

January 22, 2021

RE: National Science Foundation (NSF) request for information (RFI) on its 2022-2026 Strategic Plan

The Association of Northeast Extension Directors (NEED) and the Northeast Regional Association of State Agricultural Experiment Station Directors (NERA) together appreciate the opportunity to respond to the National Science Foundation's (NSF) Request for Information to guide development of their 2022-2026 Strategic Plan.

For background, the Association of Northeast Extension Directors¹ (NEED) (www.northeastextension.org) is the non-profit professional association where Cooperative Extension Directors and Administrators from the northeast region come together to set priorities, link resources, collaborate on new projects, and support an effective Extension System. Through the Cooperative Extension System, Land-Grant colleges and universities bring vital, research-based, practical information to agricultural producers, small business owners, consumers, families, and young people. They do this with expert professionals centered at Universities and, critically, in local and county-based offices, ensuring that the folks working to meet community needs are community members themselves.

The Northeastern Regional Association of State Agricultural Experiment Station Directors² (NERA) (<https://www.nerasaes.org/>) is a formal coalition of Directors of fourteen state agricultural experiment stations (SAES) in the northeast US. The northeastern SAES are primarily located on the campuses of the region's thirteen Land-grant Universities with the exception of Connecticut, which houses stations in both New Haven and Storrs. All these stations contribute to a nationwide research system dedicated to meeting the global challenges associated with agriculture, food systems, natural resources, and human nutrition by offering the best available science.

The core missions of NEED, NERA, and the broader Cooperative Extension System (CES) and Agricultural Experiment Station Systems (AES) of which we are a part, align with NSF's core mission "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense" (NSF Act of 1950). Similar language can be found in the Smith-Lever Act of 1914, the Morrill Act of 1862, and the Hatch Act of 1887. Both CES and AES receive core or capacity funding from the USDA's National Institute of Food and Agriculture (NIFA). This baseline capacity funding is uniquely matched, at a rate of at least 1:1, by a combination of state, county, and local support resulting in a cooperative funding model ensures that CE and AES efforts are truly cooperative, locally relevant, and accountable.

1. What are the interests, values and emergent science and policy issues that the Strategic Plan should recognize?

Please consider the following list of interests and emergent science and policy issues we believe should be directly recognized in NSF's strategic plan:

Role of complex systems and convergence research: Complex systems pose grand research challenges and opportunities. The NSF's program in Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) is an excellent example of a program that supports broad

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trans-disciplinary approaches to understand the interconnection and interdependencies of food, water and energy. As in the past, this program linked the NSF with the USDA/NIFA to promote broad cooperation across disciplines, institutions and organizations to produce new knowledge, novel technologies and innovative capacities to address humanity's basic and essential needs. We hope that NSF will also give special attention to the energy-water (see DoE <https://www.energy.gov/articles/ensuring-resiliency-our-future-water-and-energy-systems>) and food-water (<https://nifa.usda.gov/funding-opportunity/agriculture-and-food-research-initiative-water-agriculture-challenge-area>) nexus, which are commonly addressed in isolation. We agree that an integrated approach to food-water-energy interactions is needed with a clear focus on addressing and mitigating the unintended consequences of energy-water and food-water components that can occur when addressed independently.

Climate science: Addressing global and local climate issues requires climate science research that considers the impacts at global, regional, and community levels, and results in solutions that are grounded and relevant to both people and place. Creation and adoption of climate adaptation and mitigation practices relies on an integration of engineering, biological, and social sciences. NSF is well positioned to drive convergence research with an emphasis on achieving the broader societal impacts while differentiating nuances in urban, rural, and suburban locations.

Stable and safe food supply: Security of the nation's food supply and system should be a national priority. By adapting technology from other sectors and bringing such innovation to agriculture, NSF will be assisting access to a safe, affordable food supply resulting in a healthier population. This should be coupled with increased partnerships with USDA/NIFA.

Preservation of natural resources: Water, air, biodiversity, forests and natural ecosystems are essential for a sustainable planet. Adequate high quality water, clean air, biodiversity drive healthy ecosystems. High quality research in this area will inform the economic, conservation and use policies of our nation's natural resources. We appreciate the opportunities that this area poses for interagency cooperation (e.g., NSF, USDA, NOAA, Interior) and program synergy (e.g., Climate Science, INFEWS).

