SPECIALTY CROP BLOCK GRANT PROGRAM

FISCAL YEAR 2021 AWARDED PROJECTS

Agriculture Commissioner
Doug Goehring

TABLE OF CONTENTS

A Letter from the Commissioner

Greetings,

Agriculture Commissioner
DOUG GOEHRING

The North Dakota Department of Agriculture is pleased to support the specialty crop industry in the state through specialty crop block grants.

The USDA defines specialty crops as “fruits and vegetables, tree nuts, dried fruits, horticulture and nursery crops.” Specialty crops grown commercially in North Dakota include dry beans, dry peas, lentils, potatoes, confection sunflowers, grapes, honey and various vegetables.

Projects that enhance the competitiveness of specialty crops in ND are eligible for these grants.

Eligible applications include enhancing food safety; pest and disease control; developing new and improved seed varieties and specialty crops; and increasing child and adult nutrition knowledge and consumption of specialty crops. Projects that directly benefit specific, commercial products or profit a single organization, institution or individual are not eligible.

North Dakota receives funds based on a grant allocation formula that is based on the average of specialty crop cash receipts and specialty crop acreage in the state.

The North Dakota Department of Agriculture has been administering the Specialty Crop Block Grant Program since 2007. Since then, we have administered a total of 235 grants and have received more than $26.7 million in funding through the past 17 annual funding opportunities; and an additional 28 grants and $4.3 million in additional one-time funding through H.R. 133, the Consolidated Appropriations Act of 2020.

We encourage organizations, institutions and individuals to submit proposals on their own or in partnerships during open application periods. Questions may be directed to Deanna Gierszewski at 701-328-2191 or scbg@nd.gov.

Thank you for your interest in specialty crop block grants.

Sincerely,

Doug Goehring
Agriculture Commissioner

ABOUT PROGRAM

The purpose of the Specialty Crop Block Grant Program (SCBGP) is to enhance the competitiveness of specialty crops. Specialty crops are defined as “fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture).”

The Food, Conservation, and Energy Act of 2008 (Farm Bill) amended the Specialty Crops Competitiveness Act of 2004. Under the amended Act, the Secretary of Agriculture is directed to make grants to states for each of the fiscal years 2008 through 2012 to be used by state departments of agriculture to enhance the competitiveness of specialty crops. The American Taxpayer Relief Act of 2012 provided funding for fiscal year 2013, section 10010 of the Agricultural Act of 2014 provided funding for fiscal years 2014 through 2018 and section 10107 of the Agriculture Improvement Act of 2018 will provide funding for fiscal years 2019 through 2023.

To be eligible for a grant, the project(s) must “enhance the competitiveness of U.S. or U.S. territory grown specialty crops in either domestic or foreign markets.” Projects must also benefit more than one commercial product (e.g., ABC Company brand), organization, or individual.

Examples of enhancing the competitiveness of specialty crops include, but are not limited to: research, promotion, marketing, nutrition, trade enhancement, food safety, food security, plant health programs, education, increased consumption, increased innovation, improved efficiency and reduced costs of distribution systems and environmental concerns and conservation.

Grant funds are not awarded to projects that solely benefit a specific commercial product. It will not benefit products that provide a profit to a single organization, institution, or individual. Grant funds cannot be put toward capital expenditures (equipment, buildings, land). They also may not be used to make improvements to capital assets that materially increase their value or useful life. Each project funded through the Specialty Crop Block Grant Program will be carried out over a two-year timeframe. The Specialty Crop Block Grant Program is funded through the United States Department of Agriculture’s Agricultural Marketing Service.

Number of Grants Awarded to the North Dakota Department of Agriculture: 2
Number of Sub-Awarded Projects: 49
Amount of Funds Awarded: $7,605,788.33

These following funding breakdowns are for annual funding and H.R. 133, the Consolidated Appropriations Act of 2020, funding:

2021 Farm Bill funding (fiscal year 21-24):

23 Projects	$3,012,946.88
Direct	$146,380.47
Indirect	$112,863.24
Total	$3,272,190.59

Additional one-time funding (fiscal year 21-25):

28 Projects	$4,058,093.40
Direct	$178,023.30
Indirect	$97,481.04
Total	$4,333,597.74

For more information, please visit the program’s website at https://www.nd.gov/ndda/scbgp.

SCBGP STAFF

KARA HAFF
Ag Marketing &
Business Development
Coordinator

DEANNA GIERSZEWSKI
Grant Administrator

2021 FARM BILL FUNDING

Aronia berries at the NDSU Carrington Research Extension Center

DISENTANGLING THE ROOT ROT PATHOGEN COMPLEX IN LENTILS THROUGH MOLECULAR DIAGNOSTICS

National Agricultural Genotyping Center
Zachary Bateson, Fargo

Project Budget: $114,636

The National Agricultural Genotyping Center will optimize a root rot pathogen assay that will test environmental samples from university and private lentil fields to provide preliminary pathogen data in ongoing research and further evaluate molecular diagnostics as a proactive management tool for root rot disease in pulse crops.

COMPREHENSIVE PANEL TO DETECT GENETIC MARKERS LINKED TO HERBICIDE RESISTANCE IN PIGWEEDS

National Agricultural Genotyping Center
Zachary Bateson, Fargo

Project Budget: $123,086

The declining herbicide options to manage pigweeds is a persistent concern for North Dakota dry bean producers. Knowing the herbicide resistance potential of local pigweed populations can help producers avoid costs of using ineffective chemical control. The National Agricultural Genotyping Center will optimize diagnostic assays to detect genetic markers linked to herbicide resistance in pigweeds collected from dry bean fields. The specific objectives for this project are to: 1) evaluate target-site mechanisms for ALS- and PPO-inhibiting herbicide resistance in late-season pigweeds that persist in dry bean fields, and 2) validate high-throughput diagnostic assays for detection of commonly occurring target-site mechanisms.

ENHANCING RUST RESISTANCE IN CONFECTION SUNFLOWER PRODUCTION THROUGH NEXT- GENERATION TECHNOLOGIES

National Sunflower Association
Tina Mittlesteadt, Fargo

Project Budget: $130,004

The National Sunflower Association will use newly available genome sequence information for sunflower to identify diagnostic single-nucleotide polymorphism (SNP) markers tightly linked to the rust resistance genes (R genes) expanding the options for stacking resistance to obtain an enhanced, long-lasting resistance to the rust disease. Rust is a growing threat to sunflower production worldwide, leading to losses in yield and seed quality. This project will apply cutting edge genetic and genomic approaches to characterize the genetic basis for rust resistance in sunflower. With improved next generation sequencing (NGS) and the decreased cost of sequencing, it is now feasible to discover millions of SNPs for any plant and connect these markers to desirable phenotypic traits.

