

Who We Are

The National Cooperative Extension System (CES) is the educational arm of the Land-grant University system. It reaches 3,300 counties, boroughs, parishes, and geographic areas with over 7,500 educators who live and work in these communities. These Extension professionals have direct ties to thousands of campus-based research and Extension specialists, providing communities access to university resources, regardless of their locations.

Unique to Land-grant universities, Extension and research have symbiotic missions that intertwine to ensure research findings are shared and implemented to solve community problems. Extension informs research by bringing community and industry needs to universities, then translates scientific findings, and delivers research-based information back to people where they live and work. Without this translational Extension work, basic research findings might never find their way into day-to-day practices. Research needs Extension to ensure impact. Similarly, Extension needs research to remain a trusted source of information.

Together, highly trained and dedicated scientists and community-based educators develop and apply science-based solutions that improve the nation's agricultural systems, environment, public health, economy, and overall quality of life for all. An investment in the Land-grant system delivers a \$20 return for every \$1 invested. For more information, visit agisamerca.org.

An “Outcomes-Driven” Roadmap

Working alongside our research colleagues, Extension leaders are developing clear goals and ambitious research and education outcomes to tackle some of our nation's most critical aspirations in the following six pillar areas:

- [Nutrition and Health](#)
- [4-H Youth Development](#)
- [Community Economic Development](#)
- [Sustainable Food Systems](#)
- [Resilient Lands](#)
- [Water Resilience](#)



This plan outlines bold and measurable objectives achievable through increased strategic investment to Land-grant universities. It will add researchers and Extension professionals who will collaborate to ensure cutting-edge research will result in practices and policies with a profound positive impact on our food system, workforce, environmental resiliency, public health, and community economic prosperity.

Cooperative Extension's National Imperative: Increased Investment in Expertise and Partnerships

Our nation faces a critical imperative: Ensuring individual and community vitality, national security, and global competitiveness. One direct way to do this is by increasing investment in Cooperative Extension and the research that informs it. Making up the lost ground in public investment to research and development is critical; however, without a comparable increase in Extension education, the scientific advances may not result in the desired improvements. Increased financial support is essential to promote transformative education and research and safeguard our nation's future.

Current Association of Public and Land-grant Universities budget requests call for approximately equal increases for Cooperative Extension and agricultural research. Increases in Cooperative Extension funding would require a multi-billion investment to match Chinese and European Union agriculture R&D investments, given current public funding and advancements by those actors.



Topical Pillars of Greatest Interest

Nutrition and Health – Before 2014, life expectancy in the United States trended steadily upward. Today, the United States ranks 48th in life expectancy, despite spending almost \$5 trillion yearly on health care. The Cooperative Extension System is uniquely positioned to address the threats to the nation’s health. Extension professionals, live and work in the communities they serve and are viewed as trusted sources. Cooperative Extension has the ability to not only influence the most important factors in human health and nutrition, but also has the ability to increase the use of screenings, immunizations, and ongoing health monitoring in their communities. Research has shown that every dollar invested in Extension programs focused on reducing diet-related disease (EFNEP and SNAP-Ed) saves nearly ten dollars in future healthcare costs. Over 200,000 individuals engage in Cooperative Extension programs yearly to improve their nutrition, increase physical activity and reduce sedentary behaviors. With additional investment, participation in these programs can be expanded to 500,000 individuals each year.

Community Economic Development – Since Cooperative Extension is already an integral part of local communities and are fostering their economic development, this outreach function of the Land-grant Universities is positioned to serve as an important community partner in overcoming challenges and seizing opportunities. However, a purposeful investment will be required for Cooperative Extension to assist in increasing community vitality, increasing the quality of life, and realizing the promise afforded by expanded broadband access to remote areas. Cooperative Extension has the capability to significantly lead community economic development. However, it lacks the capacity necessary to meet challenges and advance future opportunities.

