April 29, 2021

SUBMITTED ELECTRONICALLY VIA REGULATIONS.GOV

RE: Docket No. USDA-2021-0003 Notice of Request for Public Comment on the Executive Order on Tackling the Climate Crisis at Home and Abroad

I. Introduction

The Good Food Institute (GFI) appreciates the opportunity to submit these comments regarding the role of the United States Department of Agriculture (USDA) in implementing President Biden's Executive Order on Tackling the Climate Crisis at Home and Abroad. GFI is a 501(c)(3) nonprofit organization dedicated to building a sustainable, secure, and just food system, and we support science and policy that accelerate progress on alternative proteins. To help achieve President Biden's climate goals and create a more equitable food system, we recommend that USDA leverage existing programs to advance open-access alternative protein research.

Meeting the Paris Agreement's goal of keeping global warming below 1.5°C relative to pre-industrial levels will require rapid and ambitious food system changes, including how the world produces protein. A transition to more sustainable and efficient protein production has the potential to deliver 14 to 20 percent of the emissions mitigation the world needs until 2050 to stay below 1.5°C.[1] This amounts to 10 to 14 gigatonnes CO2-eq per year of emissions mitigation compared to business as usual by 2050,[2] making the protein transition a larger global climate solution than vehicle electrification, onshore wind turbines, and reducing food waste combined.[3]

[1] ClimateWorks' original modeling is based on Roe, S. et al. *Contribution of the land sector to a 1.5 °C world*, Nature Climate Change (Oct. 2019), https://www.nature.com/articles/s41558-019-0591-9; Stehfest, E. et al, *Key determinants of global land-use projections*, Nature Communications (May 2019), https://www.nature.com/articles/s41467-019-09945-w; and Poore, J. and T. Nemecek, *Reducing food's environmental impacts through producers and consumers,* Science (June 2018), https://science.sciencemag.org/content/360/6392/987.

[2] This mitigation potential includes emissions reductions from reduced deforestation for livestock and feed production, reduced emissions from feed crops, and reduced direct emissions from the sector. It does not include carbon removal or sequestration.

[3] Based on annualizing Project Drawdown's cumulative mitigation potential of these sectors, https://drawdown.org/solutions.

Alternative proteins from plants,[4] from cultivated cells,[5] and via fermentation[6] must be part of the protein transition to meet the goals of the Paris Agreement and increase the resilience of our food system. These scalable, market-based solutions can help usher in a new era of American agricultural innovation and drive environmentally sustainable economic growth.

Right now, the United States leads the world with the most companies in this sector. But our leadership is not assured. Over the past four years, other countries have invested in alternative protein research and development while the United States government has hesitated. Bold action is needed to ensure that the full diversity of protein foods is grown and made in America, and in all of America.

As we explain below, USDA can leverage existing programs and funding to encourage this kind of climate-smart agriculture that can Build Back Better by making American agriculture stronger, more resilient, and more inclusive.

II. Recommended Priorities for USDA's Role in the Executive Order on Tackling the Climate Crisis at Home and Abroad

Alternative proteins, a form of climate-smart food production, can reduce food system emissions while protecting biodiversity and freeing up significant amounts of land for additional climate mitigation strategies. However, public research is crucial to increase the availability and bring down the cost of alternative proteins so that these environmental benefits can be fully realized. USDA is well-suited to fund and implement this research via existing programs.

[4] **Plant-based meat** consists of the same basic components as animal-based meat (namely protein, fat, vitamins, minerals, and water) derived directly from plants and modified to biomimic the full sensory experience of their animal-based counterparts. Next-generation plant-based meat, made popular by American companies such as Beyond Meat and Impossible Foods, looks, cooks, and tastes like conventional meat.

[5] **Cultivated meat** (also called cell-cultured or cultured meat) is animal meat produced by growing cells from animals. At scale, cultivated meat production will look similar to the fermentation process in beer breweries. Production begins with a small sample of cells from an animal. The cells from this sample are grown by feeding them a nutrient-rich cell culture medium in a bioreactor. During cultivation, the cells multiply many times over, producing muscle, fat, and other components of meat. Some cultivated meat products are grown on scaffolds — biodegradable or edible structures made of food-grade materials — that support the development of a desirable texture and three-dimensional shape. These materials are already widely used in the food industry, and their safety is well documented. The resulting meat looks, tastes, and cooks like conventional meat.

[6] **Fermentation** traditionally refers to using microbes — usually fungi or bacteria — to produce food. In industrial biotechnology, fermentation has come to mean simply the cultivation of microbial organisms. Fermentation can either produce more of the microbial organism or use that organism to produce another substance, such as enzymes whose use is ubiquitous in food applications. Companies are now using fermentation to create high-quality ingredients and flavors, as well as applying gene editing and engineering techniques to use easily-cultivated microbes (often yeast) to produce desirable food ingredients, including animal and plant proteins and fats.