STEM Literacy: The gap in science education between high school and higher education is of national concern. We urge NSF to prioritize investments that establish the nation's global position as a leader in innovation.

Interagency scientific efforts and support: In order to ensure relevancy and good stewardship of public funds, NSF should invest in understanding its mission-to-mission crossover with aligned agencies, reduce unnecessary barriers while maintaining oversight, create formal pipelines for agency scientists to connect projects, and explore pathways for data access and interoperability with necessary safeguards.

Public understanding and trust of science: Scientific findings result in broad impact if scientists and their products are trusted. In recent years mistrust has been sown against public servants, scientists, and the scientific method in general. NSF must invest in understanding the local conditions that must be met to change the tide. This requires investment and valuation of social science research, community development work, coalition building, and public advocacy campaigns that promote digital and scientific literacy and recognize the ways "science" has been perverted and used for racist, classist, ableist policies and practices in the past. We seek a commitment to the creation of humane, ethical, and introspective science that values local insight and information moving forward.

Science-based discoveries that directly improve quality of life: Enhance and invest in a scientific portfolio that focuses on patented tools that assist citizens in overcoming barriers to every-day life issues. NSF can partner with universities and other agencies in the identification of barriers to adoption of best practices that enhance quality of life and put scientists to work on solutions.

We believe that the following values should be elevated within the strategic plan as guideposts for NSF's work and investment:

- Recognition, valuation, and integration of local and indigenous ways of gathering information formulating methodologies and knowing.
- Science must be reflective of community need.
- Interdisciplinary science, research, and community engagement is necessary to address and understand the complex nature of our world and problems. We must be willing to ask questions in a way that does not prescribe to historic "science" ideals.
- Commit to diversity, equity, inclusion, and antiracism.

2. How can NSF help maintain US leadership in an evolving global research and education landscape?

Modify RFA creation and proposal review:

- If NSF maintains that projects should be evaluated and chosen based on intellectual merit and broad impact, we recommend that, to the extent possible, NSF widen the pool of grant application reviewers and final product evaluators to include thought leaders from non-NSF agencies, AES scientists and the broader university research system . Specifically, we recommend that NSF prioritize the inclusion of campus- and field-based Cooperative Extension professionals. Inclusion of such individuals will help NSF identify proposals that are best positioned to secure broader impacts for identified peoples and places. Inclusion will also help shift the culture of review panels toward generating science that ensures a more sustainable, successful, equitable, and resilient nation.
- By identifying Cooperative Extension as a preferred potential partner in RFAs, NSF would position funded projects to have broader relevancy and impact. With over 150 years of success in community engagement, Extension has the capacity to lead and partner. Specifically, NSF can incentivize partnership by including language that refers applicants and inquirers to their local/state Cooperative Extension office to discuss the added value of including Cooperative Extension as a partner of PI's on proposals and/or providing additional funds to those projects that include Extension as a co-PI.

Invest in workforce education and development:

- NSF should collaborate with Cooperative Extension's 4-H program to leverage and expand the 4-H STEM curriculum to include NSF materials. A deeper partnership between NSF and 4-H will allow our country to expand the STEM-skilled and STEM-literate workforce and to achieve such ambitious targets as a million new scientists.
- Consistent with our recommendation of a commitment to diversity and equity, we recommend continuing and increasing investment in recruitment, retention, and scholarly support of underrepresented undergraduate and graduate students, underrepresented faculty in STEM departments, underrepresented principal investigators submitting proposals worthy of support, and underrepresented institutions.

Increase accessibility and use of research data:

- Data science can empower users to make informed decisions that are tailored to specific situations. NSF can lead efforts to increase data-driven decision making in all realms by supporting engaged research around the use of data and investing in the infrastructure necessary to collect and use that data. It can also assess data gaps, increase the availability and application of large data sets by the public, and partner with the Cooperative Extension Service to increase the application of those data sets to address community identified problems.
- We support and encourage the creation of a working group to assess the interoperability and accessibility of current key data sets across agencies that speak to common goals, assessment metrics, and themes. Once completed, we support engaging key public access and university partners to provide guidance to accessing and using such data and connecting/aligning internal university data systems.

