# Using Biotechnology to Reduce GHG Emissions from Animal Farming

Agriculture accounts for almost 20% of the world's greenhouse gas (GHG) emissions,[1] and livestock alone uses 80% of total agricultural land. The bulk of GHG emissions from livestock (consisting of methane, nitrous oxide, and carbon dioxide) arise from four main sheep and cattle rearing activities: enteric fermentation, manure management, feed production, and energy consumption. While governments place a high value on the introduction of clean energy, there is much to be desired in terms of finding innovative ways to control GHG emissions by the dairy and meat industry. For the world to achieve the Climate Action Plan targets for 2050, a focus on cleantech alone will not be enough.

Cutting down GHG emissions associated with livestock requires concerted research, and the development of technologies that can ensure cleaner methods of animal farming. In parallel, the world also needs to rethink its consumption patterns. While raising awareness is the first step towards altering the consumption of meat and dairy, the food industry will have to ensure the faster development and widespread distribution of alternatives to ensure a long term change in consumer behavior.

Genetic selection focused on ruminant animals' enteric fermentation could significantly reduce overall emissions by 2050. Experts say that about 20% of animal methane emission is determined by genetic make-up alone.[2] Researchers have already developed genetic systems that can reduce methane emissions by 20%.[3] However, a lot is still to be desired in terms of breed specificity of

[1] McKinsey & Company. April 2020. *Agriculture and Climate Change.*
https://www.mckinsey.com/~/media/mckinsey/industries/agriculture/our%20insights/reducing%20agriculture%20emissions%20through%20improved%20farming%20practices/agriculture-and-climate-change.pdf
[2] Ibid, 2020
[3] Ibid, 2020

genetic programs. Moreover, uptake remains an obstacle owing to a lack of financial incentives in the form of credit payments for methane limitation while animal rearing.

Another way to use biotechnology to reduce emissions from animal farming is through innovations that improve animal health and productivity. Healthier livestock have better productivity and longer lifespans, making it possible to meet the world's growing meat and dairy demand with fewer animals and reduced GHG emissions. A McKinsey study suggests that in North America implementation of improved animal health measures can improve the productivity of farm animals by 8%. Researchers are working towards developing innovations in the Internet of Things (IOT) as low cost methods of supporting farmers in monitoring animal health. A great example of such an innovation is LIVEQuest, a low-cost tool developed through a partnership between the United Kingdom and China that allows farmers to place devices on livestock and continually monitor health and productivity. This helps farmers cater to livestock needs quickly and improve animal health and productivity in a cost-effective manner, thereby providing farmers with the right incentives for take up.[4]

Addressing the production of animal feed can also improve GHG emissions from livestock. In India, a software tool helps determine the best mix of feed for 2.4 million animals in more than 30,000 villages. The software considers each animals' nutritional needs and GHG emissions when suggesting a feed mix.[5]

All the above innovations focus on the production side of the meat and dairy value chain. Working on clean innovations in production, without addressing excessive consumption patterns in meat and dairy is a one-legged approach to combating environmental degradation. It is estimated that by 2050, global meat consumption would more than double. In 2016, the United Arab Emirates (UAE) Ministry of Foreign Trade reported annual meat consumption at 85.14kg per capita, which was

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[4] Innovation China UK. http://www.icukonline.org/Technology%20portfolio/NEWTON_PROJECT1.shtml
[5] Sreelata, M. 02 July, 2019. *Software helps cut Indian cows' methane emissions*.
https://www.scidev.net/global/livestock/news/software-helps-cut-indian-cows-methane-emissions-1x.html

thrice the amount in major meat importing countries, and 18 times more than the world average.[6] Reducing the consumption of meat and substituting with less carbon-intensive food is critical in ensuring that the world is able to meet GHG reduction targets by 2050.

While changing consumer behavior would require sustained awareness campaigns, development of non-meat alternatives that look and taste like meat would be a good way to ease consumers into finding alternatives to fulfill their protein requirements. Biotechnology has advanced fairly in this endeavor, however, meat resembling products in the market are still far from being readily available.[7] Companies working on the production and distribution of these alternatives are a handful. Examples include Impossible Foods, a company producing plant based burgers that look and act like meat while using 75% less water, 95% less land and 87% fewer gas emissions than a regular beef burger; NotCo, a Chilean company that produces dairy alternatives; and Finless Foods, a company developing non-fish alternatives to seafood. These companies use cutting edge biotechnologies such as synthetic biology and artificial intelligence in creating their products. However, the field of synthetic biology is still uncharted territory as investors and governments tread carefully in devising ways that can truly change how societies eat.

The UAE is not the largest producer and/or consumer of dairy and meat in the world and hence its contributions to the GHG emissions owing to production are low compared to other countries. However, its forward-looking policies embedded in wellbeing and innovation, and its rich human capital can make it a pioneer in the research and development of biotechnologies that can disrupt the way the livestock industry impacts the world environment.

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[6] Pandey, V. 27 July, 2019. *UAE Fresh Mutton and Fruits Market, 2016.* Glasgow Consulting Group. http://glasgowconsultinggroup.com/uae-fresh-mutton-and-fruits-market-2016/#:~:text=According%20to%20the%20ministry%20of,more%20than%20the%20world%20average.
[7] Wilcox, M. 14 May, 2019. Synesthetic Biology is Changing What We Eat. Here's What We Need to Know. https://civileats.com/2019/05/14/synthetic-biology-is-changing-what-we-eat-heres-what-you-need-to-know/