4-H Positive Youth Development – For our youth, the road ahead may be challenging, but youth who become 4-H alumni are succeeding. Data shows that compared to their peers, they're:

- 2x more likely to have the goal of being a leader
- 3x more likely to participate in community service
- 2x more likely to report living life with intentionality and purpose

Currently, five to six million young people are gaining critical life and work skills in 4-H that lead to their success, and we would like to double this number. The lack of Cooperative Extension Capacity prevents millions of youth from participating in 4-H.



Water Resilience – Whether it’s too much or not enough water, communities will continue to face challenges with respect to water quantity and water quality. New innovations in flood mitigation, drought prevention, and reducing water pollution will require investments in research and Extension. We will need to partner with industry and government to solve these critical challenges and ensure communities have access to clean water. With new investment, Cooperative Extension can take the lead in the future to implement innovations at the individual, community, state, and a national scale.

Resilient Lands – As a global leader in agricultural production, the United States must strengthen the resilience of its agriculture and natural resources to better withstand the growing challenges of variable weather and extreme events. This requires production practices that regenerate soil, conserve water, and support biodiversity and community resilience. By adopting soil health principles, innovative technologies, and climate-resilient practices driven and delivered by Land-grant University research and Extension, we can safeguard natural resources, advance U.S. agriculture, and bolstering national food and nutrition security

Sustainable Food Systems – Cooperative Extension has provided education and support to this nation's agricultural producers for more than 100 years. While Extension has increased the efficiency in our production systems, the national and global population continues to grow and food security remains a challenge to some populations. Growing enough food to feed everyone in a sustainable and affordable way requires further investments in research and development as well as new Extension educational programs that help develop regional food production, processing, and distribution systems to protect national security and minimize hunger.



A Critical Crossroads for the Nation:

The United States faces an urgent crisis that threatens its agricultural leadership, food security, and economic stability. Increased productivity through innovation has long driven U.S. agriculture’s success, but declining public investment now jeopardizes this progress. Nobel and World Food Prize laureates warn that without substantial, strategic investment in agricultural science, the world risks a catastrophic “mismatch of global food supply and demand by mid-century.”¹ Immediate action is essential to maintain U.S. competitiveness, preserve environmental resources, and ensure a safe, abundant, and affordable food supply for everyone.

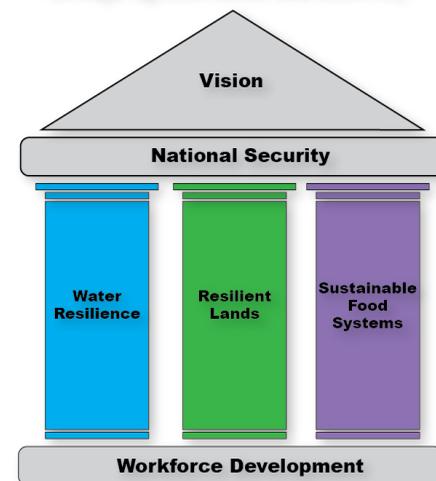
Public investment in agricultural research has plummeted by a third since peaking in 2002, reverting to 1970s levels by 2019. Meanwhile, competitors like China have surged ahead, surpassing U.S. funding of agricultural research and development. Despite delivering \$20 in economic benefits for every \$1 invested, federal funding has steadily declined, eroding the nation’s ability to compete and innovate.² The stakes are too high to ignore. Global competition, geopolitical instability, pandemics, and extreme weather events are placing unprecedented strain on the nation’s food systems, public health, and economy. The U.S. must act now to reinvest in food and agricultural innovation, ensuring a resilient and secure future for all.

An Outcomes-Driven Roadmap for the Nation:

To respond to the critical challenges our nation and agricultural sectors face, Land-grant University leaders developed a 10-year platform with clear goals and ambitious science outcomes aimed at addressing land resilience, water security, and sustainable food systems. This roadmap includes:

- Bold stakeholder-informed goals that enhance national security through strategic research and Extension.
- Innovative strategies to equip the next generation of agricultural professionals with the skills needed to address future challenges.
- Plans to foster strategic public and private partnerships to drive the adoption of innovative solutions.
- Innovative funding strategies and plans to ensure accountability and maximize impact.

