Rutgers the state University of New Jersey New Brunswick Campus
Combined Research and Extension Plan of Work
2022-2026

Status: Final
Date: 05/14/2021

I. Plan Overview

1. Executive Summary

Rutgers University is New Jersey's land-grant institution and home to the New Jersey Agricultural Experiment Station (NJAES) and its associated extension unit, Rutgers Cooperative Extension (RCE).

New Jersey is one of the smallest states in the United States. With over 9.1 million residents living within 8,729 square miles, New Jersey is the most urbanized and densely populated state in the nation. It is the only state defined by the U.S. Bureau of Census as 100 percent metropolitan, a designation that belies the rurality of significant areas of the southwestern and northwestern regions of the state.

New Jersey's population is highly diverse compared to the United States as a whole, and tends to be better educated than the U.S. population. New Jersey's industrial base has shifted over time from manufacturing and production industries towards more of a service economy. Per capita and household incomes in New Jersey are significantly higher than the national average, and New Jersey consistently ranks fourth or better among all the states in these measures of economic well-being.

As the most urbanized and densely populated state in the nation, New Jersey faces some significant challenges. It is a study in contrasts, with large cities, lightly populated rural areas characterized by forests and farmland, and wide swaths of suburban tracts. Industrial development is heavily concentrated in northern New Jersey, particularly in the northeastern quadrant, while southern New Jersey is largely rural, dominated by farms and preserved forested acreage. New Jersey's economic largesse is likewise not spread equally over its entire population, with significant disparities in wealth and well-being across the state. While the overall poverty rate (percentage of population living at or below the poverty line) in New Jersey is generally around 10%, poverty rates in major urban areas can range from 20% to almost 40%. Higher poverty rates are also observed in smaller cities and towns, particularly in the more rural southern part of the state. These communities, in particular, face significant challenges both now and in the future.

New Jersey represents a unique frontier of the rural-urban interface. Despite being highly urbanized, New Jersey still has a significant agriculture industry that contributes meaningfully to local economies (annual farm gate revenue exceed $1 billion), culture, and senses of place. Agriculture remains an active use on 15 percent of the state's land base and represents more than half of the remaining stock of privately owned, undeveloped land. In addition to providing breaks in development and aesthetic diversity, farmland also provides important environmental and ecosystem benefits across the state. At the same time, the intersection of rural and urban/suburban interests in New Jersey raises pressing environmental issues and the challenge of balancing environmental, economic, and quality of life concerns.

New Jersey is also a coastal state, which raises another host of issues. Coastal communities rely on tourism, aquaculture, commercial and recreational fishing, and related activity to fuel their local economies. Rising sea levels, environmental threats to ocean and coastal ecosystems, and sustainable management of fishery resources are just some of the local concerns.

Rutgers University and NJAES/RCE: A Brief History

Rutgers University is the only educational institution in the nation that has been a colonial college, a land-grant college, and a state university. Almost 100 years after its founding in 1766, the NJ State Legislature selected Rutgers College as New Jersey's land-grant institution (in 1864) and allocated funds to support a new academic unit (Rutgers Scientific School) to carry out the land-grant academic mission. This legislation also created a Board of Visitors to oversee the affairs of this school and its associated farm.

The New Jersey Agricultural Experiment Station (NJAES) was established and funded by the State of New Jersey per legislation enacted in 1880, seven years before federal enactment of the Hatch Act of 1887. The state legislation also specified a governance structure for the station: a Board of Managers consisting of the Rutgers Scientific School's Board of Visitors, as well as the president of Rutgers College and an agriculture faculty member. The Board determined that the NJAES should be located in New Brunswick. NJAES was separate and distinct from Rutgers Scientific School and was supported with funds from the State of New Jersey.

In later years, New Jersey also took the initiative of establishing and funding a formal program of extension activity. From the inception of the land-grant school and NJAES, Rutgers faculty affiliated with the land-grant college were active in outreach to New Jersey's farmers. In 1911, three years before the federal passage of the Smith-Lever Act, the farmers of Sussex County, in collaboration with the Lackawanna Railroad and the local chamber of commerce, established the state's first formal cooperative extension program. A formal Extension Department was organized within NJAES in 1912. Subsequently, the state legislature passed the NJ Farm Demonstration Act (1913), which provided funds (and authorized counties to do the same) to support a demonstration program. The law also directed the NJAES Board of Managers to appoint a state superintendent of farm demonstration. This demonstration program eventually evolved into Rutgers Cooperative Extension (RCE).

At Rutgers, the land-grant mission has historically been closely associated with an academic unit that includes agricultural science in its curriculum (originally, the Rutgers Scientific School). However, the nature of this association changed over time as the academic unit evolved from its primary focus on agriculture to its current broader mission. Despite the fact that its curriculum included engineering and mechanical sciences, the Rutgers Scientific School was commonly referred to by the state legislature and others as the College of Agriculture. In 1917, it was officially designated by the state legislature as the College of Agriculture and was supported with state-appropriated funds. Rutgers College became Rutgers University in 1924 but the College of Agriculture remained a distinct and separately funded unit within the university and reported to the state-mandated Board of Visitors. Shortly thereafter, non-agricultural science and technical curricula were spun off from the College of Agriculture.

In 1945, Rutgers was officially designated by the state legislature as the State University of New Jersey. This designation included NJAES and RCE, as well as all university academic units. This legislation further directed that the NJAES Board of Managers would now report to, and its members be appointed by, the university's Board of Trustees. In 1956, the New Jersey State Legislature passed the Reorganization Act creating a university Board of Governors, which was charged with the oversight and management of university operations, including NJAES/RCE. This 1956 legislation also transferred the reporting relationship of the NJAES Board of Managers from the Board of Trustees to the Board of Governors. The university's Board of Trustees was retained to serve in a fiduciary and advisory capacity focused on the use of university assets, including those of NJAES, which existed prior to the implementation of the Reorganization Act. While NJAES and RCE still remained as separate entities, the NJAES Board of Managers relinquished its fiduciary/management role to the university, and took on a stakeholder advisory role.