INCREASING CONSUMER USE AND CONSUMPTION OF PEAS, LENTILS AND CHICKPEAS

Northern Pulse Growers Association
Brian Gion, Bismarck

Project Budget: $80,730

The Northern Pulse Growers Association (NPGA) proposal is to design an educational outreach program to the restaurants in the region which will address the priorities of the North Dakota Department of Agriculture related to enhancing the competitiveness of specialty crops through increased sales and consumption of dry peas, lentils, chickpeas and fava beans.

VIRTUAL EXPERIENCES DELIVERING REAL PROTECTION OF SPECIALTY CROPS FROM PLANT DISEASES AND ECONOMIC LOSS

NDSU
Samuel Markell, Fargo

Project Budget: $121,177

North Dakota State University plant pathologists will deliver transformational educational experiences to growers by utilizing immersive 360-degree videos and drone imagery that teach disease management practices by letting growers 'experience' protection of specialty crops from diseases and yield loss.

ROOT ROT OF LENTIL: EVALUATION OF CROP ROTATION, INTERCROPPING AND RISK ASSESSMENT

NDSU
Audrey Kalil, Williston

Project Budget: $28,662

Lentil production has been an economic boon to northwest North Dakota, but in recent years root rots have becoming increasingly problematic. Recommendations for a four-to-five-year rotation between lentil crops to avoid the build-up of root rot pathogens in the soil can be a challenge for many growers, as lentils may be their primary profit generating crop. The North Dakota State University Williston Research Extension Center will compare one-, two-, three- and four-year intervals in between lentil crops to determine the effect of these rotation lengths on root rot disease severity and yield in a no-till, dryland cropping system. Intercropping lentils with mustard will be evaluated for suppression of root rot in lentils in a short rotation. Finally, a soil root rot potential seedling bioassay will be used to determine the effect of rotation length on root rot inoculum in the soil and these data will be correlated with yield and field root rot severity. This effort will improve root rot management and help generate more specific rotation recommendations for lentils grown in North Dakota.

Beans at the NDSU Carrington Research Extension Center

PYRAMIDING DESIRABLE BEAN RUST GENES FOR BROADER AND DURABLE RESISTANCE

NDSU
Juan Osorno, Fargo

Project Budget: $162,533

Bean rust is one of the most important diseases both in North Dakota and worldwide. Under high disease pressure conditions, seed yield losses range between 50 to 100%, especially if infection occurs at early growth stages. Genetic resistance is a good control alternative because of lower costs compared with chemical applications, plus it is more environmentally friendly. Since its beginning in the early 1980s, the dry bean breeding program at NDSU focused its efforts on the genetic improvement of rust resistance. The Ur-3 gene was deployed in many released varieties and provided rust protection during many years. Unfortunately, bean rust is a highly variable pathogen and in 2008, a new race of the pathogen that overcomes the Ur-3 resistance gene, was detected in North Dakota. Fortunately, a few alternative genes were found to be effective against this new race (named 20-3). The NDSU dry bean breeding program started efforts to incorporate the Ur-11 resistance gene which has broader resistance. However, additional genes are needed to ensure long-term durable resistance. Recent efforts are focused on incorporating the Ur-5 gene.

INTEGRATED IMPROVEMENT PROCESS OF COLD-HARDY GRAPES; FROM BREEDING, PRODUCTION, TO SENSORY ANALYSIS

NDSU
David Boehm, Fargo

Project Budget: $269,846

The Northern Crops Institute will lead a collaborative and integrated effort between North Dakota State Universities Grape Germplasm Enhancement Project (GGEP) and the North Central Research Extension Center (NCREC) to evaluate 11,000+ winter-hardy grape accessions, including breeding projects, to grafting and production improvements, to final microvinification (small batch wine) process and tasting evaluations at the NCI. Outcome to include an improved process for selecting and screening cold-hardy grapes for North Dakota and disseminate non-proprietary information to all stakeholders in the expanding grape and wine industry through industry meetings, reports and with the Winery Association of ND (WAND) and the ND Grape and Wine Association (NDGWA).

EVALUATION OF LUPIN ADAPTATION IN NORTH DAKOTA AND SEED QUALITY FOR FOOD INGREDIENTS

NDSU
Blaine Schatz, Carrington

Project Budget: $196,972

The North Dakota State University Carrington Research Extension Center will evaluate a diverse number of lupin selections to determine their adaptation for production in North Dakota and assess their nutritional profile for inclusion in food products. This project will source and assemble a diversity of lupin genetics representing experimental lines and released varieties grown in other parts of the world. Seed quality of the most adapted materials will be evaluated to determine their level of the primary nutritional factors important for lupin as a food ingredient or product and to assess any presence of alkaloids, an antinutritional factor. Multiple food ingredient companies and researchers will be provided with seed samples for evaluations to determine acceptance within their products. Achievement of project objectives will position North Dakota to be in a favorable position to supply the emerging demand for this high-quality plant-based protein.

PROVIDING ACCESS TO SPECIALTY CROPS TO GRADE SCHOOLS IN NORTH DAKOTA

North Dakota Department of Agriculture
Kristine Kostuck, Bismarck

Project Budget: $61,915.88

The North Dakota Department of Agriculture (NDDA) will provide educational resources and grants to grade school classrooms to purchase supplies to grow lettuce, herbs, tomatoes and peppers in their classroom during the school year. The growing of vegetables in the classroom will provide hands on learning to enhance STEM education already being taught.

IMPACTS OF FUNGICIDE APPLICATIONS AND PLANT DISEASES ON SPECIALTY CROP YIELDS AFTER HAIL

NDSU
Samuel Markell, Fargo

Project Budget: $180,342

North Dakota State University plant pathologists will; 1) determine the severity and yield impact of diseases that occur on pinto bean, navy bean, chickpea, dry edible pea and confectionary sunflower following hail, 2) determine the disease severity and yield impact of foliar fungicide and cupric hydroxide applied after hail events, 3) determine the impacts of fungicide applications on plant health, and 4) develop and disseminate management recommendations to growers at meetings, field days and through media.

MINING THE SOIL AND HOST GENETICS FOR SUSTAINABLE ANSWERS TO VERTICILLIUM WILT IN POTATO

NDSU
Julie Pasche, Fargo

Project Budget: $176,720

North Dakota State University plant pathologist and potato breeder, and University of Minnesota potato breeder will improve the management of Verticillium wilt of potato using sustainable methods. Specifically, we will develop, optimize and validate multiplex qPCR methods to quantify Verticillium dahliae and Colletotrichum coccodes from potato stem tissue and soil, and identify genetic regions associated with resistance to V. dahliae in potato breeding germplasm developed for North Dakota growers. This project is somewhat unique in that it will leverage existing genetic and phenotypic data for NDSU breeding lines. These efforts focus on two inter- related, critical and sustainable aspects of Verticillium wilt management and bring together three potato researchers with complementary expertise.

