# Fiscal Year 2021 Description of Funded Projects

**Number of Grants Awarded:**     14
**Amount of Funds Awarded:**     $9,988,944.00

For more information, please visit the grant program's website:
https://www.ams.usda.gov/services/grants/scmp

**NOTE:** The below project descriptions were provided by the grant recipients.

## California

**Recipient:** California Department of Food and Agriculture
**Project Type:** Research
**Award Amount:** $915,263.00

### Enhancement of specialty crop seed germination, seedling vigor, and pest management using cold plasma technology

Low and inconsistent seed germination and seedling vigor are major bottlenecks in the production of many specialty crops, including greenhouse ornamental and vegetable plugs (seedlings). Production practices promoting seed germination and seedling vigor are of particular importance to organic producers, who have higher disease and pest pressures and considerably fewer options available in terms of synthetic fertilizers and pesticides. Recent scientific studies show that cold plasma treatments can significantly increase seed germination percentage, elicit earlier germination and therefore reduced production costs, and significantly increase seedling vigor due to better growth and suppression of seed pathogens. The California Department of Food and Agriculture, in collaboration with four institutions in four states (University of California Davis (principal investigator), University of Minnesota, University of Maryland, and Cornell University (NY)), plan to demonstrate and disseminate solutions to enhance seedling plug productions and pest and disease management through optimized cold plasma treatments of specialty crops seeds. Systems to perform cold plasma treatments of large samples of seeds are commercially available and cost-effective, so outcomes from this project can be readily adopted by specialty crop producers. In this project, integration of optical sensing is proposed as a highly innovative approach to real-time and cost-effective quality control of cold plasma treatments. To maximize project impact, a stakeholder advisory board is included and consulted throughout the project period. Due to the broad relevance of seed germination and seedling vigor, project outcomes have direct relevance to producers for a wide range of annual specialty crops.

**Recipient:** California Department of Food and Agriculture
**Project Type:** Research
**Award Amount:** $878,971.00

### Climate ready Vines for the Western United States

Traditionally, trees have been used to shade and cool buildings. However, they can take many years to grow to a size that is effective in providing these services. Few vine species have been studied for their ability to mitigate solar loads onto buildings thereby reducing the surface temperatures of walls. Vines on trellises have the potential to render similar cooling effects and can be cultivated at a much faster rate than trees. However, a rigorous evaluation that compares the performance of a large number of vines taxa has not been conducted. This project seeks to demonstrate the growth rates and water needs of different vines and the impact of these variables on the ability to reduce temperature around structures in the various climates across the Western US. This is a multi-state collaborative research effort to evaluate and monitor potential energy saving, water use, ecological, and horticultural characteristics of vine plants across different climates and latitudes. Participating institutions with five study sites located in Arizona, California (2 sites), Utah, and Washington will capitalize on an existing network of multi-state research infrastructure. Based on standardized experimental protocols, the project will generate data, knowledge, and information needed to develop a robust database of vine plants suitable for different climates. This will inform best management practices and the assessment of the associated ecosystem services to achieve multi-functional vine selection and management across the western states.

**Recipient:** California Department of Food and Agriculture
**Project Type:** Research
**Award Amount:** $871,052.00

### 2022 Investigate Remediation of Smoke Impacted Grape Juice and Wine through the Development of Unique Phenol Glycosidases and Resins for Volatile Phenol Removal

Grapes are the highest value crop in the United States and there are more than one million acres of grape-bearing land, 96% of which is located on the West Coast. The grape and wine industry have an economic impact of > $140 billion. In recent years the grape growing regions on the West Coast have experienced catastrophic wildfires. Climate experts agree that wildfires will occur with greater frequency and intensity. Persistent exposure to smoke can compromise the quality and value of wine grapes and adversely affect wines. The 2020 wildfires alone resulted in an estimated $3.5 billion loss in revenue. Currently there are no effective remedial actions available to the industry for smoke impacted grape juice and wine resulting in devastating losses when wildfires occur. This project proposes the development of a novel treatment option in grape juice and wine that will selectively remove the smoke impact compounds without impacting the overall quality of wine. Designer enzymes in combination with optimized resins will be employed and treatment guidelines based on juice and wine matrix specifics will be developed in partnership with grape and wine entities in California, Oregon, and Washington State.