Over time, the focus of the College of Agriculture's curriculum expanded to include not only agricultural commodity production, but also agribusiness and environmental disciplines. In 1965, the official college name was changed to College of Agriculture and Environmental Science in acknowledgement of this change in educational emphasis.

Further developments resulted in a curriculum that integrated humanities and social sciences with the biological and physical sciences. A multi-program approach was proposed, where Cooperative Extension, research, and existing and new academic instructional programs would focus on the interactions between people and their environment. In 1973, the College of Agriculture and Environmental Sciences became Cook College, named for George H. Cook (1818-1889), first director of the New Jersey Agricultural Experiment Station, and the person largely responsible for the original designation of Rutgers as the land-grant college in 1864. As the result of another major university-wide reorganization in 1981, Cook College was designated as a professional school with continued focus on agriculture and the environment.

While under the same university management since 1945, Cook College, NJAES, and RCE all operated independently during this period. The academic dean, the NJAES Director, and the RCE Director each controlled their own operations and budget. NJAES served as the "research" function for the school, funding a portion of each faculty member's salary to support their research.

In 2006, Cook College became the School of Environmental and Biological Sciences (SEBS). As a result of administrative reorganization, SEBS, NJAES, and RCE functions were consolidated into two distinct units (SEBS and NJAES/RCE) under one administrative position. The Executive Dean of the School of Environmental and Biological Sciences also serves as Executive Director of the New Jersey Agricultural Experiment Station, combining both the research and the extension functions. This position is the chief administrative officer of both land-grant units, providing overall direction to the operations of both SEBS and NJAES/RCE, and maintaining cooperative relationships with the U.S. Department of Agriculture, New Jersey Department of Agriculture, and all other appropriate stakeholder organizations and agencies.

SEBS and NJAES/RCE jointly fund and share campus-level administrative functions, such as a business office, budget office, information technology support, and human resources. These administrative offices report to the Executive Dean (SEBS)/Executive Director (NJAES).

The University's Board of Governors has formally delegated the authority for receiving, managing, and reporting on all USDA-National Institute of Food and Agriculture (NIFA) capacity grant funds to the Executive Director of NJAES. While each unit (SEBS and NJAES/RCE) still receive separate state funding streams, all state and USDA-NIFA capacity grant funds are managed through the above-referenced business office and budget office.

The NJAES has three co-equal leadership positions that report to the NJAES Executive Director and are responsible for setting strategic goals and policies for NJAES. They have primary responsibility for leadership of, implementation of and accountability for NJAES activities, both on and off-campus. These are (1) Director of Research/Senior Associate Director of NJAES, (2) Director of Strategic Development and Administration/Senior Associate Director of NJAES, (3) Director of Cooperative Extension / Senior Associate Director of NJAES. The research function resides within the NJAES Office of Research and is managed by the Director of Research, who also serves as the Dean of Research for SEBS. He/she is responsible for overseeing the SEBS/NJAES research portfolio with the goal of achieving research excellence for NJAES and the school. The Executive Director for NJAES has delegated authority for the management of USDA-NIFA's research capacity grant funds to the Director of Research, who serves as the official authorized organizational representative to USDA-NIFA for these funds. The Director of Research leads grant facilitation and research administration to support successful submissions for USDA, NSF, NIH and other federal and state funding, promotes interdisciplinary research collaborations among SEBS/NJAES faculty and across the university, coordinates missions of SEBS-based institutes and centers with NJAES and departmental research goals, strengthens graduate and postdoctoral training, and deploys strategic investments in research infrastructure and core facilities.

The Director of Strategic Development and Administration and Senior Associate Director (NJAES) has authority for strategically deploying/utilizing NJAES assets and budgets for on and off campus farms, research stations, incubators and auxiliary units. He/she works in concert with unit leadership to maximize the efficiency and effectiveness of their operations, ability to support cutting edge research and outreach, and promote economic development. The Director of Strategic Development and Administration collaborates with the Directors of Research and Cooperative Extension, as well as the Associate Dean of Planning and Budgets, to strategically administer these assets to support the mission of NJAES, ultimately benefitting the stakeholders and residents of New Jersey. In addition, he/she leads NJAES economic development programming, leads NJAES state and federal relations activities and serves as NJAES representative to relevant stakeholder groups and associations.

The chief administrator of Rutgers Cooperative Extension has the title of Senior Associate Director and Director of Cooperative Extension. This position is authorized to operate and coordinate the programs of Rutgers Cooperative Extension in the areas of agriculture, resource management, family and community health sciences, 4-H youth development, continuing professional education, and related mission areas all consistent with school, university, and USDA policies. The chairs of the Department of Agriculture and Natural Resources, Department of 4-H Youth Development, and Department of Family and Community Health Sciences are direct reports to the Director of Cooperative Extension. He/she also oversees and coordinates the efforts of the statewide system of 20 county extension offices, as well as federal programs including the Expanded Food and Nutrition Education Program (EFNEP). The Director of Rutgers Cooperative Extension manages all federal extension funding, including Smith-Lever appropriations. He/she is a primary liaison with RCE stakeholders from various commodity and interest groups, holds ex officio positions on various state bodies, and may serve as the Executive Dean/Director representative to other state-level committees or boards. He/she engages actively in county, state, and federal regulations, and serves on state, regional, and national cooperative extension, USDA and other agency bodies.