“A world where people and the planet thrive through agInnovation and discovery”



The Role of Land-Grant Universities (LGUs):

LGUs are uniquely equipped to tackle today’s challenges through their integrated mission of research, education, and Extension. Their work has both national and global impact, driving collaboration, scientific exchange, and resource sharing to address pressing agricultural issues. Agricultural Experiment Stations and Cooperative Extension Service provide critical leadership in developing stakeholder-driven, science-based solutions that enhance agricultural productivity, sustainability, public health, water resources, and environmental protection—while training future generations of agricultural leaders. Notably, LGUs and other non-federal institutions conduct approximately 70% of publicly funded agricultural research and development, highlighting their essential role in driving innovation.

A National Imperative: Public Investments in Agricultural Research, Extension, and Education:

Addressing the critical societal challenges facing the U.S. and the world demands a bold and immediate increase in federal investment in Land-grant University agricultural research, Extension, and education. Without significant funding over the next decade, the nation’s ability to secure water resources, advance agricultural sustainability, and safeguard public health and the environment will be at serious risk. To build a resilient and sustainable future, it is crucial to prioritize and expand public support across a diverse range of grant programs. While USDA capacity and competitive grant programs—including research infrastructure—should be the primary focus, aligned funding opportunities across other federal agencies must also be leveraged to achieve the roadmap goals.

¹Hunger’s Tipping Point: An Urgent Call to Transform Food and Nutrition Security. https://www.worldfoodprize.org/en/laureates/laureate_letter/. World Food Prize Foundation.

²Investment in U.S. Public Agricultural Research and Development has Fallen by a Third Over Past Two Decades, Lags Major Trade Competitors. <https://www.ers.usda.gov/amber-waves/2022/june/investment-in-u-s-public-agricultural-research-and-development-has-fallen-by-a-third-over-past-two-decades-lags-major-trade-competitors>. USDA Economic Research Service.

Overview

Before 2014, life expectancy in the United States trended steadily upward. Currently, the United States ranks 48th in life expectancy despite spending almost \$5 trillion yearly on health care. Today, health includes traditional medical care, access to and consuming healthy foods, maintaining physical and mental health, and strengthening social connections. Our Land-grant university researchers and Extension professionals often live and work in the communities they serve and are viewed as trusted sources of both scientific knowledge and university access. They are uniquely positioned to improve the nation's health.

Outcome Goals & Impacts:

- Reduce diet-related diseases by 50% through prevention strategies, including improved access to and consumption of healthy foods.
- Increase the use of screenings, preventative medicine, and ongoing health monitoring to reduce the prevalence or severity of diseases.
- Encourage a 150% increase in physical activity and decrease in sedentary behavior through expansion of proven Extension exercise interventions.
- Establish local food systems by growing local food economies that improve food distribution, create jobs, and start new businesses. Grow the dollar value of local food economies in targeted areas by five percent per year, from 2027 through 2035.
- Increase investments in Extension's immunization education efforts to \$10 million annually to generate a 20:1 annual savings in future healthcare costs.
- Develop community-based collective action focused on impacting the basic needs for health and safety.
- Identify and address the health issues facing farmers and other agricultural workers, including mental health, zoonotic disease transmission, safe use of pesticides, and workplace safety.

Extension and Research Opportunities:

- Advance precision and lifespan nutrition research to reduce diet-related disease by 50%, improve measurement metrics and assess the impact of community incentives and adoption of dietary changes on preventing or delaying the onset of diet-related diseases. Research has shown a 10-fold reduction in health care costs for every dollar invested in EFNEP and SNAP-Ed.
- Develop research interventions that leverage environmental design and community planning. Investigate fitness tracking tools, rural trail development, and family based interventions to promote long-term physical activity. Assess the impact of exercise on mental health, comparing it to anti-depressant and anti-anxiety medications, and explore dose-reduction benefits.
- Educate community members to spot early signs of stress, depression, mental illness, and suicide risk. Provide basic training and continuing education to 50,000 health ambassadors, community health workers, volunteers, and community members.
- Evaluate the role of health communication science in counteracting misinformation. Investigate the relationship between stress, immune health, and how exercise may improve vaccine responses.
- Provide education to the highest priority health and safety needs of agricultural producers and workers, particularly older farmers and migrant farm workers. Study the impact of systemic stressors in the agricultural industry, including financial instability, isolation, and weather unpredictability, on health outcomes.
- Integrate AI-driven solutions including data analytics, machine learning, and wearable technology in research, adoption, and metrics.