**Recipient:** California Department of Food and Agriculture
**Project Type:** Research
**Award Amount:** $795,194.00

## *Understanding and Improving Nitrogen Use Efficiency in Spinach*

Spinach, a highly nutritious leafy green vegetable produced largely in California, Arizona, and Texas, is valued at over $500 million. Nitrogen fertilization, necessary for high yield and desirable leaf quality, poses environmental concerns, especially to ground and surface water quality. Current nitrogen rates are as high as 225 kg/ha for baby spinach. Increasingly stringent nitrogen management regulations require growers to carefully manage their nitrogen applications. Growing spinach with lower nitrogen fertilization would be desirable as long as production can be maintained, and quality is adequate. Our project addresses this issue by incorporating spinach germplasm that remains dark green under lower N fertilization rates into breeding populations and to use genomic and phenomic tools to predict yield and accelerate selection programs, resulting in faster genetic gain. Further, we will identify the biochemical, physiological, and genetic reasons that some plants that can produce and remain darker green at lower nitrogen fertilization rates. New germplasm and tools (for example drone-mounted imaging tools) better suited to lower fertilization management will be developed, benefitting growers and consumers, as well as limiting pollution.

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**Recipient:** California Department of Food and Agriculture
**Project Type:** Research
**Award Amount:** $554,663.00

## *Optimization of Habitat to Support Pollinators and Reduce Pests: Removing Barriers to Habitat Adoption in Highbush Blueberry*

Highbush blueberry requires pollination typically achieved through managed honeybees and/or wild bee populations. Uncertain honeybees supply and health concerns after blueberry contracts, combined with honeybees not being optimal pollinators of blueberries, make support of wild pollinators essential to future production and competitiveness of U.S. blueberry crop. It is well-established that habitat near blueberry crops increases wild pollinators, pollination, and crop production, which can increase revenues by $15,000/ha. Yet, a major impediment to the uptake of habitat measures by blueberry growers is the perceived risk of increased pest pressure in crops resulting from habitat inadvertently increasing pests of concern such as spotted wing drosophila. To address this issue and increase optimization and uptake of habitat, we will conduct a review of non-blueberry plants that support key pests in blueberry using literature and stakeholder interviews, conduct novel research to further inform key pest alternate host plants in five primary blueberry growing states, create a web-based tool to identify ideal pollinator supporting plants and plants to avoid or eliminate in pollinator-supporting habitat near blueberry, conduct an assessment of barriers, and provide extension to growers on pollinator habitat value, alternate host plants, habitat optimization, and cost-share and recognition programs. This comprehensive program will help growers create and manage habitat that they are confident is increasing their production without creating pest problems, resulting in greater crop yield, and more sustainable and competitive U.S. blueberry production.

# Georgia

**Recipient:** University of Georgia Research Foundation, Inc.
**Project Type:** Research
**Award Amount:** $725,248.00

*Being a good neighbor, managing adjacent land use risks associated with bioaerosols from cattle and poultry operations to fresh produce*

Recent foodborne illness outbreaks in produce have been associated with risk of bioaerosol contamination from food animal production on adjacent land. However, there is a lack of data with respect to 1) quantifying populations of foodborne pathogens in bioaerosols; 2) modeling the potential for spread to nearby areas; and 3) determining if there are genetic predeterminants for pathogens spread by this mechanism. Without this information, we lack the foundational knowledge that is a prerequisite in advising produce growers regarding risks associated with adjacent animal production as well as investigating potential mitigation strategies, if warranted. Our multidisciplinary team of researchers and Extension specialists from the University of Georgia, University of Florida, and Auburn University will address these questions. In this project, we will target poultry, dairy, and beef cattle operations and sample for Shigatoxigenic Escherichia coli (STEC; dairy, beef) as well as Salmonella (poultry, dairy, beef) in bioaerosols during the typical production window for fresh produce. Through this approach we will quantify populations of pathogens by particle size, stratified by location from the animal operation, and model these findings along with weather conditions and topography. Bioinformatics will provide detailed insight regarding genetic similarity among isolates and other drivers that may play a role in fitness or virulence. Lastly, outputs from this work will be shared with producers and other Extension colleagues to disseminate science-based knowledge of hazards associated with the interface of animals and fruit and vegetable production.

# Iowa

**Recipient:** The University of Iowa
**Project Type:** Research
**Award Amount:** $461,000.00

*Southeast Potato Initiative to Improve Marketability and Resilience to Environmental Stress Through Breeding, Modeling and Economics*

Scientists from the University of Iowa and Montana State University propose to investigate a series of new fertilizer additives that will improve the performance of sweet corn, seed potatoes, and radishes to heat and drought stress to ensure their harvest yields. These fertilizer additives will be investigated in greenhouses and in farm fields to identify the additives that can double the survival of crops to heat and drought stress while maintaining, or possibly improving, their harvest yields. Heat and drought stress are responsible for lowering harvest yields, and they are increasing in frequency due to changes in climate. This proposal will identify inexpensive fertilizer additives that can greatly increase the survival of specialty crops to these environmental stressors. Importantly, these fertilizer additives have also been shown to increase harvest yields in prior work in greenhouses and in season-long field trials of other crops. Because these fertilizer additives are inexpensive and only small amounts will be needed to protect crops from heat and drought stress, they can be commercialized upon completion of this grant. To translate this work to commercial applications, field trials will be completed each year of this

proposal to investigate the effects of optimized additives on seed potatoes and sweet corn. In addition, an agriculture start-up company that was launched in 2018 can commercialize these fertilizer additives. This project will benefit farmers who grow sweet corn, potatoes, and radishes by ensuring strong harvest yields even in weather-challenging years.