Both the Director of Cooperative Extension and the Director of Research serve as the Authorized Technical Representatives for directing USDA-NIFA-funded activity and managing USDA-NIFA capacity grant funds in their respective functions. This authority is delegated to them by the Executive Director of NJAES.

NJAES/RCE Collaborations with State and County Agencies

NJAES/RCE activity is centered on the needs of the stakeholders. This core principle was evident at the founding of NJAES, when early extension educators, primarily Rutgers Scientific School professors, not only personally visited each New Jersey county to talk to farmers on specific topics, but also channeled their information through meetings of county Boards of Agriculture, farmers' institutes, fact sheets and bulletins, and agricultural trains bearing exhibits and lectures that traveled from town to town. Current processes for obtaining and using stakeholder information is specifically described elsewhere in our Plan of Work.

NJAES/RCE is integrally connected to stakeholders through various partnerships with NJ stakeholder organizations, pubic agencies, and policy makers in state and county jurisdictions. NJAES/RCE maintains close relationships with various agencies within the State of New Jersey, particularly the Department of Agriculture and the Department of Environmental Protection. These agencies look to NJAES/RCE for science-based information and expertise to inform rulemaking and regulatory actions, as well as to provide training/certification courses for pesticide applicators and other technical operations.

By legislative mandate, the Executive Dean (SEBS)/Executive Director (NJAES) or his/her designee serves on the following NJ state boards or councils:

State Agriculture Development Committee (ex-officio).
New Jersey State Mosquito Control Commission (ex-officio).
New Jersey Wine Industry Advisory Council (ex officio).
New Jersey Aquaculture Advisory Council (ex officio).
State Soil Conservation Committee (the Director of Rutgers Cooperative Extension also serves on this committee).
State Pesticide Control Council (ex officio).
State Farmland Evaluation Committee (ex officio).

The New Jersey State Legislature also draws on expertise from Rutgers Cooperative Extension for specific purposes. Under statutory mandate, NJAES/RCE operates a pesticide applicator training program to certify professional pesticide applicators. For certification, applicants are required to meet applicable state and federal regulations via satisfactory completion of the NJAES/RCE-administered training program and a required examination. The NJ Secretary of Agriculture is required by legislative mandate to consult with NJAES/RCE when issuing rules and regulations in a number of areas, including the use of pesticides in proximity to honey bee colonies, leaf composting on agricultural land, and the development of integrated pest management training programs for schools, to name a few examples. The designated State Climatologist is a Rutgers University faculty member associated with NJAES/RCE.

A good example how NJAES/RCE has forged a close and long-standing working relationship with the State of New Jersey and its constituent counties can be found in the history of New Jersey's mosquito/vector control programs. In 1902, the state legislature passed an act authorizing and directing the New Jersey Agricultural Experiment Station "to investigate and report upon the mosquitoes occurring within the state, their habits, life history, breeding places, relation to malarial and other diseases, the injury caused by them to the agricultural, sanitary and other interests of the state, their natural enemies and the best means of lessening the numbers, injury, or detrimental effect." In 1906, the state legislature passed an act that anticipated a broad program of mosquito control throughout the state, including the elimination of mosquito breeding places on the salt marshes. Local work was to be done through boards of health, but NJAES was designated as the responsible agency. Before 1912, anti-mosquito work had been conducted mainly by the state through the Agricultural Experiment Station with the cooperation of local boards of health, but the passage of the county mosquito commission law in 1912 transferred mosquito control work to the county mosquito extermination commissions. Annual plans of work and budgets of the individual county commissions must be reviewed and approved by the Executive Director of the NJAES. NJAES/RCE activity in this area now includes providing science-based information on surveillance and control of a wide range of disease-bearing vectors. This activity is managed through the NJAES Center for Vector Biology.

Most of the outreach to stakeholders occurs at county and local levels. NJAES/RCE maintains a presence in all of New Jersey's 21 counties. Almost all (20) NJ counties maintain a county-based extension office, where RCE county agents and program staff work with county extension staff to meet the needs of county residents in a wide variety of areas, including agricultural and environmental resource management, individual and family health and well-being, and in youth development.

Most counties have established a County Board of Agriculture and an RCE agent assigned to the county serves as a non-voting member of each county's board. In addition to providing in-kind support to RCE in the form of office space and county-paid staff, New Jersey's counties also provide direct funding to support RCE county agent salaries. Each county's Board of Agriculture also appoints a representative to the NJAES Board of Managers.

NJAES/RCE research and extension facilities throughout the state include several research farms, shellfish/finfish research and extension laboratories and field trial locations, three business incubators, and marine coastal education and management centers.

NJAES/RCE strives to develop and deliver practical science-based solutions that contribute to agricultural sustainability and health and wellness of our communities and the environment through research and community outreach.

The critical issues that stakeholders have identified fall into five broad categories, and form the basis of the NJAES work plan:

Maintain viable agriculture and aquaculture.
Protect and sustain our resources.
Ensure healthy outcomes: food, nutrition, health.
Ensure positive outcomes for our youth.
Build sustainable and resilient communities.

These general categories encompass a wide variety of short-term, medium-term, and long-term issues that drive NJAES/RCE budgeting, resource development, and resource management decisions. NJAES/RCE stands ready to identify and address shorter-term emergent issues while maintaining sustained support for research and extension programs needed to deal with long-term issues such as climate change, overreliance on non-renewable energy sources, emergence of pesticide resistant pests and pathogens, rising food insecurity, and other threats to NJ residents and communities. Our research/extension programs are consistent with USDA-NIFA science priorities of sustainable agriculture production systems, family and consumer sciences, agroclimate science, sustainable energy, food safety, human nutrition, environmental systems, bioeconomy/ bioenergy/bioproducts, education and multicultural alliances, and youth development. At the same time, NJAES maintains and is indeed actively intensifying its commitment to make its resources, expertise, and programs—and, more broadly, those of Rutgers University and the entire land grant system—available to all New Jersey residents, businesses, and communities. This is manifest in efforts to ensure equitable access to all NJAES programs and resources.