DEFINING OPTIMUM ROW SPACING FOR IMPROVED SIZE PROFILE AND YIELD OF CHIPPING POTATO TUBERS

NDSU
Andrew Robinson, Fargo

Project Budget: $117,444

North Dakota State University will determine the value of narrower row spacing to reduce size profile and improve total marketable yield. Potato chips are most sold in small bags of 0.75 to 1 oz. Because smaller bags are most popular to consumers, chip processors would like to receive smaller sized tubers and will likely mandate a smaller size profile soon. It is unknown though what effect row spacing would have on chipping potato production. Because it is very costly for a commercial potato grower to change equipment for narrower row spacing, a research project should be performed to determine if there is value in narrower row spacing. The purpose of this study is to determine the optimal row spacing of chipping potatoes to improve marketable potatoes.

Trees at Burnt Creek Nursery in Baldwin, ND

INDUCING STERILITY IN ORNAMENTAL WOODY TREES AND SHRUBS

NDSU
Todd West, Fargo

Project Budget: $45,739

Many woody plants are well adapted for the harsh growing environment of North Dakota. Unfortunately, with non-native plants, there is a risk of invasiveness. Examples of this include Siberian elm and common buckthorn. Both plants are well adapted for growing in very difficult places but are highly invasive. This North Dakota State University project proposes to 1. evaluate commercially available sterile ornamental trees and shrubs and 2. induce sterility by developing tetraploids of several different woody trees and shrubs. These tetraploids will be utilized for breeding and inducing sterile cultivars to be used in the ND nursery and landscape trade.

DEVELOP COMPLEMENTARY PULSE PROTEINS FOR IMPROVING NUTRITIONAL QUALITY AND FUNCTIONALITY OF PULSE PROTEINS

NDSU
Jiajia Rao, Fargo

Project Budget: $181,758

North Dakota State University will address the critical needs of pulse proteins to be utilized as “Alt protein” in the food industry, which can directly help increase the market and profitability of pulse production in North Dakota (ND). In North America, positioning a good/excellent source of protein claim in food requires enough “high-quality” protein. The quality of a protein is primarily determined by its amino acid composition and digestibility. Pulse proteins are known to be deficient in certain essential amino acids such as sulfur amino acids or tryptophan. The most promising solution to overcome these deficiencies by combining pulse proteins

with cereal proteins/or another source of plant protein, leading to a complete amino acid profile and overall digestibility and functionality. However, functionality, sensory and flavor profile of pulse protein blends are not explored yet. Therefore, the aim of this study is to investigate the effects of pulse protein and/ or rice, hemp protein blending method, ratio on amino acid profile, in vitro digestibility and physicochemical characteristics of protein mixture.

DETERMINING NITROGEN USE EFFICIENCY OF NEW RUSSET-SKINNED POTATOES

NDSU
Andrew Robinson, Fargo

Project Budget: $134,194

North Dakota State University (NDSU) will determine the response of lower nitrogen rates of newly released potato cultivars or advanced selections from the NDSU potato-breeding program. There is a great push for more sustainable potato production North America from consumers and processors. One way to improve sustainable potato production is to reduce inputs by using new cultivars that have higher nitrogen use efficiency. A reduction of inputs could lessen the production cost and put fewer products into the environment. Exciting cultivars that the NDSU Potato Agronomy program have tested can produce potatoes with less nitrogen than the standard Russet Burbank.

OPTIMIZING FUNGICIDE SPRAY DROPLET SIZE FOR IMPROVED MANAGEMENT OF FOLIAR DISEASES IN FIELD PEAS

NDSU
Michael Wunsch, Carrington

Project Budget: $107,581

The North Dakota State University Carrington Research Extension Center, in cooperation with the NDSU North Central and Langdon Research Extension Centers, will conduct multi-location field trials to develop rigorous disease management recommendations for optimizing fungicide spray droplet size for improved management of Ascochyta blight and powdery mildew in field peas. Field peas, grown for domestic and international consumption and for the non-GMO plant-based fractionated protein market, are an important rotational legume in western and central North Dakota. Powdery mildew and Ascochyta blights are economically important diseases of field peas, impacting both seed yield and seed quality, and fungicides are important tools for their management. Preliminary research indicates that the yield response to fungicide applications in field peas is strongly influenced by the spray droplet size utilized in fungicide applications. This project seeks to establish field studies to develop rigorous recommendations on optimizing fungicide droplet size relative to crop canopy characteristics for improved management of Ascochyta blight and powdery mildew in field peas.

OPTIMIZING FUNGICIDE TANK-MIXES WITH CHLOROTHALONIL FOR IMPROVED MANAGEMENT OF ASCOCHYTA BLIGHT IN CHICKPEAS

NDSU
Michael Wunsch, Carrington

Project Budget: $109,377

The North Dakota State University Carrington Research Extension Center, in collaboration with the NDSU North Central and Williston Research Extension Centers, will conduct field trials and conduct outreach to North Dakota and Montana chickpea producers to improve the management of Ascochyta blight in chickpeas. With the development of resistance to QoI fungicides, Ascochyta blight of chickpeas is managed almost

exclusively with fungicides with DMI (triazole) and/or SDHI modes of action. Neither mode of action provides satisfactory disease control under conditions of high disease pressure, and the reliance on two modes of action is high risk for the development of fungicide resistance. The contact fungicide chlorothalonil represents another mode of action and is registered for use on chickpeas, but it is not used widely due to poor efficacy when applied alone. This project seeks to optimize fungicide application rates in tank-mixes with chlorothalonil, assess whether different brands of chlorothalonil perform equivalently, evaluate which commonly used fungicides benefit from this tank-mix strategy, and identify the spray droplet size that optimizes the performance of the tank-mix.

BOOSTING FIELD PEA PRODUCTION AND INSECT PEST CONTROL: THE ROLE OF ROOT MICROBE DIVERSITY

NDSU
Deirdre Prischmann-Voldseth, Fargo

Project Budget: $99,582

Root microbes are promising tools in the sustainable management of specialty crops that can be manipulated by farmers, although their use is hampered by variable performance and a lack of information of how they function under realistic growing conditions. North Dakota State University will conduct greenhouse and field experiments to determine how manipulating the species diversity of beneficial arbuscular mycorrhizal fungi benefits microbes associated with field pea roots, levels of key phytohormones and nutrients, plant growth, and reduces insect pest densities. NDSU will disseminate results to stakeholders via presentations and published articles.

A haskap berry at the NDSU Carrington Research Extension Center

ASSESSMENT OF IMPROVED HASKAP SELECTIONS FOR NORTH DAKOTA

NDSU
Kathleen Wiederholt, Carrington

Project Budget: $97,369

The North Dakota State University Carrington Research Extension Center will make selections of new Japanese haskaps to identify varieties that are better suited to North Dakota's growing conditions. We will assess the berry cling, ripening time, productivity and fruit quality of new material and plants that were propagated in a previously supported project which will begin to bear fruit in 2022 and 2023. Results will be made available through meetings, field days, publications and web content.

