AMERICAN SOCIETY FOR MICROBIOLOGY

November 9, 2020

Acting Deputy Secretary
United States Department of Agriculture
1400 Jefferson Dr. SW
Washington, DC 20250

Re: Docket No. USDA-2020-0008

Dear Acting Deputy Secretary:

On behalf of the American Society for Microbiology (ASM), thank you for the opportunity to comment on the Agriculture Innovation Agenda. As one of the oldest and largest life science societies with more than 30,000 members in the United States and around the globe, our mission is to promote and advance the microbial sciences. ASM is committed to advocating for public policies that are rooted in science.[1] ASM supports policies that respect and enhance the integral role of plant, animal, soil, and water microbiomes in a healthy and economic supply of food, fiber, fuel and a well-functioning agroecosystem, policies that promote research on environmentally sustainable agricultural practices, and policies that facilitate implementation of these practices.[2]

ASM appreciates the U.S. Department of Agriculture's (USDA) commitment to environmentally sound and economically viable agricultural practices, and we support the goal of increasing U.S. agricultural production by 40 percent while cutting the environmental footprint of U.S. agriculture in half by 2050 as described in the Agriculture Innovation Agenda (AIA) goals. In order to reach this goal, USDA will need to expedite the deployment of innovative technologies and practices that enhance on-farm decision-making, improve soil health, reduce pollution and sequester carbon in the soil. As noted in the National Academies report *Science Breakthroughs to Advance Food and Agricultural Research by 2030*,[3] further understanding of animal, soil, and plant microbiomes will provide opportunities to improve crop production, transform feed efficiency, and increase resilience to stress and disease. Such practices can also help communities mitigate and adapt to climate change.

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[1] "ASM Policy Framework," American Society for Microbiology, https://asm.org/Articles/Policy/2019/November-19/ASM-Policy-Framework-Preamble

[2] "Microbes in Agriculture," American Society for Microbiology, https://asm.org/Articles/Policy/2019/November-19/Microbes-in-Agriculture

[3] National Academies of Sciences, Engineering, and Medicine. 2018. Science Breakthroughs to Advance Food and Agricultural Research by 2030. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/25059.

Yet while further research will be necessary to identify new practices and improve existing technologies and practices in pursuit of the AIA goals, ASM notes in these comments several practices with strong records of success that engage microbiomes in maintaining and improving yields and the environmental performance of American and global agriculture, including with regards to climate change. Microbiomes are communities of microorganisms, or microbes—bacteria, archaea, viruses, fungi, prions, protozoa, and algae – that live on, in, and around people, plants, animals, soil, oceans, and atmospheres. Some of the most important developments in modern medicine have resulted from harnessing the power of microbes, including a vaccine against smallpox and the discovery of penicillin. While applications of microbiome research in human health have seen rapid expansion, microbes also play key roles in animal and plant health and the stability of ecosystems. As a core part of its missions, ASM leads, collaborates and galvanizes scientists, stakeholders and the public across multiple sectors.[4] ASM encourages the USDA, through the AIA, to support farmers and agriculture stakeholders to adopt the technologies and practices discussed below, and continue to collect and assess data resulting from these practices, in order to accelerate technology and practice deployment, and agricultural research investments, moving forward, including increasing coordination of microbiome research across federal agencies.

USDA's request for written stakeholder input acknowledges that more support among its agencies can accelerate deployment of technology and practices that are already known to maintain or enhance agricultural production while reducing pollutants released into the environment. While there are many technologies and practices already known to increase yields and improve the environmental footprint of agricultural production, ASM specifically asks USDA to support the deployment and use of technology and practices:

- to enhance farmland and microbial research data collection and utilization;
- promote use of inoculants that can improve the health of agricultural soils and plant production; and
- encourage conservation tillage and pasture management or grazing practices that enhance soil health.

Technologies

The AIA goals will require expediting deployment of technologies in farm fields and among other agricultural stakeholders such as seed, fertilizer, equipment providers, and agronomists. Among many developing technologies that can contribute to the AIA goals, ASM specifically highlights building out computer infrastructure that can make beneficial use of big data, and microbial soil inoculants, as important technologies to improve and disperse.