Critical issue areas are described in more detail below.

Maintain viable agriculture and aquaculture

New Jersey currently has 9,883 farms and 734,000 acres of farmland. The total annual value of all agricultural products produced by our farms, including both plant and animal agriculture, is $1.1 billion. These farms are an important source of fresh produce and other food products for New Jersey residents and for the commercial food industry. Agriculture is a relatively small part of the state's overall economy but dominates the local economy in our southern counties. State agriculture also helps to feed the nation. New Jersey ranks 3rd among all 50 states in cranberry production, 4th in peach production, 5th in bell pepper production, and 5th in blueberry production.

NJAES/RCE supports plant breeding programs for tree fruit, turfgrass, strawberries, cranberries, ornamental trees, tomatoes, peppers, basil, and hazelnuts. These programs produce new cultivars and varieties characterized by higher

yields, better disease resistance, and enhanced quality products that are adapted to changing climate and new pest pressures. The development and implementation of integrated pest management strategies and timely pest advisories, issued through NJAES/RCE help farmers to detect and manage threats to their crops quickly and effectively. Helping NJ farmers identify and take advantage of new and emerging market opportunities, as well as identifying more cost-effective production practices, also support and sustain NJ agriculture. In a region where growing urbanization increasingly impinges on agricultural land-use and practices, New Jersey farmers face a panoply of regulations regarding agrarian land use, nutrient/waste management and disposal, water use, and other regulations and policies that affect their operations. NJAES/RCE researchers and county agents keep abreast of these issues, developing and disseminating new methods and agricultural practices to adapt farm operations to the new regulations and reduce land use/cultural conflicts with neighboring non-agricultural neighbors. NJAES/RCE faculty and staff also develop strategies to improve the bottom line for farm operations. More cost effective production methods, educational training resources for women and entry-level farmers, development of cost-effective technologies and operational processes for greenhouses, and identification of profitable niche market opportunities for NJ farmers are just some of the strategies that NJAES/RCE faculty and staff develop and disseminate.

New Jersey's coastal waterways are an important source of food and an economic engine for local shore economies. NJAES continues to make strategic investments in the growth and culture of finfish and shellfish, as well as training and outreach on species of commercial and recreational importance to New Jersey.

Efforts to support agriculture extend beyond production and harvest. NJAES/RCE develops new packaging, value-added processing, treatment, and storage technologies that extend the post-harvest quality and shelf-life of produce and other farm products.

New Jersey’s farms are also an important source of non-food products, such as the turf and nursery/ landscaping products that enhance our environment. NJAES/RCE works closely with these industries to produce more attractive and resilient turfgrass and ornamental tree varieties, address current and emerging pest and pathogen threats, and develop and promote best practices for maintaining and enhancing landscapes.

Protect and sustain our resources

Development patterns and population density place tremendous demands on New Jersey’s ecosystems. Industrial and wastewater impacts on water quality, aging infrastructure, and regulations governing municipal stormwater and agricultural water use are some of the issues that confront NJ residents, farmers, and businesses. Integrated research and extension programs address water quality and quantity issues affecting New Jersey residents and businesses. Effective stormwater management via the use of green technology and other methods, agricultural best management practices, wastewater treatment, and watershed restoration are just a few strategies developed and implemented through NJAES/RCE. These research and extension priorities are of increasingly heightened importance in many communities due to the effects of climate change. Research continues on the process and effectiveness of biodegradation as a treatment in the elimination of harmful contaminants in our waterways and wastewater. NJAES/RCE coordinates effective and efficient nutrient management and education programs that help stakeholders meet industry and state regulatory standards.

New Jersey’s Atlantic and Delaware Bay coastlines are an important part of the state’s economy. Its fishery/aquaculture industry is concentrated here, as is the bulk of the tourism industry. Changes in coastal water quality as a result of climatic changes, changes in watershed quality and management, and other events can have deleterious economic and ecological impacts on this important resource. New Jersey’s coastline is also feeling the effect of rising sea levels and saltwater infiltration into freshwater aquifers and inland water systems as a result of climate change. NJAES researchers are using state-of-the-art technologies such as geospatial mapping, drones, and underwater gliders to gather the data needed to track and assess these developments. RCE faculty and staff develop educational and outreach programming in coastal water quality, watershed management, and ecological restoration in collaboration with watershed, recreational, marine trade, and other groups active in our coastal counties.

Other vital areas of NJAES research and extension efforts focus on eco protection such as factors key to protecting our natural resources. Examples include developing sources of renewable biofuel energy to decrease dependence on fossil fuels, finding solutions to problems which affect pollinators which affects crop health, tracking landscape changes in our state which are affected drastically by climate changes, and studying animal behavior and welfare which in turn affects human health and food safety. Vital needs exist in the management of human-wildlife interactions, ranging from vector-

borne diseases to crop depredation to damages to residential property. Similarly, science-informed management of the impacts of New Jersey's built environment and climate conditions on the state's forested lands (in the context, for example, of wildlife habitat, ecosystem health, recreational uses, and environmental services) is an area of growing need, as well.