TRANSLATING HIGH- THROUGHPUT PHENOTYPING INTO REALIZED GENETIC GAIN IN PULSE CROPS

NDSU
Nonoy Bandillo, Fargo

Project Budget: $190,453

Collecting useful, accurate, interpretable, and biologically relevant phenotypic data in a resource-efficient manner is a major bottleneck in plant breeding. The phenotyping bottleneck, particularly for capturing under- and over-canopy traits, is a perennial problem for successful evaluation of new breeding lines. The NDSU researchers will pioneer development and utilization of a high-throughput field phenotyping platform for 1) efficient generation of high-quality trait data, 2) speed- up the time-consuming and laborious traditional data gathering, and 3) increase selection accuracy of phenotyping field experiments. We will explore a combination of aerial imaging and under-canopy robot, including development of a machine learning algorithm, for estimation of important agronomic yield-related and adaptation traits. We will focus our efforts on field pea with a current market cap value of $9 billion due to growing plant-based protein market.

WEED CONTROL IN ONION: USING AN INTEGRATED SYSTEM FOR EARLY SEASON CONTROL

NDSU
Harlene Hatterman-Valenti, Fargo

Project Budget: $83,283

North Dakota State University will establish a contractual relationship with the State Department of Agriculture to lead and execute the project. Objectives are to determine appropriate herbicide applications that will keep the field weed-free without onion injury prior to the two-true-leaf stage when several products are available. Field experiments will be in a grower's field and the NDSU Agricultural REC near Oakes, ND. Data from each location will be recorded and analyzed. The findings from this research will be provided at field days, meetings, and will be published nationally and locally online. With demonstration of early season weed control, onion acreage will increase, potentially diversifying a producer's cropping system and increasing the competitiveness and profitability for ND growers.

UNLOCKING BENEFICIAL MICROORGANISMS FOR ENHANCING ADAPTABILITY AND RESILIENCE OF DRY EDIBLE PEA

NDSU
Barney Geddes, Fargo

Project Budget: $199,543

Dry edible pea is a critical specialty crop to agriculture in North Dakota, which ranks top in the US for dry edible pea production. Consumption of pea protein is gaining traction in a growing market driven by products such as the Beyond Meat burger. In North Dakota, key stresses that affect pulse crop production include abiotic stresses like drought and biotic stresses such as root rot. A growing body of evidence suggests that plants can recruit beneficial microbes from the soil to improve their adaptability and resilience to stressful conditions. Researchers from North Dakota State University are working to identify beneficial members of the pea microbiome that become enriched following exposure to biotic and abiotic stresses and applying new innovations towards harnessing them as a tool for sustainable dry edible pea production.

ADDITIONAL ONE-TIME FUNDING

Honey samples at the National Agricultural Genotyping Center

USING HONEY SAMPLES TO MONITOR PATHOGENS AND PARASITES IN NORTH DAKOTA BEEKEEPING OPERATIONS

National Agricultural Genotyping Center
Zachary Bateson, Fargo

Project Budget: $179,861

The National Agricultural Genotyping Center (NAGC) will develop molecular diagnostics for two parasitic protozoans and the Tropilaelaps mite to incorporate into a surveillance program using honey samples from commercial and hobby beekeepers in North Dakota.

INCREASE THE VALUE FOR NORTH DAKOTA POTATOES THROUGH EDUCATION AND ESTABLISHING A NEW BRAND

Northern Plains Potato Growers Association
Ted Kreis, East Grand Forks, MN

Project Budget: $250,000

The Northern Plains Potato Growers Association (NPPGA) will create a branding plan to showcase North Dakota grown potatoes as best-in-class in the market; develop marketing tools directed towards customers, chefs, and consumers to communicate the culinary, sustainability and nutritional value of North Dakota potatoes; and provide tools for educators to use in and out of classrooms to enhance the understanding and challenges of the potato from springtime planting to fall time harvest. The NPPGA represents approximately 225 potato growers throughout the Northern Plains. North Dakota is the 4th largest potato growing state, producing volume in four major potato markets: chip, fresh, seed, and frozen processing. To build a strong future and expand awareness of the potato industry in North Dakota, the NPPGA would like to create a comprehensive brand, marketing and communications plan to build a name for North Dakota grown potatoes. This campaign will be directed toward educators, potato customers, and consumers. By promoting the value and the quality of potatoes grown in North Dakota, processors, buyers, other potato growers, kids, chefs and consumers will create greater demand and increase the value for this specialty crop. NPPGA will contract with an ag-based marketing agency to develop a strategic marketing and communications plan which will

include a new, creative brand with messaging that highlights North Dakota grown potatoes. Specific deliverables will be used to reach audiences which may include video production, digital, website radio, digital advertising, outdoor advertising, events, social media, print media, and/or audio media.

ASSIST GROWER/SHIPPERS PROMOTE AND SELL NORTH DAKOTA GROWN POTATOES AT NATIONAL/INTERNATIONAL TRADE SHOWS

Northern Plains Potato Growers Association
Ted Kreis, East Grand Forks, MN

Project Budget: $144,680

The Northern Plains Potato Growers Association will provide a venue at the Produce Marketing Association Fresh Summit trade shows in October, 2022 and October, 2023 for our fresh potato packing sheds and growers to market and sell Red River Valley Potatoes to grocery chains and foodservice providers nationwide with the end result being to increase the awareness and consumption of North Dakota grown potatoes. The PMA Fresh Summit is the largest gathering of its kind with the main purpose of connecting growers/shippers with wholesale buyers of fruits and vegetables for delivery to retail grocery stores and restaurants. The PMA Fresh Summit is generally attended by over 20,000 people, many who are important decision makers for grocery and restaurant chains. All of the Red River Valley Potato's competitors attend as well, so it is very important that we make a strong showing.

USE GPS, DIGITAL MAPPING AND SPATIAL STATISTICS TO IDENTIFY AND DESCRIBE ANY PREDICTABLE, WITHIN-FIELD DISTRIBUTION OF POTATO VIRUS Y

Regents of the University of Minnesota
Ira MacRae, Minneapolis, MN

Project Budget: $104,807

The University of Minnesota – Northwest Research & Outreach Center will use highly accurate GPS, digital mapping and spatial statistics to identify and describe any predictable, within-field distribution of Potato Virus Y in seed potato fields of North Dakota. These distributions will be used to develop recommendations for targeted application of management tactics (e.g. scouting, rogueing and management inputs) designed to improve the economic and environmental sustainability of North Dakota seed potato production. These recommendations will be disseminated to the North Dakota producers at potato Research Reporting events, field days and other outreach events.