Data

ASM supports publicly funded programs that provide critical human resources and infrastructure needed to deploy new knowledge and technologies in the field, of which reliable, accessible, interoperable and secure field crop production data collection and management would be a prime

[4] "ASM Policy Framework," https://asm.org/Articles/Policy/2019/November-19/ASM-Policy-Framework-Preamble

example. In particular, ASM supports USDA's implementation of policies and programs that encourage the equitable and transparent collection, aggregation and interpretation of farming and microbial research data with robust protections of anonymity (which ensures data quality and encourages more full participation). Through programs like the Agricultural Research Service's (ARS) cooperative agreements and research projects funded through the National Institute of Food and Agriculture's (NIFA) extramural grant programs, USDA can advance data collection, assessment, and sharing to support individual farmers, research scientists in agriculture, and other agricultural stakeholders in achieving AIA goals. In addition to the direct participation in building out computing infrastructure that can process farming and microbial data, ASM also encourages USDA to share data freely, but securely and with the protection of anonymity for farming data, among its various agencies.

In addition to enhancing production and conservation through advising on-farm decision making, computer infrastructure that can effectively assess massive quantities of farming and microbial research data will also be key to identify and develop new microbial soil inoculant products that enhance farm production and reduce its environmental impact, and to effectively monitor and combat antimicrobial resistance that jeopardizes productivity as well as human health (ASM supports establishing a global surveillance system to inform realistic, defensive action plans to combat the spread of antimicrobial resistant organisms and to evaluate the impact of these intervention measures).[5] ASM encourages USDA to leverage existing infrastructure, such as the National Microbiome Data Collaborative, to the extent practicable for these purposes.[6] Integrating accurate, anonymous, high-quality data from farms with other sources can help farmers improve yields and avoid unproductive fertilizer applications, consider different uses for fields that require intense tillage or input applications to be productive, and anticipate production complications arising from climate change.[7] As data technology improves, it will allow farmers and agricultural stakeholders to make additional improvements that will further the AIA goals.

Microbial Inoculants

Throughout the agricultural sector, the farming and environmental benefits of soil health are becoming more thoroughly and widely understood. When farmers make management decisions that enhance soil health, they often maintain yields while mitigating harmful nutrient pollution to waterways, store atmospheric carbon in working soils, and build resilience to climate change. ASM argues for USDA, specifically the Natural Resources Conservation Service (NRCS) to increase efforts to promote good soil health in the discussion of beneficial practices, but the use of prepared inoculants to increase soil health is a technology that may kick start soil health and build momentum toward the achievement of the AIA goals.[8]

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[5] ASM. "Microbes and Health." https://asm.org/Articles/Policy/2019/November-19/Microbes-and-Health

[6] National Microbiome Data Collaborative: https://microbiomedata.org/

[7] Martinez-Feria, Rafael and Bruno Basso. "Unstable crop yields reveal opportunities for site-specific adaptations to climate variability." *Sci Rep* 10, 2885 (2020).doi: https://doi.org/10.1038/s41598-020-59494-2

[8] See, ie, Milkovich, Matt. "Microbial inoculants can improve soybean yields," Michigan State University March 2018, https://www.canr.msu.edu/news/microbial-inoculants-can-improve-soybean-yields

Farmers converting from more traditional or input-intensive forms of production to more conservation-minded management are sometimes frustrated by the rate at which soil health improves and the time it takes to realize production and environmental benefits. ASM suggests that USDA consider incorporating microbial seed inoculants more thoroughly in its conservation promotion programs, such as the Environmental Quality Incentives Program (EQIP) and the Conservation Technical Assistance Program (CTA). By including inoculants developed to promote soil health in its outreach and conservation support programs, NRCS may engage farmers in achieving soil health benefits faster, and encourage more farmers to pursue soil health, in furtherance of the AIA goals.

Inoculants would also improve plant health, resulting in increased nutrient use and water use efficiencies and resilience to plant diseases. This would decrease inputs thus improving profitability and reducing the environmental footprint of farming enterprises.

Both enhanced data and microbial inoculants are technologies that will facilitate collaborations between farmers and other agricultural stakeholders that utilize microbes to achieve the AIA goals. USDA's investment in these technologies may expedite deployment and enhance the efficacy of the "on-farm" practices ASM encourages USDA to support below.