Ensure healthy outcomes: food, nutrition, health

The causes of obesity are complex and multi-factorial and include socioeconomic lifestyle and genetic factors.. NJAES researchers explore multiple facets of nutrition, with a special focus on the underlying biochemical, physiological, and behavioral elements that cause or accompany obesity. RCE develops programs to encourage and facilitate healthy food choices, physical activity, and other strategies to help NJ residents attain and maintain healthy weight. RCE faculty and program staff address diverse unmet issues of nutrition and health, from teaching our most vulnerable residents about healthy eating on a budget to promoting the benefits of exercise. By bringing the best in research and education to respond to the urgent and growing challenges to nutrition and human health, NJAES/RCE programs guide New Jersey residents to better health. Programs are aimed at a range of populations, including special programs for NJ schools and early care centers to expose children and their families to healthy lifestyle choices. RCE programs also facilitate access to healthy food choices in our urban "food deserts."

NJAES researchers identify and document environmental and other causal factors that increase the prevalence of certain cancers and chronic health conditions. They also focus on the nutraceutical properties of various plants to identify health-promoting foods and supplements in so-called "functional foods." Through RCE, NJ residents can access various self-management workshops for the management of diabetes, cancer survival, and other chronic health conditions. The human microbiome (i.e. gut bacteria) plays an important role in human health. NJAES researchers are exploring various dietary interventions and natural products to modulate these microbiota and improve human health.

Food-borne illness is of great concern among both public health experts and the food industry. The adoption of safe food handling practices at all stages of food production and handling reduces the incidence of food-borne illness. NJAES research identifies sources of food-borne illnesses and effective methods to prevent/reduce their incidence. RCE programs provide food-safety education and information about risks of food-borne illnesses (from both contaminants and allergens) to NJ residents, farms, food processors, schools, and workplaces. On-farm food safety programs help agricultural producers manage food safety risks based on sound science, as well as aid them with compliance with federal and state regulatory requirements.

Ensure positive outcomes for our youth

4-H is a major component of our youth development activity. The 4-H Youth Development Program uses a learn-by-doing approach to enable youth to develop the knowledge, attitudes and skills they need to become competent, caring, and contributing citizens of the world. This is accomplished by using the knowledge and resources of caring adults.

4-H programs are available to youth throughout NJ, with significant outreach to disadvantaged youth in urban areas. 4-H educators strive to reach underserved youth populations throughout the state, including children with disabilities and adjudicated youth, and develop programming to meet their needs. 4-H programs continue to evolve with the interests, needs, and aspirations of the state's young people, offering traditional agricultural programs as well as contemporary STEM-based programs.

Build sustainable and resilient communities

As urbanization, environmental changes, and new technologies are reshaping the way we live, communities must learn to adapt or establish new ways to use their resources to meet current needs while ensuring that adequate resources are available in the future. NJAES/RCE is addressing a multitude of community issues identified by stakeholders, which include the development and dissemination of information on issues related to home horticulture (e.g. lawn and garden care, pest control, nutrient use, sound cultural methods) and household and community pest management (e.g. termites, ticks, bed bugs, mosquitoes). NJ residents, municipalities, and other managers of public lands or facilities (including schools, parks and recreation areas) rely on this information.

NJAES/RCE has a substantial and continuing track record of working with local communities to help install green infrastructure projects to remediate problems associated with stormwater runoff, flooding, and water retention/reuse.

These projects encompass residential, agricultural, and industrial settings. NJAES also has growing engagement in solar and wind energy research, policy formulation, and demonstrations to help the state meet its renewable energy goals.

New Jersey's urban residents are at particular risk for food insecurity, as nutritious food may not be available in sufficient quantities to meet local consumer needs. RCE helps local farms and small grocery stores to provide affordable, culturally appropriate, and fresh food to their customers, and educates consumers regarding affordable and nutritious food choices. Locally grown food, using vacant warehouse space and other unused urban property, is another community-based solution currently under development with NJAES/RCE assistance.

NJAES/RCE continues to work with stakeholders to identify and address community needs. These include governmental agencies at the state and local levels, commercial businesses, professional groups, and non-profit agencies. Through these collaborations, RCE faculty/staff offer training and resources for professionals in all of New Jersey's 21 counties in the areas of food, nutrition, health/wellness, and food safety. RCE is approved by the New Jersey Department of Education to provide continuing education credits to teachers. Many of these RCE programs also offer professional development credits for registered dietitians, and family and consumer sciences professionals.

Communities are supported and enriched by the volunteers who put their time and talents to the service of their communities. Trained volunteers are an asset in all areas of community service. RCE provides training for volunteers for youth development programs (including 4-H), environmental stewardship,and horticulture programs administered through individual county extension offices. Individuals who want to address environmental issues that affect their communities and lives can receive volunteer training through RCE's Rutgers Environmental Stewards program.

NJAES/RCE Plan of Work: 2022-2026

The New Jersey five-year Plan of Work (FY 2022-2026) is an integrated plan that melds NJAES Research and Rutgers Cooperative Extension programs. This plan addresses all requirements set by the Agricultural Research, Extension and Education Reform Act of 1998 (AREERA) regarding the use of Hatch Funds, Smith-Lever 3(b) and 3(c) and required non-federal matching funds.

This Plan of Work reflects NJAES/RCE activities that recognize the needs of our small but highly diverse state. Through our research and extension programs, we use innovative approaches to apply the land-grant model to: support a sustainable agricultural and food system at the urban/suburban fringe; protect the state's natural resources; sustainably develop NJ's human and community capital; and address nutrition, health and wellness concerns. Addressing the most pressing problems of our time requires multidisciplinary, collaborative, and cutting-edge approaches to generating and transferring knowledge and technology. Research development technologies and findings are delivered via educational programs and training, technology transfer, policy recommendations, publications and the formation of spin-off companies. This is achieved statewide through dozens of centers, institutes, and off-campus research stations and Cooperative Extension offices. Integration of research and extension activity, as well as collaboration with our colleagues at other institutions, figure prominently in NJAES/RCE programs.