DETERMINING INTERACTION OF NEMATODE AND FUNGAL PATHOGENS FOR CONTROL OF ROOT ROT OF FIELD PEA

NDSU
Guiping Yan, Fargo

Project Budget: $116,120

The Department of Plant Pathology at North Dakota State University will determine the molecular types of pin nematode species widely present in pea fields in North Dakota, develop a new real-time PCR assay for rapid detection and identification of the nematode species, evaluate the effects of co-inoculation of pin nematode and fungal species on root rot, growth and seed weight of field pea, and further compare the effects of infection from both pathogens with the infection of nematode or fungal species alone. Results of the proposed research will improve the pin nematode detection efficiency and capacity in infested fields and help understand whether the interaction between nematode and fungal pathogen causes more severe root rot and more negative impact on growth and yield of field pea and whether the pin nematode plays an

important role in the root rot disease complex. This information is important to help growers perform risk assessment and make proper management decisions for controlling the root rot disease to increase field pea yield and improve the production of field pea.

PULSE GRAIN BIOPROCESSING FOR ENHANCED NUTRITIONAL PROFILES AND FUNCTIONAL PROPERTIES

NDSU
Bincan Chen, Fargo

Project Budget: $193,332

North Dakota State University will develop a green and tunable bioprocess by combining microbial (Aspergillus oryzae and Lactobacillus plantarum) and/or enzymatic conversion to enhance the nutritional and functional properties of pulses. The aim of this project is to tackle the nutritional, sensory, and physiochemical challenges currently faced by using pulse grains (yellow pea, lentil, and chickpea) as functional ingredients in food systems. The release of essential amino acids, soluble proteins, and bioactive compounds by A. oryzae-secreted hydrolases will be assessed. The degradation of anti-nutritional factors by L. plantarum will be evaluated. The synthesis of secondary metabolites particularly aroma and flavor compounds, and the production of "bitter-blocker" compounds by the microorganisms will be determined. Remedy strategies of applying extra commercial enzymes will be developed if the microbial bioprocessing is insufficient. This research will also evaluate the physicochemical properties (i.e. solubility, gelation, foaming, and emulsification) of flours and proteins extracted from bioprocessed pulse grains. The mathematic model will be simulated to optimize the bioprocess and the parameters will be recommended for application in real practices. Performing this research will generate valuable information to promote the utilization of pulse grains in the food industry, as well as assisting in raising consumer's awareness of pulse consumption. The accomplishment of this project will in return increase the profitability and competitiveness of ND pulse growers and promote a healthy local food system. The research findings will be shared with diverse audiences including pulse growers, processors, consumers, industrial professionals through web pages, workshops, publications, and conferences, etc.

Remote-controlled drip irrigation project on the NDSU campus

UTILIZING REMOTE-CONTROLLED IRRIGATION FOR HIGH TUNNEL TOMATO AND PEPPER PRODUCTIONS IN ND

NDSU
Xinhua Jia, Fargo

Project Budget: $122,808

The North Dakota State University (NDSU) if awarded a grant will establish a contractual relationship with the State Department of

Agriculture to lead and execute the vegetable irrigation project. Under a previous specialty crop block grant, NDSU Department of Plant Sciences (PS) and Williston Research Extension Center showed that high tunnels can be used to effectively modify the environment and greatly enhance the growth of warm season high tunnel crops, such as tomatoes, peppers, and cucumbers. Another grant by NDSU Department of Agricultural and Biosystems Engineering (ABEN) showed that tomato and watermelon can be automatically managed by drip irrigation. Combing the findings from the two previous projects, this new project will manage the high tunnel vegetable production via remote-controlled drip irrigation, in contrast to the traditional time-based irrigation, 1-2 times per week depending on plant visible cues or expected hot, dry days. The emphasis is to optimize water usage for the greatest yields and fruit quality of tomato and pepper inside and outside a high tunnel. This project will enhance the competitiveness of tomato and pepper productions through greater capacity of sustainable practices resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources. With the continuation of the NDSU High Tunnel Community of Practice listserv, we will be able to address grower questions and quickly disseminated results to stakeholders; and with grower meetings and field days we will be able to reach new and potential stakeholders.

DIGGING DEEPER IN POTATOES BY DEVELOPING AN ELECTRONIC POTATO PRODUCTION BOOK

NDSU
Andrew Robinson, Fargo

Project Budget: $246,540

North Dakota State University Extension Potato Agronomy program will develop an electronic potato production book complete with photo galleries, videos, research data and other information that will assist potato growers in making quick, critical management decisions. The electronic book will be accessible online with a computer or smart phone. We expect potato growers to be able make more accurate and quicker decisions that will enable them to improve production and profitability. The book will include information on production practices from planting to growing the crop and storage of the potato tubers. We will develop the text, organize previous taken pictures (2D), create 360-degree photos, record educational videos, provide links to previous research articles and Extension articles for specific topics in the book. This will allow potato growers to be able to dig as deep as they desire in a subject and gain the knowledge they need and not have to questionably search the internet. Once this framework is built for the electronic book, we will be able to continue to build upon it with more pictures, videos, and links to articles on specific topics.

FILLING THE PITS CAUSED BY POTATO COMMON SCAB IN NORTH DAKOTA

NDSU
Julie Pasche, Fargo

Project Budget: $223,000

North Dakota State University plant pathologists and extension professionals will partner with a potato common scab expert from USDA-ARS to improve the management of this disease in North Dakota in both the near- and far-term. We will begin by characterizing the North Dakota pathogen population. Understanding the local pathogen population is the first critical step in the development of management strategies. While collecting diseased tubers from grower fields across the state to recover the pathogen, we will rate disease severity and collect soil. This will

Potato scab

allow us to determine if any relationship exists between the soil characteristics and disease severity. Using pathogenic Streptomyces isolates collected from North Dakota, we will evaluate resistance in cultivars commonly grown in North Dakota. In addition, we will evaluate 2,4-D for the management of common scab. This tool has shown some promise, but varying results have been observed across trials. Again, performing these evaluations under our local growing conditions will help us develop answers for local growers. Finally, we will report results from these evaluations to growers so that they can begin using any management strategies we find promising during this work.

PROVIDING FARMERS WITH RESOURCES TO HELP THEIR CUSTOMERS INCREASE CONSUMPTION OF SPECIALTY CROPS

North Dakota Department of Agriculture
Colby Lysne, Bismarck

Project Budget: $365,380.40

The North Dakota Department of Agriculture (NDDA) will create a series of web episodes that show how to cook and preserve specialty crops. The NDDA will create materials targeted to consumers to increase the consumption of specialty crops. The episodes and corresponding recipes will be made available to specialty crop producers.

NEW TECHNOLOGY TO FIGHT AN OLD FOE: CHARACTERIZING RESISTANCE TO POTATO POWDERY SCAB

NDSU
Asunta Thompson, Fargo

Project Budget: $201,619

North Dakota State University potato breeder and plant pathologist, alongside the University of Minnesota potato breeder will improve our understanding of the genetics of resistance to powdery scab of potatoes, with the ultimate goal of developing cultivars resistant to this increasingly important and management-evading pathogen. We propose here to identify powdery scab resistant lines in the North Dakota breeding program. With that, we will identify genes for pathogen resistance for which markers will be developed. These markers will increase the efficiency in selecting for resistance and ultimately speed the breeding process. To do this, we will utilize new sequencing technology proven to be successful in identifying resistance to potato late blight. Stakeholder input and feedback will be used as a valuable resource in conducting these studies.