A. Alternative Protein Research is a Critical Component of Climate-Smart Agriculture.

At the House Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Subcommittee year-ahead USDA hearing earlier this month, House Appropriations Chair Rosa DeLauro called for "parity in research funding for alternative proteins," going on to say, “The United States can continue to be a global leader on alternative protein science, and these technologies can play an important role in combating climate change and adding resiliency to our food system.”[7] Alternative proteins have significant environmental benefits and should be part of the United States’ strategy to leverage food innovation to combat climate change.

Both the primary ingredients and processing methods for plant-based meat have very low greenhouse gas emissions. For example, life-cycle analyses of plant-based burgers produced by Impossible Foods and Beyond Meat conclude that they reduce greenhouse gas emissions by approximately 89 percent compared to traditional ground beef.[8] This is plant-based meat at a very small scale; as production levels climb, efficiencies will improve, and climate impact will continue to fall.

Cultivated meat has a lower carbon footprint than most forms of traditional meat production even when conventional energy is used. The vast majority of cultivated meat’s climate impact comes from electricity use at the production facility, so just as electric cars are only as clean as the source of their electricity, cultivated meat is most sustainably produced with renewable energy. When renewable energy is used, cultivated meat reduces the climate footprint of beef, pork, and chicken by 92 percent, 52 percent, and 17 percent, respectively.[9] And as with plant-based meat, these numbers will improve as production capacity scales up.

In addition to having a smaller carbon footprint, plant-based meat uses up to 99 percent less land than traditional beef, and cultivated meat could use 95 percent less land than traditional beef.[10] With this massive decrease in land use, additional opportunities arise for growing food crops, carbon sequestration, production of renewable energy, and protection for biodiversity.

---

[7] House Committee on Appropriations, *Chair DeLauro Statement at the U.S. Department of Agriculture - The Year Ahead Hearing* (Apr. 14, 2021), https://rb.gy/xugnhb.

[8] Khan S. et al., *Comparative Environmental LCA of the Impossible Burger with Conventional Ground Beef Burger*, Quantis USA & Impossible Foods (Feb. 2019), https://bit.ly/2D6oVMb; Martin C. Heller & Gregory A. Keoleian, Beyond Meat’s Beyond Burger Life Cycle Assessment: A Detailed Comparison between a Plant-based and an Animal-based Protein Source, Univ. Mich. Ctr. Sustainable Sys. (Sept. 2018), https://bit.ly/2XIk11I.

[9] The Good Food Institute, *Cultivated meat LCA and TEA: Policy recommendations* (Mar. 2021), https://rb.gy/6b2bbt.

[10] *Id.*; The Good Food Institute, *Plant-based meat for a growing world* (Aug. 2019), https://rb.gy/hocct3.

Furthermore, open-access alternative protein research will allow the country to diversify its crops, making us more resilient to extreme weather, crop diseases, and pests. Yellow peas, for example, which are currently used in plant-based meat production, are more resilient than corn, soybeans, and wheat because they require less water and are drought tolerant. Having a greater variety of plants grown in American fields will provide an insurance policy against climate disasters and other circumstances that would devastate just one.

Public research is needed to accelerate industry growth to leverage these climate benefits. The alternative protein market is still very small compared to the market for traditional animal agriculture. Plant-based meat is approximately one percent of all dollar sales for total retail meat in the United States.[11] Additionally, while some remarkable products are on the market, nearly all plant-based meats widely available today are burgers and nuggets, and cultivated meat is only in the market with limited distribution in Singapore. Plus, the prices of alternative proteins are not yet competitive with conventional animal products. For example, both the Beyond and Impossible burgers cost roughly twice what a traditional burger costs (and beef is the most expensive meat). And cultivated meat is far from price parity with any traditional meat currently. Fortunately, open-access research can address these challenges, resulting in a world where everyone can enjoy alternative proteins and their environmental benefits.

USDA is well-suited to prioritize alternative protein research as an agricultural solution to climate change through existing programs. Specifically, USDA's Agricultural Research Service (ARS) and the National Institute of Food and Agriculture (NIFA) can fund and perform open-access alternative protein research tackling key white spaces to accelerate the growth of this sector. As the premier intramural agricultural research agency, ARS is uniquely positioned to prioritize and advance alternative protein research, much of which fits within the scope and expertise of already ongoing research programs, including the National Programs in Plant Genetic Resources, Genomics, and Genetic Improvement, Sustainable Agricultural Systems Research, and Product Quality and New Uses, among others. Likewise, as The Good Food Institute shared in a recent meeting with ten NIFA National Program Leaders, NIFA can animate its mission to "invest in and advance agricultural research … to solve societal challenges" by building upon its recent history of funding alternative protein research. (Last year, NIFA awarded nearly $500,000 each to plant-based meat researchers at the University of Massachusetts Amherst and Purdue University via the Agriculture and Food Research Initiative).