NJAES-supported SEBS faculty researchers have access to state-of-the-art research methods and technologies. These include: land, sea, and air-based remote sensing robotic technologies; efficient short-read and long-read genomic sequencing methods and equipment for use in techniques that include environmental DNA surveillance and genotyping through sequencing for plant and animal breeding; mass spectrometry systems for natural product analysis (including gas chromatography, liquid chromatography, and ion trap systems); high resolution microscopy systems; flow cytometry; biomolecular fragment analysis systems; and high input/output computational technologies to gather and analyze data.

In addition to laboratory-based research, NJAES' Extension Specialists conduct applied research studies within NJ communities, and at agriculture and aquaculture farms and laboratories. Extension Specialists are specifically charged with the responsibility of conducting applied research that addresses the critical issues defined above and then to disseminate their findings to stakeholders. They are in a unique position to identify and assess relevant research findings (both from their own research and the research of their academic colleagues) and then to convey this information to stakeholders, either directly or through RCE county agents. A good portion of their research is pursued within a multistate context, within structured research and dissemination programs, and in association with their colleagues in the land-grant community and beyond. This integration of research and extension delivers sound science-based information to support Cooperative Extension educational programs that benefit communities, individuals, and industries. Additionally, NJAES-

supported researchers also actively collaborate with their peers at other land-grant institutions to address issues that are regional or national in scope.

RCE county agents are faculty members of Rutgers, the State University of New Jersey. Most of these agents/educators work within a defined geographic area (at the county, regional, or state level), and provide educational leadership to a science-based program in all or prescribed parts of agriculture, resource management, family and community health sciences, and 4-H youth development. County agents may also be involved in applied research projects, whose findings will be disseminated through RCE educational programming. They maintain strong collaborative relationships with their NJAES/RCE colleagues through various working groups organized around specific agricultural commodities or other interests, and they often pursue multistate collaborations with their colleagues in other states. For example, RCE county agents and extension specialists collaborate with their colleagues in Delaware, Maryland, Pennsylvania, Virginia, and West Virginia to produce the Mid-Atlantic Commercial Vegetable Production Recommendations, a compendium of state-level information based on research results from each institution and from USDA. Similar collaborations produce the Mid-Atlantic Berry Guide and Turfgrass Weed Control for Professionals. These are commodity-driven partnerships and collaborations resulting in improved and more effective recommendations based on multistate experience, research, and knowledge that benefit growers throughout the region. Family and Consumer Health Sciences educators and 4-H/youth development agents also engage with colleagues at regional and national levels to develop training and assessment programs and materials.

Both integrated and multistate research and extension activities conducted by NJAES/RCE faculty are funded from a variety of sources, including state appropriation, USDA-NIFA capacity grants, competitive grants from various agencies within USDA, and grants from other governmental and non-governmental sources.

NJAES/RCE is deeply committed to reaching underserved and underrepresented populations in NJ. One of the primary goals of this effort has been educational programming that is culturally sensitive to the needs of urban youth and clientele. The Office of Urban Extension and Engagement was established in FY 2019 to increase the coordination of programs and facilitate collaborations between faculty and staff, students, civic organizations, and government agencies to address food security, individual and community health, resource stewardship, urban agriculture and food chains, environmental planning and design, and other concerns facing our state's urban communities. In addition, an increasing number of NJAES/RCE programs are available on the web in Spanish by simply clicking on the Spanish tab on the home page. Links are also available to USDA Extension and other resources in Spanish language.

2. FTE Estimates

Year	1862 Extension	1862 Research
2022	105.0	50.0
2023	105.0	50.0
2024	105.0	50.0
2025	105.0	50.0
2026	105.0	50.0

II. Merit / Peer Review Process

A formal review process evaluates the technical merits and suitability of proposed research to the research mission and critical issues of the NJAES. Scientists both internal and external to NJAES will be asked to rate and comment on the scientific merit and agricultural impact of the proposed research. This review process is an established formal practice that has proved effective in past reviews of NJAES Capacity projects.

Criteria used for review will be as follows:

Scientific and technical merit of the proposal

Soundness and clarity of approach, procedures and methodology
Evidence of relevance to agricultural science
Probability of significant societal contributions as well as measurable outcomes from the project
Appropriateness of the research to the mission, goals and critical areas specified by the NJAES

Appropriate stakeholders will play a role in the merit review process as they assess extension programs for relevance in addressing local needs. Key reviewers in this process will be established advisory committees at the county and state level, as well as program/center specific advisory committees. These reviews will generally occur frequently as part of routine meetings with various stakeholder groups and will provide continual feedback to guide and inform our extension programs.

In addition, NJAES leadership will continue to meet with the NJAES Board of Managers, an external advisory board mandated by state legislation, to discuss and conduct listening sessions on stakeholder needs to drive both research and extension programming.

III. Stakeholder Input

1. Actions to Seek

NJAES work and priorities is defined based on the needs of stakeholders. We make ourselves available to as many stakeholders (or their representatives) as possible through a variety of venues. Our extension faculty are required to reach out to stakeholders and assess needs. Knowing that NJAES/RCE actively solicits stakeholder input encourages our stakeholders to collaborate with us.

Governmental contacts and interactions are an important source of stakeholder input. In addition to being primary stakeholders themselves, these agencies are in touch with the needs of their constituencies and can help connect NJAES with specific stakeholder groups. NJ state agencies include the NJ Departments of Agriculture, Environmental Protection, Human Services, and Health. NJAES is represented on several state-level advisory boards within these agencies.