Risk of Not Acting:

Throughout history, any civilization's success has been determined by its ability to ensure the health and well-being of its people. Failure to provide individuals with a predictable and accessible supply of safe, affordable, healthy food may be a major threat to the future success of our nation. Specifically, inaction would contribute to declining life expectancy, unsustainable healthcare costs, increased absenteeism, elevated prevalence of various diseases, slowed economic growth, and a weakened national defense.





How 4-H Promotes Positive Youth Development:

4-H helps youth find their spark, build real-world skills, and become resilient, adaptable, lifelong learners.

4-H, an integral part of the Cooperative Extension System, is a unique youth development program available in every US state and over eighty countries with affiliated programs. It is open to all youth aged 5-to-19 who want to have fun, learn new skills, and explore the world. In return, young people gain the skills to succeed, confidence, compassion, and connections with caring adults.

The challenges that youth, families, communities, and businesses face today differ from a generation ago. We must empower youth with the skills needed to conquer today's challenges and shape tomorrow's world. Youth who participate in 4-H emerge:

- Prepared with college, work, and life readiness skills
- Driven to contribute to their communities with leadership and teamwork skills
- Skilled in driving economic growth with critical thinking and problem-solving experience skills
- Experienced and articulate communicator

Outcome Goals and Impacts:

Data shows that compared to their peers, 4-H'ers are:

- 2x more likely to have the goal of being a leader
- 3x more likely to participate in community service
- 2x more likely to report living life with intentionality and purpose



*Tufts University longitudinal study of Positive Youth Development, 2021

4-H is built upon a proven model that impacts youth with caring adult mentors. Nationally, 4-H aims to scale this model to reach 10 million youth annually by 2030 - and help build a generation of young people who are Beyond Ready.

Extension and Research Opportunities:

4-H is dedicated to understanding how youth discover their passions and interests to help them become responsible citizens leading healthy and productive lives. A few research opportunities include:

- How do we measure 4-H's impact in transforming young people's interests and passions into a thriving adulthood and the best methods to achieve that success?
- How do we develop program environments that are optimal for youth to thrive?
- How do we build a sense of community for youth without an identified meeting space? Does that have an impact?
- How does the high turnover rate of youth development educators impact high-quality youth programming?
- How can we increase Artificial Intelligence (AI) literacy among youth to prepare them to use these tools as productive members of the workforce?
- What are the best ways to incorporate research on social connectedness with research on cognitive resilience?

Risk of Not Acting:

A generation or more of youth will be denied the 4-H opportunities to develop the skills necessary to thrive in an ever-changing world.