In addition, we recommend USDA pursue an interagency initiative with the National Science Foundation (NSF) to research alternative proteins. This is a cross-cutting area of research where unique expertise at NSF and USDA can function synergistically. An interagency initiative will combine NSF's engineering and manufacturing expertise with USDA's food production, safety, and nutrition expertise. In recent meetings with The Good Food Institute, NIFA scientists were

[11] The Good Food Institute, *Plant-based retail market overview* (Apr. 2021), https://gfi.org/resource/marketresearch/.

receptive to alternative protein research and NSF has expressed a strong desire to collaborate with USDA on this research area, building upon their 2020 grant of $3.55 million for cultivated meat research and training at the University of California Davis. To facilitate these partnerships, The Good Food Institute is encouraging the White House to establish an interagency initiative akin to the National Nanotechnology Initiative[12] to coordinate federal research efforts on alternative proteins. This initiative can identify and perform the research and development to remove the technological barriers currently facing the alternative protein sector and ensure interagency coordination in such research efforts to improve efficiency, minimize duplication of effort, and grow workforce talent.

Both basic and applied scientific research is needed to accelerate alternative protein growth to meet the pressing timelines of fighting the climate crisis. We have identified the following areas as the most crucial research needs for alternative proteins.

Plant-Based

- Crop breeding and engineering for higher protein yields and functionality.
- Protein fractionation and functionalization, including from existing agricultural side streams.
- Improved plant fat profiles.
- Novel methods for texturizing and structuring plant-based proteins.

Cultivated

- Animal science and animal nutrition insights for developing cell lines and media formulations for optimal flavor, nutrition, and growth characteristics.
- Biomaterials for tunable, edible, and low-cost scaffolds that promote cell adherence and differentiation with spatial control.
- Bioprocess systems and biosensor technologies that can monitor the concentrations of specific nutrients and metabolic byproducts and adaptively control the feed inlets and outflows to optimize cell performance and reduce costs.

Fermentation

- Increased titers and yields for fermentation-produced ingredients via strain engineering.
- Screening and adaptation of novel strains as commercial candidates.
- Feedstock optimization for leveraging existing biomass streams.

Addressing each of these key research areas will help address the climate crisis via food and agriculture innovation. This research will enable alternative proteins to be widely available and affordable to all so that the climate benefits of alternative proteins can be fully realized.

[12] *See* National Nanotechnology Initiative, https://www.nano.gov/.

In addition to the environmental benefits of alternative protein research, open-access research will create new market opportunities for established growers and new farmers alike. For example, instead of selling crops for animal feed at commodity prices, research on the most nutritious and functional specialty crop and pulse ingredients for plant-based meat will provide farmers the option of selling inputs for alternative protein products at greater profit.

By including alternative protein research in the agency's climate-smart agriculture strategy, USDA will help enable American agriculture to be stronger, more resilient, and more inclusive.

B. Open-Access Alternative Protein Research Will Help Create a More Equitable Food System.

USDA-funded alternative protein research will also help ensure that these climate-smart agricultural technologies are accessible to all communities, and that producers and consumers alike benefit from the growth of this nascent industry.

Private investment in alternative proteins has increased in recent years. However, only a small proportion of these investments goes to research, and the results of private research are often proprietary, primarily benefiting only the company that conducted the research. In contrast, the publicly available results of USDA-funded open-access research will benefit all producers and communities, not only particular companies. By funding open-access research, USDA can help ensure that the findings of alternative protein research are equitably available to entrepreneurs, producers, and other researchers throughout the United States.

Open-access research is essential to help the alternative protein industry offer more diverse products at greater scale. As noted above, plant-based products are not yet cost-competitive with traditional animal products and are primarily limited to burgers and nuggets. As the industry grows and volumes rise, prices can be expected to go down, ensuring that all Americans can afford and have access to alternative proteins.[13]

2020 sales data shows that purchasers of plant-based products are more likely to be people of color.[14] Open-access research will increase options for these consumers and the general population, as well as for consumers abroad via export.

Publicly funded alternative protein research will also create new economic opportunities for farmers and others throughout the supply chain while boosting food system resilience. Given the right incentives, alternative protein production facilities similar to craft beer breweries can be

[13] In February 2021, Impossible Foods announced a 20 percent price cut in suggested retail prices in grocery stores due to growth and economies of scale, https://rb.gy/qm37bg.

[14] The Good Food Institute, *Plant-based food retail sales reach $7 billion* (Apr. 2021), https://gfi.org/blog/spins-data-release-2021/.

established in rural, semi-rural, and urban areas. This widely distributed production and supply network will create opportunities for workers in farming and food production and keep money flowing through local economies. A distributed system will also protect against supply chain disruptions by creating an overlapping network of production. That means fewer lost jobs due to storms, droughts, wildfires, flooding, and disease outbreaks—and that Americans who live in the areas most vulnerable to these disruptions, often low-income people of color, will have better opportunities to earn a decent living for themselves and their families.

III. Conclusion

Alternative proteins should be one of USDA's strategies to mitigate climate change and increase food system resilience. Investing in alternative protein research will ensure that the United States remains a leader in climate-smart agriculture while building a more secure, sustainable, and just food supply.

Thank you for your consideration and for the opportunity to submit these comments. Please contact Emily Hennessee at emilyh@gfi.org with any questions as you consider our submission.

Sincerely,

Emily Hennessee
Policy Associate
The Good Food Institute
emilyh@gfi.org

Erin Rees Clayton, Ph.D.
Associate Director of Science and Technology
The Good Food Institute
erinc@gfi.org