MARKETING NDSU SELECT TREES AND TREE VALUE EDUCATION

NDSU
Todd West, Fargo

Project Budget: $72,205

Project Partner: North Dakota State University
Several non-commercial release programs have marketing programs to educate the value of the sections for the specific climate and conditions. One such program is Chicagoland Grows; they feature plants that are suited for Chicago planting. I would like to do something similar with the NDSU program called NDSU Select or ND Select which has a dedicated website with detailed information on each release, pictures, and use. There would be labels, point of sale signs, and other materials available for download for any entity that would like to showcase that the specific plant is a NDSU Select plant. Utilizing a marketing program will be evaluated with ND retail garden center/nurseries. This would help with sales across the state and increase revenues. The other part of the proposal is to develop a database/website that has labels and brochures for non-NDSU materials stating what the tree is, the benefits it provides and the value of the tree. Starting in 2017, Minneapolis Dept of City Forestry began placing durable tree labels on newly planted trees. These labels had information on the tree species, what benefits it provides and the value of the tree. This helped with public awareness of the importance of trees and their value. This project proposes the development of an informational website and tree labels to be utilized in community plantings. Both of these marketing/educational opportunities would be positive for the NDNGLA and NDUCFA associations and help with increasing sales and public awareness.

MANAGING SCLEROTINIA HEAD ROT IN CONFECTION SUNFLOWERS WITH BEE-VECTORED CLONOSTACHYS ROSEA AND PARTIALLY RESISTANT HYBRIDS

NDSU
Michael Wunsch, Carrington

Project Budget: $118,483

The North Dakota State University Carrington Research Extension Center, in cooperation with the NDSU Langdon Research Extension Center, will conduct multi-location field trials and outreach to North Dakota and Minnesota sunflower producers to improve the management

A sunflower with head rot being studied at the NDSU Carrington Research Extension Center

of Sclerotinia head rot of confection sunflowers, a sporadic but serious disease for which no management tools are currently available. Field trials will be established to develop rigorous recommendations for the combined deployment of partially resistant hybrids and a novel disease management strategy that has conferred consistent, strong reductions in head rot. In field trials conducted in Carrington and Oakes, the

least susceptible confection hybrid had 30 to 89% lower incidence of Sclerotinia head rot than the most susceptible hybrids under moderate to severe head rot pressure. In field trials conducted in Langdon and Carrington in 2016-2020, the use of bees to inoculate sunflower heads with strain CR7 of the fungal biological control agent Clonostachys rosea conferred 13 to 60 percent reductions in Sclerotinia head rot under moderate to severe disease pressure. This proposal seeks to integrate these management strategies, to determine the spatial distribution of bee hives required to achieve satisfactory control of head rot by quantifying the distance away from bee hives that satisfactory disease control is achieved, and to generate additional data on the relative susceptibility of confection hybrids. The project will contribute to the development of rigorous head rot management recommendations for confection sunflowers. Results will be disseminated at outreach meetings, in trade publications, and with reports published online.

SPECIALTY FRUITS AND VEGETABLES: INCREASING KNOWLEDGE, SKILLS AND CONSUMPTION AMONG YOUTH AND ADULTS

NDSU
Julie Garden-Robinson, Fargo

Project Budget: $81,464

North Dakota State University Extension specialists, faculty and staff from at least 25 counties and external partners will enhance knowledge and safe food handling of specialty fruit and vegetable crops from field to fork. This project addresses three key priorities of the North Dakota Department of Agriculture related to enhancing the competitiveness of specialty crops: 1) enhancing food safety, 2) improving the capacity of all entities in the specialty crop distribution chain to comply with FSMA, etc. and 3) increasing child and adult nutrition knowledge and consumption of specialty crops. The project will create new educational materials related to specialty fruits and vegetables grown in North Dakota targeting both youth and adults. Through the development of materials such as online modules, fact sheets, information releases, presentations, participants will increase their knowledge of specialty crop use. As a result of partnerships with NDSU and Iowa State University faculty and specialists, farmers markets and growers, the project will offer face-to-face workshops, webinars and online module-based training for growers, small food businesses, including topics such as Good Agricultural Practices, FDA acidified food regulations and topics including agricultural water, biological soil amendments, domesticated and wild animals, and worker health and hygiene. The project will increase knowledge and consumption of North Dakota specialty crops through the offering of education for children in 4-H programs and schools, including school gardens, related to North Dakota specialty crops. Knowledge gained and behavior changes will be evaluated through the use of pre/post surveys.

PREDICTING POTATO GROWTH IN THE RED RIVER VALLEY

NDSU
Andrew Robinson, Fargo

Project Budget: $122,384

North Dakota State University will develop potato bulking models and a calculator to help potato growers determine the best time to desiccate vines in preparation for harvest. For decades, chip, fresh and seed potato growers in the Red River Valley have dug multiple 10 feet of row staring about a month or more before harvest to determine when the correct time is to desiccate potato vines. With a predictive model, potato growers could increase returns by saving time to dig and size potato tubers, increase yield by not removing so many tubers from the field

and preserve other plants by not damaging them to walk into the field. We plan to develop predictive models utilizing historical data that will be provided by many potato growers and utilize the North Dakota Agriculture Weather Network history weather data. As a result, we will develop on online model or models (depending on variety or weather conditions) that will utilize information provided by the grower to determine the most likely bulking development of tubers. The objectives of this study are to 1) develop bulking rate models for seed, chip, and fresh potato historical data, 2) create an online model or models that stakeholders can utilize to determine the most likely bulking rate for each field every year, and 3) disseminate this information and train stakeholders at field days, grower meetings, the Valley Potato Grower magazine and on the NDSU/UMN Potato Extension webpage (z.umn.edu/spud).

NEW SLOW DARKENING BEAN SPECIALTY MARKET CLASSES FOR IMPROVED SEED QUALITY AND MARKET EXPANSION

NDSU
Phil McClean, Fargo

Project Budget: $58,828

The North Dakota State University (NDSU) dry bean breeding program successfully developed and released a slow darkening (SD) pinto variety, ND Palomino, which 1) increased the quality and reputation of North Dakota pinto beans, and 2) increased the competitiveness of ND grown beans in both national and international markets. Today, ~35% of the pinto acreage in the state is grown with SD pinto varieties. We propose to extend to introduce the SD trait into cranberry, pink, and light red kidney market classes that are also prone to darkening issues. Attempts to transfer the SD trait into these market classes were unsuccessful. Recent collaborations between the NDSU genomics (McClean) and breeding (Osorno) programs have now defined the genes and implemented the molecular tools necessary to successfully transfer the SD trait. These molecular tools allow us to: i) accurately select appropriate parents for crosses; and ii) track the SD allele during the breeding and selection process. These breeding efforts have just begun, and early generation breeding lines have been developed. This project will allow us to continue the breeding efforts. After the 2-year duration of this project, we anticipate promising SD breeding lines within these market classes will be undergoing early generation field testing for agronomic performance and future release as improved SD varieties.