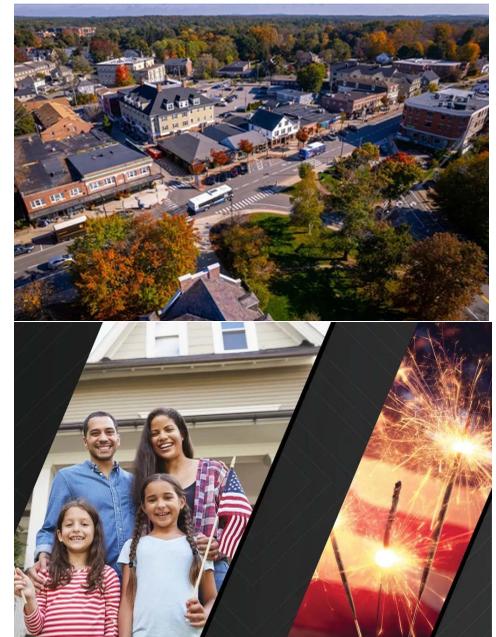


Overview

Cooperative Extension's community and economic development programs make rural and urban cities healthy, vital and more livable. These programs address critical issues such as small business development and job creation, housing access, workforce development, digital skills training, business and family financial management, access to housing and health care and developing strong community leaders and civic decision-making. While Extension works across communities of all sizes, the nation's rural areas are especially in need of community and economic development assistance from Land-grant Universities to reduce population decline and losses of farmers and farmland. Additionally, rural areas are increasingly vulnerable to complex threats such as natural disasters, including drought, flooding, and wildfires. Managing natural resources in rural America is important to maintaining a sustainable food supply, protecting water resources, mitigating the impacts of increased climate variability and improving the personal health and safety of our citizens. Despite these challenges, Extension community development programs remain underfunded and dramatically understaffed across the country. To be successful in obtaining the goals of a Land-grant system roadmap, we must increase the investment in community and economic development programming.

Outcome Goals & Impacts:

- Foster strong growth in small businesses, local economies and residential quality of life by helping rural communities address the trends associated with population loss as well as in-migration.
- Preserve farmland, increase pathways for beginning farmers and ranchers, and enhance opportunities for rural agricultural businesses.
- Increase the vitality of rural communities by providing research-based information that helps them to be more resilient through more informed public policy decisions, economic and business development, public health and environmental quality.
- Improve essential services, especially by enhancing digital skills for more than 100,000 rural residents annually, and cooperating with other agencies to expand access to the 30% of U.S. households that currently have no or limited access to the internet.
- Enhance the ability of rural communities to address natural disasters and reduce disaster-related losses by educating property owners about protecting their property and emergency preparedness.
- Create more livable communities and improve the quality of life in rural America.
- Increase community vitality through research-based Extension strategies that consider local people and places' varying needs



Extension & Research Opportunities:

- **Agricultural Resilience:** Analyze and potentially prevent the loss of farmers and farmland, through science-based technical assistance. Our vast economic databases, can identify land use trends and opportunities for positive programming.
- **Small Business Development and Job Creation:** Support small business development and local entrepreneurship through local business training and counseling.
- **Access to Essential Services:** Facilitate community access to applications and know-how to optimize the use of broadband.
- **Community Leadership:** Empower rural communities and their leaders with training and skill development in public decision making, civic engagement, leadership and conflict resolution.
- **Community Policy-Making:** Provide access to and understanding how to use research-based data sets (U.S. Census, housing, economic and job sends, workforce development and other major sources of information such economic and occupational data found in IMPLAN).
- **Youth Pathways to Careers:** Provide rural youth with opportunities to discover future occupations in agriculture, technology and entrepreneurship which allow them to remain in rural America.

Risk of Not Acting:

Without action, rural America will continue to lose population, farmers, businesses, and workers, as well as farmland, threatening the nation's long-term supply of food, clothing, and shelter, reducing tacit knowledge about food production. Furthermore, communities across the rural-urban continuum will face instability and the risk of reduced capacity to respond to natural calamities and emergencies, including new pandemics, vector-borne diseases, and a changing environment. Through attention to community and economic development, a more resilient future is possible.

Overview:

United States food and national security depend on transformative innovations driven and delivered by Land-grant University research and Extension to build a resilient and adaptable food system. By advancing diverse approaches in production, processing, and distribution across regions, food supply chains in all agricultural and food sectors are strengthened, reducing the risk of disruptions. Delivering these innovations creates a food system that meets current needs while preparing for future challenges—ensuring it remains economically robust, internationally competitive, and energy resilient, thus securing the nation’s food supply for generations to come.

