THE GOOD FOOD INSTITUTE

Fiscal Year 2021 Funding Request

Opportunities in Plant-based Meat and Cultivated Meat Research

November 13, 2019

Executive Summary

The United States has the opportunity to lead the world by supporting innovative research in:

- **Plant Protein.** Advance the development of plant-based protein-rich foods for human consumption by supporting research in these topics:
  - Characterizing proteins to assess their suitability as ingredients.
  - Screening novel protein-rich crop varieties.
  - Developing protein extraction methods.
  - Improving protein functionality and structuring.
  - Optimizing plant-based food manufacturing methods.

- **Cultivated Meat.** Fund or carry out research on topics critical to the development and commercialization of cultivated (cell-based) meat:
  - Developing stable agriculturally relevant cell lines.
  - Optimizing cell culture media for growing meat.
  - Exploring novel methods of scaffolding support for muscle cell growth.
  - Improving cultivator (bioreactor) designs.

These topics align with the Administration's Fiscal Year 2021 research priorities of environmental leadership and American bioeconomic innovation. Other countries are making small investments in these fields. As home to many leading plant-based and cultivated meat companies, the United States should seize the opportunity to lead.

Private investment alone is not enough. Private research and development projects often address short-term, company-specific questions and are not shared across the sector. Public funding, on the other hand, can be longer term in scope with benefits to entities across the sector.

Rationale

The United States has the opportunity to lead the world in two innovative and promising new food sectors: plant-based meat and cultivated (cell-based) meat. The United Nations projects more than a 50 percent increase in global meat consumption by 2050, and these new sectors offer a way to meet that growing demand in sustainable ways with fewer threats to human health.[1]

Just as federal research and development (R&D) funding has sparked innovations in computing, genomics, manufacturing, and other fields,[2] so federal funding for research on plant proteins and cellular agriculture could set the stage for dramatic improvements in these sectors.

While private R&D funding in these sectors is growing, private investment alone is not enough. The overall amount remains fairly small, with roughly $140 million invested in cultivated meat companies as of October 2019.[3] By comparison, investments in food tech over the ten years ending in 2018 totaled about $30 billion, and investments in renewable energy over the last decade total about $2.6 trillion.[4] Additionally, private R&D funding tends not to take the place of public funding, according to the U.S. Department of Agriculture's Economic Research Service, which says that private R&D tends to focus on food manufacturing and machinery, with public research "more likely to be applied to areas with large social benefits, such as environmental protection, nutrition, and food safety."[5]

U.S. leadership in these sectors cannot be assumed. Other countries see the economic potential and public good in these fields and are investing in them, including Japan,[6] Israel,[7] The Netherlands,[8] India,[9] and Singapore.[10]

The United States should invest, too. Federal investment in research in these sectors aligns squarely with the Administration's recently announced Fiscal Year 2021 research priorities of American environmental leadership and American bioeconomic innovation.[11] Federal R&D funding will help ensure that the United States remains a leader in these exciting and promising fields, and more broadly in global efforts against public health threats like antibiotic resistance.

Plant Protein Research

The Good Food Institute (GFI) notes the increasing public interest in the health, nutritional, and environmental profiles of plant-based protein-rich foods for human consumption. Research in this sector holds economic promise and aligns strongly with recently announced Administration R&D goals of bioeconomic innovation and American leadership in protecting our oceans and other important natural systems. GFI therefore encourages the Administration to continue and expand research that characterizes proteins from plants to assess their suitability for use as ingredients in plant-based meat products for human consumption.

Specific crops worthy of investigation include grains (oats, barley, rice, sorghum), pulses (dry beans, dry peas, lentils, chickpeas), nuts (almonds, peanuts, walnuts), edible seeds (sunflower, flax, hemp), mushrooms, and water plants (seaweed such as kelp and duckweed). Research focused on the optimization of crops and their derivative ingredients for protein-rich plant-based foods for human consumption is expected to help expand the market for these crops.

GFI encourages the Administration to consider related areas of research, including the development and optimization of: (1) breeding and high-throughput screening methods for novel varieties of crops to identify improved agronomic, nutritional, and techno-functional profiles; (2) safe and efficient methods of protein extraction; (3) safe and efficient techniques for improving protein functionality and structuring for plant-based foods; and (4) methods of plant-based food manufacturing that are cost-effective, require minimal resource inputs, and easily scaled. GFI is particularly interested in encouraging research in the above areas that will disseminate research protocols and data through publicly-available online repositories accessible by academic researchers and stakeholders across the various plant-based food value chains.