Our extension faculty and staff work closely with county and local government agencies, including their county commissioners, local municipal governments, public health agencies, mosquito control commissions, Boards of Agriculture, youth services commissions, and municipal water and sewage authorities. RCE is actually integrated into county governing bodies, providing direct lines of communication to identify community needs. For example, each county extension office has a County Extension Department Head who is appointed by the Director of Rutgers Cooperative Extension and serves as a liaison between the Director and county administrators and commissioners. County-based extension faculty are also ex officio on various county boards within key stakeholder bodies (e.g., county boards of agriculture). The Director of Cooperative Extension also regularly attends key stakeholder meetings throughout the state, facilitated by county extension offices.

The NJAES Board of Managers provides an important conduit for stakeholder input to guide NJAES/RCE research and extension activity. This advisory board includes representatives from each New Jersey county and representatives from key stakeholder interests (marine and aquaculture industries, food industry, and others). Board members conduct periodic needs assessments, actively elicit input from their county and industry constituencies, and provide timely input to identify, prioritize, and address stakeholder needs. Through regularly scheduled board meetings, as well as topically defined subcommittee meetings, the Board contributes to strategic program planning within NJAES. Board members are also routinely invited to serve on RCE faculty search committees and serve on advisory boards for specific NJAES units (e.g. research farms).

NJAES/RCE faculty and staff collaborate directly with stakeholders through working groups organized around agricultural commodity groups. Stakeholders are active members in these working groups, representing a broad range of commodity groups. Some of the most active examples include the New Jersey Turfgrass Association, NJ Blueberry and Cranberry Research Council, NJ Vegetable Growers Association, NJ Nursery and Landscapers Association, and NJ Soybean Board. Other working groups are organized around 4-H program areas, food safety, water management, and pesticide training and safety, among others. Several of our NJAES-supported research centers and institutions have stakeholder advisory groups to help these centers focus their research and extension programs on important stakeholder needs. Through their participation in these advisory groups, stakeholders have direct input into the design, development, participation, and sustainability of NJAES programs.

2. Methods to Identify
As described above, NJAES faculty and staff routinely interact with a wide range of stakeholders from state and local government, agricultural commodity and other interest groups, private non-profit associations, and the general public. All of these interactions provide networking opportunities that allow us to identify and extend our services to groups and individuals from more non-traditional and/or less visible communities, as well as with stakeholders with emergent needs.

For example, collaborations with non-profit groups that address youth development or family/community health issues provide a ready means to identify and reach new stakeholders to ascertain their needs, particularly among underserved populations such as at-risk or adjudicated youth and populations who don't speak English or for whom English is their second language. Rutgers Cooperative Extension faculty and staff often partner with non-profit agencies to assess the needs of the populations that they serve and to develop and deliver appropriate programs. Routine program evaluations also provide useful information on stakeholder needs.

Each spring, we open our campus, including the campus-based NJAES facilities and programs, to the general public. This event (AG Field Day) attracts people from all over the state, allowing us to connect with New Jersey's residential, non-agricultural, and urban populations.

3. Methods to Collect
Methods for collecting stakeholder input run the gamut, from formal data collection methods (e.g. surveys or focus groups) to informal interactions with our stakeholders.

We use surveys and course evaluations to ask program attendees if the program met their needs and expectations. We also ask about other needs that we can address programmatically, and how our programs should be revised and expanded. Focus groups and one-on-one interviews are also part of our formal "tool kit" for gathering stakeholder input. These tools are especially useful to help identify and characterize problems and to develop appropriate research objectives and programs.

In addition to these more formal methods, unstructured and/or informal stakeholder contacts also yield valuable information and insights into individual and community needs. These contacts yield information that stakeholders might not want to reveal in more structured information collection settings. Venues such as county 4-H/agricultural fairs, in addition to our own campus-based Ag Field Day, provide opportunities to connect with new audiences, to learn about their needs, and to inform them of NJAES/RCE services and opportunities. Research presentations at citizens groups can elicit valuable feedback to inform research agendas, methods, and community concerns.

Routine information dissemination conducted by our faculty and staff are two-way streets that allow our stakeholders to respond to the information that they receive. Such conduits as routine meetings with specific stakeholder groups and web-based written communications (such as blogs) can elicit valuable input regarding unmet or emerging needs, as well as suggestions for improving existing programs and communications.

Large regional or national conferences provide opportunities for extension and research personnel to interact with other researchers, growers, and chemical and other agriculture-related industry professional and technical staff. These interactions and conversations also inform research and extension activity and priorities.

"Routine" communication in this day and age includes a heavy social media presence. We use Facebook, Twitter, Instagram, and YouTube, among other platforms, to connect with known and potential stakeholders. Reactions to our posts are monitored for stakeholder response to the information that we post. All programs described on our website include the name and contact information for an employee who can answer any questions or provide more information about that program.

4. How Considered
In addition to improving existing research and extension programs, stakeholder input will often result in new programs and projects to address both long-standing and newly emergent needs, as identified by our stakeholders.

With constraints on funding and resources, we rely on stakeholder input to inform key decisions regarding research and

extension priorities and how our funds and personnel can best be deployed to meet stakeholder needs. Our strategic plans are developed “from the bottom up” in consultation with a range of stakeholders and are then reviewed by key stakeholder groups such as the NJAES Board of Managers. These plans will identify specific stakeholder needs as priorities; these priorities, in turn, will drive research and extension program development, hiring decisions, and budgeting.