# Massachusetts

**Recipient:** Boston Area Gleaners, Inc.
**Project Type:** Marketing and Promotion
**Award Amount:** $666,300.00

## Boston Food Hub: Connecting New England growers to consumers in Boston through streamlined food system logistics

Boston, a city of over four million people, presents tremendous wholesale opportunities for local and regional growers. This project is designed to increase access to the Boston market for agricultural producers in the six New England states, and to reduce distribution costs through logistical efficiencies. Boston Food Hub (BFH), a program of Boston Area Gleaners, has relationships with dozens of area growers, most of whom are in Massachusetts and, increasingly, has relationships with a range of customers in eastern Massachusetts. With the right infrastructure and partners, Boston Food Hub can serve as a central distribution nexus for all of the growers in New England. This project will transform the capabilities of food hubs in the region, and their potential for selling regional products by bringing together producers, distributors, food hubs, local food enterprises and customers into a single network. This network will increase the volume of regional produce reaching consumers in eastern Massachusetts and will connect the dots of food businesses across New England.

# Mississippi

**Recipient:** Mississippi State University
**Project Type:** Crop Specific
**Award Amount:** $750,000.00

## Advancing Optical Technologies for Enhanced Quality Evaluation, Grading

## and Sorting of Sweetpotatoes

Sweet potato production is a key component of agricultural industries in Mississippi, North Carolina, and Louisiana. Grading and sorting of sweet potato storage roots for quality is performed manually, which is labor intensive, costly, and subject to human evaluation error. Internal quality influencing consumer acceptance, such as texture, flavor, and hidden defects, is usually not evaluated in current practice. Non-destructive, automated detection of both external and internal quality would allow the sweet potato industry to reduce labor costs while delivering superior, consistent products to the marketplace, enhancing consumer satisfaction and profitability of the commodity. Mississippi State University, in collaboration with North Carolina State University, Louisiana State University and University of Illinois Urbana-Champaign, aims to advance non-destructive optical technologies for enhanced quality evaluation, grading and sorting of sweet potatoes. Specifically, this project will: 1) develop computer algorithms for quantification and classification of appearance quality of sweet potatoes using machine vision technology; 2) evaluate hyperspectral and interactance imaging for detecting internal quality,

including firmness, soluble solids, dry matter, and internal defects of sweet potatoes; and 3) develop and evaluate an automated sweet potato grading and sorting machine prototype. The research team will disseminate project results via peer-reviewed articles, conference presentations, social media, and outreach events.

## South Carolina

**Recipient:** South Carolina Department of Agriculture
**Project Type:** Research
**Award Amount:** $615,466.00

### *Optimization of Nutritional Programs for Stone Fruit in the Southeastern U.S.*

This Project will develop and provide holistic fertilization guidelines to the stone tree fruit industry with accurate, timely, efficient, and effective crop nutrient information to maximize orchard growth, productivity, and fruit quality, while maintaining natural resources and improving long-term sustainability and profitability of fruit farms. This project is aligned with a key priority of the USDA Science Blueprint: "the reduction of environmental impacts and optimization of sustainability of agricultural systems." Our research will focus on understanding the influence of orchard-specific characteristics on tree nutrient dynamics. This Project will i) assess the validity of established sufficiency levels and leaf analysis as tools to decide if annual applications of fertilizers are needed; ii) determine orchard nutrient restitution needs based on yield, rootstock, and ripening time; iii) build a model for planning fertilization needs; and iv) translate findings into management recommendations, sharing them with growers and extension agents at production meetings and through outreach publications. The outcomes of this project will allow stone fruit producers to better understand the effects of using nutrients dynamics information to mitigate losses caused by overfertilization, reduce the impact of nutrients in the environment, choose appropriate fertilization practices, and make management decisions to increase profitability. The results of this research will be communicated to the southeastern tree fruit growers to allow for the effective use of fertilizers for stone tree fruit production. The ultimate goal of the project is to provide guidelines for fertilizer management in stone fruit tree in the Southeast U.S.

