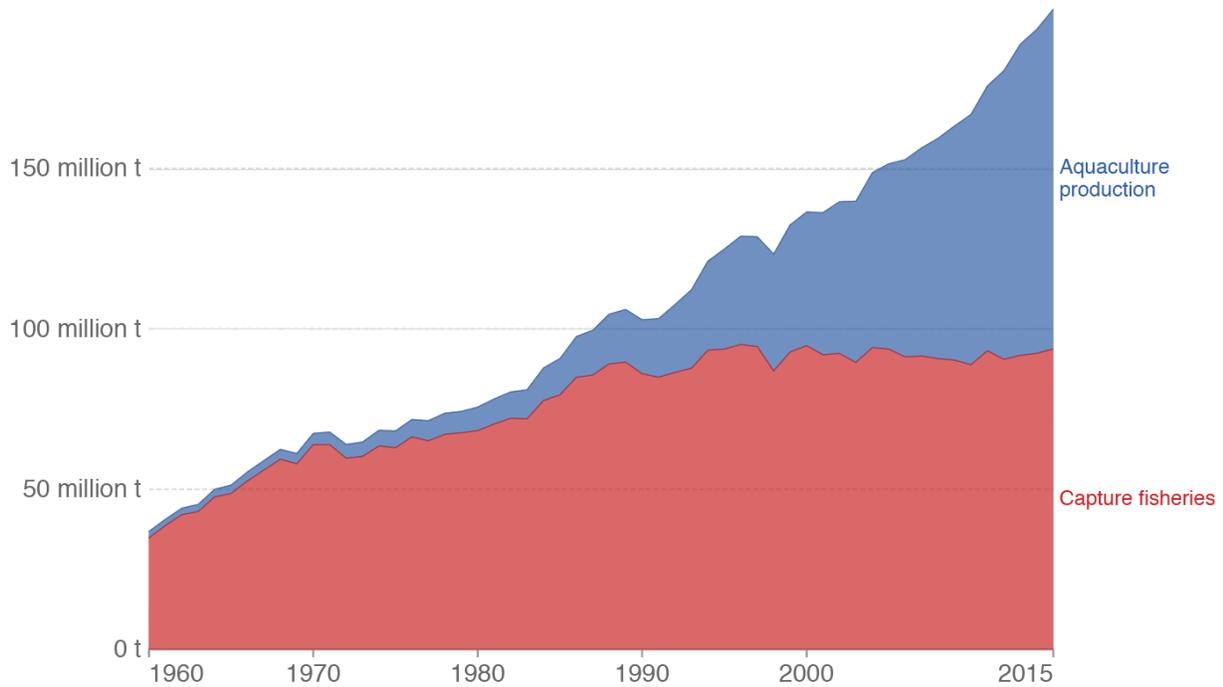
unprocessed alternatives, such as bean and beetroot patties, are up to 80% less than those of artificial ones.

**Synthetic meat**

Though not widely available commercially, synthetic meat, also known as lab-grown or cultured meat, is another alternative to animal meat. Synthetic meat uses animal cells and cultivates them in a lab in the hopes of producing an authentic-tasting meat product, Synthetic meat technology is still in its infancy— the first synthetic hamburger was only produced in 2013— but it is quickly attracting interest as an alternative to animal products that would allow consumers to retain the ability to choose between different varieties of meat. Research and production into synthetic meat is expensive, however, and synthetic meat may only be a long term solution to an issue that requires immediate action.

**Aquaculture**

Growth in Wild fish catch vs. Aquaculture Production since 1960



Source: UN Food and Agriculture Organization (FAO) Adapted From OurWorldInData.org/seafood-production • CC BY



**Aquaculture has recently overtaken wild fish catch as the largest supplier of fish for consumption**

Aquaculture, most prevalent in Asia, is the practice of farming fish for meat and other products. Global fish stocks are currently overexploited, meaning that fish are depleted faster than they can reproduce. Indeed, Commercial fishing stocks for wild fish catch are predicted to completely run out 2048— a prospect that would leave marine ecosystems in disarray. Commercial fishing also risks bycatch, where fish are unintentionally caught while fishing for other species. Aquaculture allows for the targeted farming and consumption of particular fish species without depleting stocks of ocean marine life. However, aquaculture also poses ethical and health concerns: fish do not naturally live in the cramped environment of farms, and are prone to stress and disease in poor conditions. In addition, the overuse of antibiotics in farms can create resilient viruses that may escalate into wider outbreaks of disease, while aquacultural waste can pollute nearby ocean water.