Outcome Goals and Impacts:

- Achieve national and local food security by producing 95% of our food domestically, increasing local and regional farm net incomes by 20%, and reducing food waste by 50%.
- Bolster supply chain resilience by strengthening local and regional markets to meet 15% to 25% of local demand, reducing the cost of food transportation by 25%, and expanding the bioeconomy.
- Reduce food insecurity by cutting the number of U.S. households experiencing low food security by 50%.
- Decrease diet-related diseases by 40% in all communities.
- Safeguard the food supply with a 50% increase in agricultural biosecurity through the creation and adoption of tactics to prevent foodborne contaminants, minimize plant and animal disease outbreaks, and manage pests from production to consumption.

Opportunities:

- **Promote innovation** across the agricultural continuum and advance strategies for regionally focused agriculture.
- **Enhance sustainability** by conducting cost-benefit, life cycle, environmental impact, and social cost-benefit analyses to assess improvements in local, regional, national, and international food systems and implement the results.
- **Reduce waste** by repurposing agricultural byproducts, extending product shelf life, implementing sustainable packaging, and educating stakeholders to minimize waste from field to retailer, thereby enhancing food security.
- **Encourage healthier lifestyles** by promoting science-based solutions, increasing access to affordable, nutritious, and safe food, and expanding education to support individuals in adopting healthier habits.
- **Ensure food safety** by developing and adopting new surveillance tools and approaches for early detection of pests, diseases, and pathogens across the food chain.
- **Improve crop and livestock genetics** to increase nutritional value and enhance resistance to pests and diseases in commodity crops, fresh fruits, vegetables, and livestock, and train local producers on deploying new technologies that take advantage of new and changing environments.
- **Adapt to change** by developing and deploying technologies and innovations that address environmental shifts and the evolving agricultural labor force.

Risks of Inaction:

Food system failures and disruptions threaten national security. Without increased investment, the U.S. risks falling behind in developing and delivering resilient, sustainable, and efficient farm-to-table practices. This stagnation could lead to increased food supply interruptions, food waste, food insecurity and hunger, foodborne diseases, economic instability, and a growing reliance on costly imports. Ultimately, a lack of innovation jeopardizes national security, food security, global economic competitiveness, health, and the stability of rural communities.

Crosscutting Education Outcome Goal:

Workforce Development: Annually train additional college students and 4-H members in food, agriculture, and renewable natural resources to meet the increasing demand for a skilled workforce. Recruitment efforts will focus on engaging youth and adult learners from diverse backgrounds and experiences.



Funding Requirement:

America’s future prosperity relies on Land-grant Universities delivering groundbreaking discoveries for a resilient, sustainable tomorrow. Achieving this requires bold investments in USDA capacity and competitive funding and aligned federal programs.

Overview:

As a global leader in agricultural production, the United States must strengthen the resilience of its agriculture and natural resources to better withstand the growing challenges of variable weather and extreme events. This requires production practices that regenerate soil, conserve water, and support biodiversity and community resilience. By adopting soil health principles, innovative technologies, and weather-resilient practices driven and delivered by Land-grant University research and Extension, we can safeguard natural resources and advance U.S. agriculture, enhancing resilience and bolstering national food and nutrition security.

Outcome Goals and Impacts:

- Enhance yield stability, improve soil health, boost energy efficiency, and increase soil carbon sequestration, while integrating renewable energy—together driving a 40% reduction in agriculture’s carbon footprint through innovation and best practices.
- Drive innovation in nitrogen fertilizer use efficiency, minimizing nutrient runoff reduction, and optimizing crop nitrogen utilization while supporting producers in adopting sustainable management practices that collectively lower production costs and reduce greenhouse gas emissions by 35%.
- Foster new forestry land management, land cover, and harvesting approaches that promote healthy forests resilient to fire and extreme weather events, while increasing by 20% annually the number of forest owners with management plans to support healthy forests capable of absorbing 30% of economy-wide carbon dioxide emissions each year.
- Improve the adoption of practices to enhance the resilience of agriculture, rangeland, and forest ecosystems by developing adaptive land management plans to optimize production amid variable and extreme weather, reducing federal crop insurance costs by 25% (\$3.5 billion).
- Improve infrastructure and emergency planning to reduce the devastating financial impact of extreme weather events on communities.