Broaden and enhance cross-agency, university, and public-private partnerships:

- We strongly support the inclusion of language that positions NSF to simplify the establishment of cross agency opportunities. This includes creating new and exploring underlying barriers to the creation of interagency agreements, memorandum of understanding, and co-funding granting opportunities with those agencies that most closely align with NSF's mission like USDA/NIFA. The areas in which we see immediate intersection between the NSF and NIFA include climate science, securing a safe and healthy food supply, convergence science, forestry and crop management, gene editing, water resources (water quality/quantity) and the advancement of wireless communications, especially in rural broadband. Addressing these grand challenge areas in a coordinated, collaborative, and outcome-driven effort is essential for the health and wellbeing of the people and the nation and the globe.
- We encourage the NSF to broaden participation and partnerships with agricultural experiment stations and existing regional centers (e.g., integrated pest management, aquaculture, rural development, sustainable agriculture). We also recommend NSF connect deliberately with Cooperative Extension as community coalitions builders so that the agency may better understand the state and county level resources available and current local actors.
- We recommend maintain and strengthening the following language within the strategic plan, "We will explore process enhancements that facilitate an expansion of inter-agency and public-private partnerships, and work with stakeholders to remove barriers. We will identify important areas of science and engineering ripe for joint investment with the private sector and other partners and work to establish new partnerships in these areas."

Invest in competitive research in 1994 Tribal Colleges, 1890 Land Grant Institutions, and small institutions:

- We support and recommend continued investment in EPSCoR as an existing pathway to build capacities of our smaller institutions and those institutions within the historically black college and university and tribal college communities.

Support core science infrastructure:

- Universities across the country are struggling with issues associated with deferred maintenance as operating costs increase, state support decreases and the reliance on student tuition and fees increases. In 2015, colleges of agriculture estimated \$8.4 billion in deferred maintenance (see [Sightlines: A National Study of Capital Infrastructure and Deferred maintenance at Schools of Agriculture](#)). In 2021, that cost is estimated at \$11.5

billion. Access to contemporary laboratories, supported by utilities and equipment, will ensure that our scientists have the capacity to undertake the cutting-edge research that is required to meet the grand challenges of science. We agree that the NSF must ensure program integrity and responsible stewardship of major research facilities and infrastructure.

Focus on increasing public trust, understanding, and valuation of science, scientists, and public servants:

- Include language in the strategic plan that recognizes one of the nation's most abundant resources - its people. By engaging the nation's people as partners through citizen science, expanding opportunities to collect real-time on the ground data, and expanding applicable workforce skills, NSF and the nation can benefit from the creation and expansion of a STEM-literate citizenry, as well as creating a national culture that is invested in science that impacts their ecosystems at home. To this end, NSF can take advantage of the Cooperative Extension Service's experience and capacity to involve citizens in scientific pursuits.
- We recommend NSF consider creating a pipeline for scientifically literate and trained young professionals into public service. NSF may do this by exploring direct hire authority through current pipeline programs. It can also learn from the successes of post graduate federal exposure programs such as the Sea Grant Knauss Marine Policy Fellowship (through which NSF's Arctic Research Program has received Fellows) through which high performing individuals are placed in congressional and executive branch offices. In pursuit of this we recommend that NSF explore partnership with NIFA to establish a Land-grant version of this Sea Grant Fellowship Program utilizing current authorities. NEED is ready and available to provide supporting information and strategies as needed.

Invest in in engagement and outreach networks:

- Cooperative Extension is an excellent model system for outreach and engagement of communities. NSF should not invest in creating a new system to bring its science greater relevancy, rather indicate in its strategic plan a desire to utilize the framework and lessons learned though 150 years of Cooperative Extension activities and the CE/AES cyclical model of assessing community needs and knowledge gaps to inform science investment and direction. Formal partnership with Extension and the Land-grant University system would allow for the NSF to leverage the connections Extension already has to every county in the nation to inform and improve its own work. This could be accomplished through the creation of community assessment grants, memoranda of understanding, and a commitment to internal NSF investigation of opportunities.

3. How can the plan best underscore the importance to the Nation of fundamental research and its broader impacts?

In support of increasing application and impact of NSF internal and funded projects, the Strategic plan itself would benefit from including language referencing partnerships with organizations like Cooperative Extension that have a long history of community education and reach into every community in the nation.