Practices

In addition to the technologies discussed above, ASM encourages USDA to invest in expediting the adoption of certain practices already determined to improve farmers' yields and environmental footprints by working with, encouraging and maintaining beneficial soil and plant microbiomes. The National Academies report *Science Breakthroughs to Advance Food and Agricultural Research by 2030* noted that identifying and harnessing the soil microbiome's capability to produce nutrients, increase nutrient bioavailability, and improve plant resilience to environmental stress and disease will lead to more productive and sustainable crop production systems.[9] A number of practices known to improve soil health by encouraging healthy soil microbiomes would, if adopted widely, make substantial progress toward the AIA goals. These practices invoke some of the same scientific principles but differ in application and means of deployment depending whether they are directed toward livestock or crops. USDA has a successful track record of promoting these practices among farmers already; ASM encourages USDA to find opportunities to reach more farmers with more assistance through existing, improved and new outreach and support programs. ASM also encourages greater understanding of these practices in agencies outside of NRCS; programs offered by the Risk Management Agency (RMA) and Farm Service Agency (FSA) may incidentally discourage farmers from utilizing practices that improve soil health for lack of understanding of how these practices interact with other aspects of farm business management.

Field Crops

[9] National Academies of Sciences, Engineering, and Medicine. 2018. Science Breakthroughs to Advance Food and Agricultural Research by 2030. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/25059.

The plant-soil-microbiome interaction in the rhizosphere requires significantly more research in order to more fully understand and maximize its environmental and productive benefit. However, at this time there is significant evidence that conservation tillage practices can reduce agriculture's climate and water quality impact while enhancing production and improving resilience to drought and flood. Conservation tillage minimizes disturbance of topsoil when planting, managing and harvesting field crops. When properly managed, conservation tillage practices can improve water retention in farmland, reduce the need for fertilizer applications, and prevent nutrients from leaving farm fields and entering surface water (where they can have a negative impact on aquatic ecosystems and human drinking water quality and cannot have a positive impact on yield, wasting the farmers' time and money).[10] In addition to conservation tillage, diversifying crop rotations and planting cover crops when working soils would otherwise lay bare between plantings, can also enhance microbial life in the soils, allowing farmers to maintain yields while reducing their environmental footprint. NRCS does good and important work supporting farmers in implementing these practices; ASM encourages NRCS to carefully assess the strengths and shortfalls of its programs over time in order to promote more conservation tillage among more farmers.

Livestock

Much of the livestock raised for food, dairy and fiber in the US eats grain-based feed for at least part of its life. ASM encourages USDA to utilize its program to promote raising livestock on pasture and diversity in the feed supply.

Planting and managing grass carefully, rather than annual crops, can benefit soil health. NRCS programs like EQIP can support farmers in finding the right vegetation to plant based on the livestock's forage needs and what the land will support. Managed rotational grazing that encourages livestock to eat just enough forage to allow the plant to recover, enhances soil health and prevents loss of nutrients to water through erosion. When these systems are implemented and run well, they may cumulatively reduce irrigation needs and make the meat supply more resilient to drought and flood. Further, the resilience of the food system and improvement of agriculture's environmental impact are enhanced by greater diversity in methods of production. Livestock raised through rotational grazing are impacted by disease differently; they are less crowded and encounter different stimulus as each animal's immune system develops than animals raised indoors. Encouraging rotational grazing ensures that veterinary microbiologists will have the opportunity to study livestock raised under different conditions in order to mitigate antimicrobial resistance (AMR) in order to preserve the efficacy of antimicrobial medicine for

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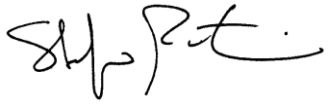
[10] "In a number of cases, conservation tillage systems resulted in reduced yields during transition to conservation tillage, but compensated with cost savings." Bergtold, Jason and Marty Sailus, editors, *Conservation Tillage Systems in the Southeast: Production, Profitability and Stewardship.* SARE handbook series 15. Sustainable Agriculture Research & Education, 2020. https://www.sare.org/wp-content/uploads/Conservation-Tillage-Systems-in-the-Southeast.pdf

livestock and humans alike. Well-managed pasture and grazing may also, in many cases, provide farmers with profitable alternatives to forcing land that does not yield well into crop production.

ASM and its members are grateful for the opportunity to identify for USDA several technologies and practices with strong potential to help farmers collaborate with other agricultural stakeholders, including microbiologists and other scientists, to realize the AIA goals. We look forward to next steps in this endeavor and stand ready to assist you. If you have any questions or would like to further discuss these comments, please contact Allen Segal, ASM Director of Public Policy and Advocacy, at asegal@amusa.org or 202-942-9294.

Sincerely,



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