Opportunities:

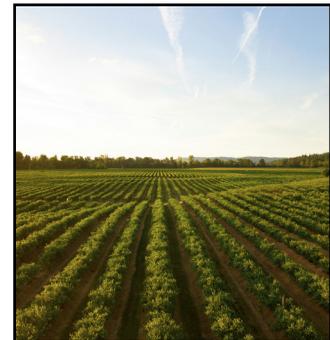
- **Identify innovative agronomic practices** that enhance nitrogen use efficiency, soil fertility, structure, and resilience, while deepening our understanding of soil composition and processes.
- **Reduce barriers to collaboration** among farmers, land managers, communities, researchers, and policymakers to increase engagement and accelerate the adoption of grassroots innovations for adaptation and resilience.
- **Develop infrastructure and response plans** to improve the resiliency of rural and urban communities.
- **Develop accurate metrics** to quantify greenhouse gas emissions, carbon sequestration, water usage, and biodiversity, integrating long-term weather modeling and scenario simulations to strengthen the resilience of agriculture and natural resource systems.
- **Apply gene-editing techniques** to create climate-resilient crops and livestock (e.g., improved water use efficiency, drought tolerance, heat tolerance), and develop feeds to reduce methane emissions from livestock.

Risks of Inaction:

From escalating wildfires to droughts and floods, agriculture and our communities are already grappling with the effects of variable weather and extreme events. Without adaptation, these challenges will intensify, resulting in lower crop yields and greater harm to livestock, forests, fisheries, and communities. Biodiversity will decline as resistant weeds, pests, diseases, and wildfires become more widespread, disrupting ecosystems and agricultural productivity. The degradation of water, air, and soil quality will worsen, leading to severe consequences for food security, human and animal health, and environmental sustainability.

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Overview:

Reliable access to safe water is fundamental to agriculture, public health, and environmental sustainability, serving as a cornerstone for food and national security. Land-grant Universities must lead efforts to build water resilience through research, education, and Extension initiatives that boost productivity, enhance water efficiency, protect water quality, and promote conservation practices. As floods and droughts intensify, advancing innovative technologies and ensuring equitable access to water resources are critical. Land-grant Universities are uniquely positioned to drive focused efforts that address these pressing challenges, securing water resources for diverse landscapes and generations to come.

Outcome Goals and Impacts:

- Increase water use efficiency by 50% across food and agricultural systems, including production and processing.
- Reduce water quality impairments—such as elevated nutrients, pathogens, bacteria, sediment, and pesticides—by 40% within agricultural watersheds to protect domestic water supplies and public health.
- Strengthen agricultural system resilience by reducing production losses from waterlogging, flooding, and drought by 50%.

Opportunities:

- **Create a multi-year strategy** that integrates innovative practices, Extension programs, and water monitoring to inform policy interventions aimed at improving agricultural water use efficiency and utilization of nontraditional water sources, resilience to floods and droughts, water quality, accessibility, and ecosystem services.
- **Promote water-efficient, flood- and drought-resilient agricultural systems** by advancing best practices, tools, and Extension programs for improving crop and livestock productivity and water conservation, reuse, and quality.
- **Collaborate with communities and public officials** to develop strategies addressing water accessibility challenges.

Risks of Inaction:

Reduced water availability will impact drinking water supplies and household use in both rural and urban communities, while also constraining agricultural production. Declining river water levels will reduce navigable waterways, disrupt transportation, increase shipping costs, and weaken farmers' competitiveness in global markets. Furthermore, lower water levels in streams and lakes will harm wildlife, recreation, and tourism, placing additional strain on local economies and ecosystems. Increased groundwater withdrawal will worsen land subsidence, damaging infrastructure such as roads, bridges, levees, and water wells, which imposes significant financial burdens, reduces flood protection, and diminishes aquifers' capacity to store water. Simultaneously, the degradation of water quality for drinking, irrigation, and recreation will pose serious risks to public health.

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