IV. Critical Issues

1 Maintain Viable Agriculture and Aquaculture

Description:

Farmers and food producers everywhere deal with threats to their livelihoods posed by unfavorable weather, volatile market prices, high costs of production, and other conditions. These threats are exacerbated by global climate change. New Jersey agriculture also operates in a densely populated, highly-regulated, high land-value state. A number of New Jersey farms are located on the urban-rural fringe; they are isolated islands of production located on expensive land in suburban locations. NJAES/RCE is committed to investigating novel ways to support all commercial growers while striving for economic and environmental sustainability, with integrated and multistate collaborations.

Aspiration: Develop vibrant value-added and direct marketing opportunities for growers through enhanced engagement with incubator programs; incorporate agriculture technology into production practices to increase efficiency and lower input use; develop/disseminate climate-smart agriculture information to improve environmental sustainability of agricultural operations; and demonstrate soil and water best management practices on NJAES farms as a resource for growers.

Term: Long

Science Emphasis Areas

Environmental Systems
Family & Consumer Sciences
Food Safety
Sustainable Agricultural Production Systems

2 Protect and Sustain Our Resources

Description:

Manmade and natural environmental factors affect water, soil, plant, and air quality, and the ability of various land and aquatic species to thrive and evolve, both ecologically and spatially. New Jersey researchers and extension agents develop an array of integrated programs designed to manage our at-risk natural resources sustainably.

From performing ecofriendly remediation, planning, and conservation to conducting environmental assessment and analysis, NJAES/RCE strives to improve ecological quality, track patterns of animal development, health and behavior, increase nutrient use efficiency, implement alternative and renewable energy sources, use economic analysis to inform environmental policymakers, build resilience to weather variability, and develop best practices for land use.

Aspiration: To have well-informed communities, businesses and residents who are aware of eco-friendly practices by expanding in-person and virtual programming that results in improved environmental quality in the state.

Term: Long

Science Emphasis Areas

Agroclimate Science
Bioeconomy, Bioenergy, and Bioproducts
Environmental Systems
Family & Consumer Sciences
Sustainable Agricultural Production Systems

3 Ensure Healthy Outcomes: Food, Nutrition, Health

Description:

Good health is essential to improving and maintaining individual productivity and quality of life, as well as to the wellbeing of the community at large. Fostering a culture of health and wellness for New Jersey residents of all ages is an important NJAES mission. NJAES/RCE promotes health and wellness through education, research, and integrated and multistate collaborations in food, nutrition, and healthy lifestyles. Obesity rates among children and adults have trended upward over the past two decades. Understanding the relationship between lifestyle and food is a key component of good health. Diet and physical activity are also important in preventing many chronic diseases, including high blood pressure, heart disease, Type 2 diabetes, and some types of cancer.

Aspiration: To provide high quality evidence based food and nutrition educational programs both in-person and virtually that play a crucial role in health promotion and chronic disease prevention and that will provide learning targeted to support a culture of health to individuals, families and the community at large.

Term: Long

Science Emphasis Areas

Education and Multicultural Alliances
Family & Consumer Sciences
Food Safety
Human Nutrition
Sustainable Agricultural Production Systems
Youth Development

4 Ensuring Positive Outcome for Our Youth

Description:

A significant portion of New Jersey's youth, especially in our urban areas, is at substantial risk for negative outcomes (e.g., poor health, substance abuse, pregnancy, school failure, and abuse). Sustained opportunities for young people to gain a sense of belonging, independence, mastery and generosity provide important life skills that ensure positive youth development. The 4-H Youth Development Program, a major component of our youth development activity, uses a learn-by-doing approach to enable youth to develop the knowledge, attitudes and skills they need to become competent, caring and contributing citizens of the world. This is accomplished by using the knowledge and resources of caring adult volunteers. Youth in 4-H programs build skills and competencies in science, healthy living and civic engagement in a variety of settings included but not limited to 4-H clubs, camps and afterschool programs. 4-H programs are designed to help youth build critical life skills like independence, mastery, generosity and belonging. 4-H programs will continue to be available to youth throughout New Jersey, with significant outreach to disadvantaged youth in our urban areas. In addition to traditional 4-H project areas like animal science and food & nutrition, youth can choose to focus on cutting-edge STEM fields.

RCE 4-H faculty will collaborate with research and extension experts from across Rutgers as well as other institutions to develop and disseminate research based programs that promote youth development.

Aspiration: To provide high-quality, positive youth development opportunities to youth throughout the state and to further develop a skilled volunteer and paraprofessional workforce trained to carry-out high context, high content educational programming both virtually and in-person, resulting in the healthy development of New Jersey's youth during out of school time.

Term: Long

Science Emphasis Areas

Agroclimate Science
Bioeconomy, Bioenergy, and Bioproducts
Education and Multicultural Alliances
Environmental Systems

Family & Consumer Sciences
Food Safety
Human Nutrition
Sustainable Agricultural Production Systems
Youth Development

5 Build Sustainable and Resilient Communities

Description:

As the most urbanized and densely populated state in the U.S., New Jersey faces unique challenges. NJAES research and RCE programs help our diverse population adapt to a rapidly changing society and improve their lives and communities through an educational process based on science based knowledge. NJAES researchers and Extension educators make the capacity of a major research university available to various constituencies in New Jersey who are seeking to build viable businesses and industries and to improve their quality of life. Integrated and multistate program options are employed whenever possible.

Aspiration: To provide comprehensive business development programming throughout the state through expansion of existing business incubation programs and creation of new programs, as well as expansion of virtual training opportunities, resulting in more sustainable and viable communities with improved quality of life for its residents.

Term: Long

Science Emphasis Areas

Environmental Systems
Family & Consumer Sciences
Food Safety
Human Nutrition
Sustainable Agricultural Production Systems