Cultivated Meat Research

GFI commends federal agencies for their work to-date focused on meeting the challenges of antimicrobial resistance and growing the bioeconomy. Increasing demand for meat across the United States and worldwide presents challenges and opportunities in these areas.

Cultivated meat will diversify and bolster the protein supply by producing meat in a new way. Rather than raising and slaughtering animals, meat is grown directly cells in a tank called a cultivator, which facilitates the same biological process that happens inside an animal by providing warmth and the basic elements needed to build muscle: water, proteins, carbohydrates, fats, vitamins, and minerals. The result is
meat, identical to conventional meat at the cellular level, that looks, tastes, and cooks the same. However, some significant technical challenges remain that prevent this meat-production method from being scaled up significantly.

GFI accordingly encourages the Administration to engage in research into the technologies and manufacturing processes most likely to have significant benefits to this industry and American consumers. Specifically, we encourage open-access, multi-disciplinary research aimed at developing stable agriculturally relevant cell lines, optimizing cell culture media for cultivating meat cells, and exploring novel methods of scaffolding support for muscle cell growth. GFI notes that crops are likely to serve as important feedstocks for the cultivated meat industry — for example, as sources of amino acids or other cell culture media components — and as sources of scaffolding material.

Conclusion

The Good Food Institute looks forward to working with the Administration to identify and federally fund research projects that do the most to advance the Administration's Bioeconomy research priorities for Fiscal Year 2021.

Endnotes

1. GFI, *Plant-based Meat for a Growing World* (2019), https://bit.ly/2mrT5VG; GFI, Growing Meat Sustainably: The Clean Meat Revolution (2018), https://bit.ly/2uEiUlY.
2. Peter L. Singer, *Federally Supported Innovations*, Info. Tech. & Innovation Found. (Feb. 3, 2014), https://bit.ly/1dngdCC.
3. See Elliot Swartz, *Money Raised*, A Bit of Science, https://bit.ly/31xWG2N (as of Oct. 2019). This figure was calculated by aggregating the total investments listed in the second graph from the top of the webpage with axes labeled "Type" and "Money Raised ($MM USD)."
4. Will Mathis, *Clean Energy Investment Is Set to Hit $2.6 Trillion This Decade*, Bloomberg, Sept. 5, 2019, https://bloom.bg/2m4JK5L.
5. Econ. Research Serv., U.S. Dep't of Agric., Agricultural research spending from the private sector has increased while spending from the public sector fell, https://bit.ly/2n202ND (last updated July 9, 2019).
6. Helen Marvell, *Japanese Government Part of $2.7 Million Investment in New Clean Meat Brand*, LiveKindly, June 5, 2018, https://bit.ly/2FJdr2r.
7. Niamh Michail, *Aleph Farms CEO on its 3D cultured beef: 'Unlike other companies, our meat grows together like real meat'*, FoodNavigator, May 2, 2018, https://bit.ly/2DXQkT5.
8. Elie Dolgin, *Sizzling interest in lab-grown meat belies lack of basic research*, 566 Nature 161-162 (2019), https://go.nature.com/2Shlzii.
9. Ramya Ramamurthy, *Indian Government Grants Over $600,000 to Cell-based Meat Research*, GFI, Apr. 26, 2019, https://bit.ly/2Le2Sdv.
10. Yoolim Lee & Joyce Koh, *Singapore Backs Lab-Grown Meat, Robots in $535 Million Push*, Bloomberg, Mar. 27, 2019, https://bloom.bg/2FI4PKu.
11. Memorandum M-19-25, *Fiscal Year 2021 Administration Research and Development Budget Priorities*, August 30, 2019, https://www.whitehouse.gov/wp-content/uploads/2019/08/FY-21-RD-Budget-Priorities.pdf.

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About GFI

The Good Food Institute is a global nonprofit building a sustainable, healthy, and just food system. Our scientists, entrepreneurs, lawyers, and policy experts are harnessing the power of food innovation and markets to accelerate the transition of the world's food system to alternative proteins, including plant-based and cultivated meat.

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