MANAGING SILVER SCURF BLEMISH FOR IMPROVED MARKETABILITY OF TABLE POTATOES

NDSU
Gary Secor, Fargo

Project Budget: $152,437

Researchers in the Department of Plant Pathology and the Plant Sciences Department at North Dakota State University will conduct research to manage silver scurf blemish disease of red and yellow table potatoes. This will be accomplished by identifying selections from the NDSU potato breeding program with genetic resistance to silver scurf and by testing efficacy of chemical and biological compounds applied as seed treatments and in-furrow treatments at planting. Results of this research will result in improved marketability and profitability for growers due to fewer buyer rejections due to blemishes. Results will be disseminated to growers, potato packers and other stakeholders through meetings, field days and media.

DETECTION OF VIRULIFEROUS STUBBY ROOT NEMATODES IN FIELDS FOR FIELDS FOR MANAGING CORKY RINGSPOT DISEASE OF POTATO

NDSU
Guiping Yan, Fargo

Project Budget: $169,892

The Department of Plant Pathology at North Dakota State University will develop a new real-time PCR assay to detect Tobacco rattle virus (TRV) vectored by stubby root nematodes in infested potato fields, improve the conventional PCR assay to identify TRV in single viruliferous stubby root nematodes, establish a biological system to increase viruliferous nematode populations and then eliminate TRV from the viruliferous nematodes, and apply the PCR assays to test soil samples collected from various fields in North Dakota to validate the assays and determine the viruliferous field stubby root nematode populations. This proposed research will provide useful tools for detecting the virus in stubby root nematodes, manipulating viruliferous and nonviruliferous nematode populations, and identifying fields with or without viruliferous nematodes. This information is important for conducting disease risk assessment and developing an effective field management strategy to control the virus and nematode in potato fields to reduce the losses.

GREEN FOXTAIL SCREENING FOR HERBICIDE RESISTANCE AND TANK MIX ANTAGONISM

NDSU
Brian Jenks, Minot

Project Budget: $66,611

Green foxtail is an annual grass weed that reduces crop yields if not controlled and is known to be resistant to some herbicides. North Dakota State University will screen green foxtail

Brian Jenks explains the green foxtail screening for herbicide resistance project

populations collected from across the state for resistance to commonly used herbicides in small grains and broadleaf crops. In addition, NDSU will evaluate various grass plus broadleaf herbicide tank mixes to determine if one product is reducing the effectiveness of another product (antagonism). The project will help us understand where herbicide resistance is developing and will help determine if tank mix antagonism is another reason green foxtail is not being controlled.

UTILIZING CATERPILLAR TUNNELS TO INCREASE PRODUCTIVITY OF WARM-SEASON VEGETABLES AND SMALL FRUITS

NDSU
Harlene Hatterman-Valenti, Fargo

Project Budget: $106,469

High tunnels effectively extend the growing season, especially in ND where late spring frosts and early fall freezes shorten the growing season. Unfortunately, most high tunnels constructed in ND consist of a single layer of

plastic, which provides poor insulation when drastic temperature changes occur and may tear under windy conditions when compared to double-poly high tunnels. Recent introduction of a smaller and more portable tunnel called a caterpillar tunnel offers similar season extension as a single-poly high tunnel, but for a fraction of the cost. The caterpillar tunnels also come in similar shapes as high tunnels (gothic-arch and half-circle), which need to be tested for ability to withstand the high winds typical for ND. North Dakota State University if awarded this grant will establish an agreement relationship with the State Department of Agriculture to lead and execute the project to utilize low-tech portable caterpillar tunnels to increase productivity of warm-season vegetables and small fruits. NDSU will evaluate the use of caterpillar tunnels for the productivity of two vegetables and two small fruits. The testing strategies will include both shapes to examine environmental differences as well as production differences for local market vegetables and small fruit genotypes. Both vegetables and small fruit that have ripening issues from the short growing season and lower average air temperatures that are typical in North Dakota have been selected for testing. Results will provide weather alteration information that should optimize growth potential of all species tested and may influence winter injury for the perennial small fruit species tested. Critical results will be disseminated through field days, meetings, media, and publications. In addition, a tunnel listserv will be developed to help disseminate results, to address problems/issues that arise, and to initiate dialogue between tunnel growers.

OPTIMIZING FUNGICIDE SPRAY DROPLET SIZE FOR IMPROVED WHITE MOLD MANAGEMENT IN DRY BEANS

NDSU
Michael Wunsch, Carrington

Project Budget: $116,932

The NDSU Carrington Research Extension Center, in collaboration with the NDSU Robert Titus Research Farm in Oakes, will conduct field research to optimize the delivery of fungicides for improved management of white mold in dry beans and will conduct outreach to North Dakota and Minnesota dry bean producers. White mold develops in the interior of the canopy, and fungicide activity is optimized when spray droplets are large enough to have the velocity to penetrate the canopy but still small enough to confer satisfactory coverage. In field testing conducted with fungicides applied at early bloom and 10-14 days later, fine droplets optimized white mold management in pinto, black and navy beans when the canopy was open at the second fungicide application, and medium to coarse droplets were optimal when the canopy was at or near closure at the second fungicide application. In kidney beans, the optimal droplet size differed by market class: coarse droplets (light-red kidneys) and medium to coarse (dark-red kidneys). In these studies, the same droplet size was utilized in both fungicide applications. Dry bean canopy closure and density increase significantly in the 10-14 days between sequential fungicide applications targeting white mold, and this project seeks to quantify the additional gains from spray droplet size that can be realized by calibrating droplet size relative to canopy characteristics at each application. Testing will be conducted on irrigated pinto, kidney, navy, and black beans. Results will be disseminated at grower meetings, posted online, and published in trade magazines and academic journals.

BIODEGRADABLE MULCHES FOR ENVIRONMENTALLY RESPONSIBLE PEST MANAGEMENT IN FRUIT AND VEGETABLE CROPS

NDSU
Greta Gramig, Fargo

Project Budget: $99,483

North Dakota State University will investigate how cellulose-based biodegradable soil-applied mulches, as replacements for widely used plastic or polyethylene mulches, can suppress multiple pests (weeds and insects) in horticultural specialty crop production systems using the transplanted model crops, strawberry and cabbage. The technologies developed by the proposed project are aimed at increasing weed suppression and decreasing insect pest pressure by disrupting pest biology and increasing beneficial natural enemies. These technologies have the potential to improve environmental sustainability and profitability of North Dakota fruit and vegetable production systems. NDSU will disseminate results to stakeholders via grower events (e.g., webinars) and publications (e.g., popular press and scientific articles).