## Texas

**Recipient:** Texas Department of Agriculture
**Project Type:** Research and Marketing & Promoting
**Award Amount:** $713,572.00

### *Mitigating Drought Stresses with Plant Biostimulants for Sustainable Production of Onion and Watermelon*

Climate change and global warming exacerbate the negative impact of drought on crop production. Plant biostimulants (BPs) may provide a novel, promising, and sustainable approach to enhance plant growth and crop yield under stressed and non-stressed conditions. This project aims to test the effects of BPs in mitigating drought stress in two specialty crops, onion and watermelon, at test sites in Texas and Utah. We will determine the efficacy of BP products based on fungi, bacteria, humic substance, and seaweed extracts on onion and watermelon production in controlled environments and field conditions. We will

integrate these results to further verify their efficacy at commercial farm level. We expect to identify the most efficient BP products and the most responsive onion and watermelon cultivars based on their increased yield and quality. We expect to identify the most efficient BP products and the most responsive varieties of onion and watermelon for increased yield and quality. Outreach and education activities to disseminate project results and promote specialty crop production will occur through hosting field days and conferences to demonstrate and disseminate research results in Texas and Utah. Project deliverables include presentations at field days and conferences, fact sheets, videos, and scientific publications. All these deliverables will be posted on university and industrial websites. Beneficiaries of this specialty crop project are onion and watermelon growers and the BP industry. The long-term impact is increased yield and quality of onion and watermelon with reduced input of water and fertilizers.

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**Recipient:** Texas Department of Agriculture
**Project Type:** Research and Crop Specific
**Award Amount:** $748,040.00

### Enhancing the Production, Establishment, and Marketability Success of Zoysiagrass Sod

Zoysiagrass is a warm-season perennial turfgrass known to produce high quality with lower inputs of water, nutrients, and  pesticides as compared to other warm-season turfgrasses in the Southeast and Southwest. However, its use is not as widespread as some other turfgrasses due to slower establishment, poor extreme temperature tolerance, and susceptibility to certain biotic and abiotic stresses in commercially available cultivars. Breeding efforts over the past decade have resulted in the development of interspecific hybrids with superior stress tolerance and appearance, which represent an important step in improving the environmental sustainability of managed turf. However, information is lacking on how to best grow-in and manage new hybrids (soon to become commercially available) at the FARM (sod producers) and LAWN (consumers including homeowners, installers, golf-course superintendents and sports field managers). This knowledge gap leaves producers and consumers to determine best management practices based on limited experiences and not research, likely creating hesitation in the adoption of economically and environmentally sustainable zoysiagrasses. A project team of researchers from three land-grant institutions propose to increase adoption and use of zoysiagrass by examining ways to 1) optimize FARM production practices to increase revenue, 2) optimize LAWN management practices to ensure long-term success of established sod, 3) understand market barriers to successful adoption of new cultivars, and 4) offer research-based recommendations for the management of new zoysiagrass.

# Washington

**Recipient:** Washington State Department of Agriculture
**Project Type:** Research and Crop Specific
**Award Amount:** $559,788.00

## Hanu Pappu WSU: Fast Tracking Resistant Potato Cultivar Development for Mitigating Powdery Scab and Mop top virus Pest Complex

This project aims to developing safe, effective, and economical pest and disease management solutions for potato growers; and the project involves conducting research in plant breeding, genetics, and genomics to improve crop characteristics with focus on disease resistance; and addressing post-harvest disease issues during storage. Outcomes include disease resistant varieties that will require less chemical usage there by reducing the environmental impacts. The proposed SCMP project involves a collaborative effort to address a disease complex that affects potato which is grown commercially in several distinct and widely dispersed geographic areas of the country.

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**Recipient:** Washington State Department of Agriculture
**Project Type:** Research
**Award Amount:** $734,387.00

## Beat the Heat - Mitigating Heat Damage in Caneberry

Pacific Northwest growers lead in national production of Caneberry (raspberry and blackberry), which is an integral crop to rural farming communities within the region. Despite the scale and significance of this crop, Caneberry growers are under threat from extremes in heat due to climate change. During the 2021 heat dome, growers in the region lost on average 30-40% of their crop, and some growers experienced total crop loss. The industry is unprepared to deal with extremes in heat, which are projected to become more frequent in the future, and need data-driven ways to effectively and economically "beat the heat." This collaborative proposal among Washington State University, Oregon State University, and USDA-ARS addresses this need through three research- and outreach-oriented objectives: 1) Evaluate the impacts and cost-benefits of heat mitigation technologies across several cultivars and promising selections of raspberry and blackberry; 2) Examine the physiological and genetic mechanisms that contribute to heat tolerance across cultivars and advanced selections of raspberry and blackberry; and 3) Effectively disseminate project information to growers and the supporting agricultural research, crop consulting, and Extension community. Completion of this project will provide both short-, medium- and long-term benefits that will contribute to the resiliency of the caneberry industry. Benefits include information on cost-effective technologies to avoid or reduce the impacts of extreme heat, knowledge of physiological and genetic mechanisms that contribute to heat tolerance to inform breeding programs in trait selection for adaptation to heat, and the long-term release of cultivars better adapted to heat.