**GMO products**

GMOs allow for the alteration of crops to make them more land, water and nutrient efficient, as well as resistant to plant viruses and otherwise harmful farming practices. Herbicide ( a toxic substance used to kill plants) resistant crops allow farmers to destroy weeds without tilling soil, slowing the gradual deterioration in soil quality (erosion). This reduced erosion makes pesticide and fertilizer induced eutrophication less likely. Organisms can also be modified for consumer benefit; genetically modified soybeans, for example, are grown in the US to reduce the quantity of fatty acid therein, creating healthier versions of soy-derived products.

**Major Parties Involved and Their Views**

**United States**

Most innovation in the domain of plant-based meats has come from the US, home to companies such as Impossible Foods and Beyond Food. American food corporations such as Tyson Foods, one of the world’s largest producers of meat, have invested in plant-based alternatives to their own products. If demand for plant-based foods grows as predicted, American companies will have more resources to invest in the development of plant-based products. Still, there is some domestic opposition to the growth of the plant-based food industry,



particularly from those from traditional food industries who stand to lose from the growth of alternatives. The US Cattlemen's association, for example, has opposed the classification of plant-based alternatives as “meat” and has sought stricter regulations on meat alternatives. The livelihoods of those employed in traditional industries must be considered when devising means to further innovation.

## Europe

Europe is the largest market for plant-based meat and predicted to grow still larger between 2021 and 2025. Demand for plant based products in Europe is largely driven by ethical and health concerns—European consumers are more open to meat substitutes that do not perfectly match the taste of imitated products. European countries have also pioneered research into synthetic meat substitutes, though such products are still not approved for sale by EU regulatory bodies.

## Asia Pacific

Apart from a few exceptions, like Singapore, the consumption of modern meat substitutes in Asia is not particularly high. However, Buddhist cuisine, popular throughout the region, comprises many dishes made with meat-imitating ingredients. Such food has been prevalent for centuries and is more widely consumed than the more recent examples of plant-based alternatives. Furthermore, China, the largest consumer of meat in Asia, has pledged to cut meat consumption in half—generating opportunities for both domestic and international producers of alternative meat. Nonetheless, Meat consumption is rising in Asia faster than it is in any other region. Regulating Asian meat consumption is key to long-term global sustainability.

## UN Involvement, Relevant Resolutions, Treaties and Events

UN involvement has thus far failed to improve the state of global food innovation. Most involvement has been through reports, recommendations, and awards.

- United Nations Decade of Action on Nutrition, 15 April 2016 (**A/RES/70/259**)
  - A resolution wherein the UN declares the decade of 2016-2025 as the UN Decade of Action of Nutrition. The resolution reaffirms the UN's commitment to

the development of new technologies to ensure that the elimination of hunger exists as a sustainable endeavour.

- IPCC Special Report on Climate Change, 7 October 2019
  - A landmark 43 page report where the UNEP recommends that countries, particularly but not only MEDCs, cut meat consumption in order to reduce emissions.

## Possible Solutions

- **Encourage the development of additional plant-based and synthetic meat alternatives:** Synthetic meat may provide hesitant consumers with a larger variety of more authentic meat alternatives. Delegates should seek to expand initiatives to produce these alternatives, and should consider the relative involvement of the private and public sectors as well as sources of funding. Some possible measures could include the creation of shared facilities for innovation and provision of funds for start-ups in the food industry.
- **Encourage the consumption of plant-based meat alternatives:** Meat alternatives remain inaccessible to many consumers as they are generally more expensive than their animal counterparts. Delegates can explore options such as subsidies to make plant-based alternatives more affordable. Furthermore, delegates should consider the development of different alternatives for different regions: most meat alternatives are imitations of beef and chicken, but in China, for example, a pork substitute would better suit local consumption habits.
- **Improving agricultural technology and practices:** A wide variety of methods to help reduce the environmental impact of agriculture should be explored. Transitioning to aquaculture, increasing research into GMOs, and establishing better waste management regimes can all help in making agriculture more sustainable. Ethical issues arising from the poor conditions of factory farms should also be taken into account.
- **Improve regulations:** Beauractic systems make it difficult for some meat alternatives to get approval for sale from some countries' food authorities. Delegates may wish to improve regulatory environments to make meat alternatives more readily available. Delegates should also discuss the categorisation of meat alternatives, including whether they should be allowed to be marketed as "meat".

## Bibliography

### Useful Links

[A short overview of animal agriculture and its links to climate change](#)

[An article on GMO use in agriculture](#)

[A tool for comparing meat consumption among different countries](#)

[An article on the process of producing meat alternatives](#)

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