FIELD PEA GENE EXPRESSION RESPONSE TO SALT-AFFECTED SOILS

NDSU
Michael Ostlie, Carrington

Project Budget: $184,047

The North Dakota State University Carrington Research Extension Center and Plant Sciences Department will investigate field pea response to increasing salt concentrations. The resulting gene expression profile will be used in the selection of parents for future crosses to achieve greater salt tolerance in field peas.

EVALUATING MAPLE CUTTING PROPAGATION TO ELIMINATE GRAFTING ISSUES

NDSU
Todd West, Fargo

Project Budget: $68,374

Project Partner: North Dakota State University
The North Dakota State University Woody Plant Improvement Program will evaluate cutting propagation methods for Korean maple (Acer

A graft on a tree

pseudosieboldianum) and hybrids, Miyabe maple (Acer miyabei), Norway maple (Acer platanoides), Purpleblow maple hybrids (Acer platanoides x Acer truncatum) and trifoliate maples (Acer griseum, paperbark maple; Acer mandshuricum, Manchurian maple; Acer triflorum, threeflower maple). This project will focus on best management practices for developing propagation methods utilizing vegetative cuttings to eliminate the need for grafting. Currently, maples are grafted onto seedling rootstocks which is less desirable because of delayed decline and failure as a result of grafting incompatibility or lack of rootstock winter hardiness. Focusing on propagation of these species, will increase availability as well as ensure long-term survival with removing problematic issues relating to grafting. Developing clonal propagation methods will also increase diversity within North Dakota landscapes. Increasing

production numbers of these species will provide increased revenues for North Dakota commercial wholesale and retail nurseries/garden centers. Results will be disseminated to specialty crop beneficiaries through conference presentations, website publications and field days.

AUTOMATED IRRIGATION FOR COMMERCIAL PRODUCTION OF WATERMELON, SQUASH, AND MUSKMELON CULTIVARS IN OAKES

NDSU
Xinhua Jia, Fargo

Project Budget: $104,301

The Department of Agricultural and Biosystems Engineering (ABEN) and Department of Plant Sciences (PS) at North Dakota State University (NDSU) will work with the Oakes Irrigation Research Site (Oakes) to use an automated irrigation system for commercial production of watermelon, squash, and muskmelon near Oakes, ND. A previous project by ABEN demonstrated that clear plastic mulch and drip irrigation produced a higher yield and sugar content for watermelon on a Red River Valley clay soil in Fargo. This new project will add a remote access to the controller so that one can access the controller anywhere and anytime. The irrigation will be managed in four ways, time-based with rain click, 10% management allowable depletion (MAD), 30% MAD, and 60% MAD. The water use efficiency will be estimated for watermelon, squash, and muskmelon in all four irrigation treatments. This research will use the advanced technology to conserve water and reduce environmental impact on weed control. It will also guide the ND farmers to commercially grow the fruits with the highest yield and quality, but with less environmental impact, which is the definition for sustainability. With many melon and squash farmers in the Oakes area and their irrigation traditions, this project will have an immediate impact to the society. Through field days, local farmers' market, irrigation workshops, and professional conferences, our team will disseminate our project results to stakeholders.

EVALUATING THE FEASIBILITY OF GROWING AND CULTIVATING GUAR AND BLACK GRAM IN NORTH DAKOTA

NDSU
Gautam Prasad Pradhan, Williston

Project Budget: $97,002

The North Dakota State University will conduct research on the feasibility of growing and cultivating guar (Cyamopsis tetragonoloba L.) and black gram (Vigna mungo L.) to provide growers new specialty/legume crops that promote agricultural sustainability through increased crop diversification and farm income. Thirty exotic germplasms of guar and black gram that showed adaptation under greenhouse system will be tested under dryland and irrigated field conditions. Feasibility of growing these crops under various conditions will be determined by analyzing data on growth, plant health, yield, and disease incidence. The project activities and outcomes will be disseminated to the stakeholders through presentations at field days, local and regional growers and extension agents' meetings, and national conferences, and by publishing in electronic and paper formats.

INTEGRATED IMPROVEMENT PROCESS OF COLD-HARDY GRAPES; FROM BREEDING, PRODUCTION, TO SENSORY ANALYSIS

NDSU
Harlene Hatterman-Valenti, Fargo

Project Budget: $166,177

North Dakota State University if awarded this grant will establish an agreement relationship with the State Department of Agriculture

Valiant grapes at the NDSU Carrington Research Extension Center

to lead and execute the project to identify grapevines with superior phenolic profiles and examine antioxidant, phenolic, and colorimetric characteristics of seedlings within a breeding population. Grapevines from distinct genotypic backgrounds with unique phenolic profiles form the bulk of lines for cold-hardy wine grape germplasm enhancement. By examining phenolic constituents and colorimetric properties, this research will work towards the identification of grapevine genotypes (parents) with marketable juice and wine color, combined with preferable phenolic profiles that will lead to more stable shelf-life of end-use processed grape products. This research will be shared with grower stakeholders through field days, electronic summaries, and annual meetings; it will be made available through subsequent publications.

EVALUATING BLACK CURRANTS, CANTALOUPES, AND HASKAPS FOR FRUIT COMPOSITION AND SUPERIOR HEALTH ATTRIBUTES IN ND

NDSU

Harlene Hatterman-Valenti, Fargo

Project Budget: $124,857

NDSU Agriculture Experiment Main Station will establish an agreement relationship with the State Department of Agriculture to lead and execute the project to evaluate blackcurrant (Ribes nigrum), cantaloupe (Cucumis melo) and haskaps (Lonicera caerulea) cultivars for fruit yield and quality, fruit composition, and health attributes. Numerous local foods producers in North Dakota wonder what fruit they can grow profitably. Black currants and haskaps are extremely cold-hardy small fruits that have been publicized as super fruits due to their exceptional health benefits. Cantaloupe is an annual vine crop, which has a low concentration of polyphenols, but because of the higher volume consumed, the total amount of polyphenols contributed the average daily diet provides substantial nutrient benefit. In addition, the nutrient diversity of cantaloupe ranks it equal to raspberries and above strawberries and blueberries in the food rating system. Examination of fruit cultivar productivity, quality, and phytonutrient concentrations will help growers select a productive and phytonutrient superior cultivar for ND conditions. Such value-added blackcurrant, cantaloupe, and haskap cultivars will immensely help growers by enhancing the competitiveness of specialty crops through increased sales, increased consumption, and subsequently ensuring higher economic returns to the specialty crop growers of ND. Fruit yield, quality, and phytonutrient composition results will be disseminated to specialty stakeholders through field day presentations and public field tours, local specialty grower meetings and regional conference gatherings.

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