Attachment 1
Task Order #11-340-20

Missouri Soybean Merchandising Council

Research Pre-Proposal

2018

Project Title: **North Missouri Soybean Breeding Program**	
Principal Investigator Name: **Dr. Andrew Scaboo**	
Principal Investigator Title, Employer: **Assistant Research Professor, University of Missouri**	
Mailing Address: **1112 University Avenue**	
City/State/Zip: **Columbia, MO**	
Telephone Number: **(573) 882-3462**	Email Address: **scabooa@missouri.edu**

Co-Investigator Name: **Dr. Pengyin Chen**	
Co-Investigator Title, Employer: **Professor, University of Missouri**	
Co-Investigator Name:	
Co-Investigator Title, Employer:	

New Project_____ Ongoing Project___**X**___ MSMC Project No. **11-340**		
Proposed Funding Start Date: **July 1st, 2019**		Proposed Funding End Date: **June 30th, 2020**
Total Funding Requested: Approved $457,500	Year 1 - **$405,384** (2019/2020)	Year 2 - $ (2020/2021)
Description of Project: ***(Limit to 150 characters. Expanded scope may be included in pre-proposal content.)*** **The goal of this project is to develop soybean varieties for northern Missouri (Maturity Group III and early IV) with improved yield potential, genetic diversity, seed composition, herbicide resistance, and abiotic and biotic stress tolerance**		
List of Project Partners, Institutions, Organizations, Businesses and Agencies: ***(Use additional page if needed.)*** **University Of Missouri**		
Principal Investigator: Andrew Scaboo **November 1st, 2018**		Authorized Organizational Representative: Michelle L. Leaton 10/26/2018
Signature Date		Signature Date

Michelle L. Leaton, Assistant Pre-Award Manager

For assistance, contact Ebby Neuner with the Missouri Soybean Merchandising Council at eneuner@mosoy.org.

MU Project# 00065102

I. Summarize the planned research, education or demonstration project. Include project goals and an overview of the project timeline, as well as potential and actual impacts to Missouri soybean producers.

The objective of this project is to develop commercially competitive conventional and herbicide resistant soybean varieties for northern Missouri. Variety development is focused on maturity group III through early maturity group IV with high yield potential, resistance to major diseases, and improved seed composition. During 2018, we started working with the Liberty Link (LL55) herbicide resistance trait (glufosinate resistance) and Roundup Ready 2 (RR2) technology is focused on high-oleic and low-linolenic variety development. Now and in the future, the northern Missouri breeding program will largely (~75%) focus on conventional germplasm for variety development.

1. Crossing

Approximately 150 crosses with conventional, LL55, and RR2 material were made at the Bay Farm Research Facility in Columbia, MO during the summer of 2018 and the F_1 seeds are currently being harvested. The F_1 seed will be sent to Hawaii for planting during October of 2018 and plants will be harvested during February of 2019. The F_2 seed will be planted in Hawaii in February of 2019 and plants will be harvested during June of 2019. The F_3 plants will be grown in Columbia, MO at the Bay Farm Research Facility during the summer of 2019 and single pods from each plant will be harvested. The F_4 plants will be grown for one generation in Ponce, Puerto Rico to develop progeny rows to be grown on 2020. The majority of crosses during 2018 focused on traits such as genetic yield potential, maturity, genetic diversity, high-oleic acid and low-linolenic acid, and disease (SDS) and nematode resistance. Crosses were also made with the intention to develop value added soybean varieties with unique compositional profiles for seed oil, protein, amino acid, fatty acid, and carbohydrate and oligosaccharide composition, as well as for abiotic stresses including drought resistance. We will also have a crossing block in Hawaii during the spring of 2019 to enable more efficient and timely germplasm and variety development.

2. Progeny Selection

Approximately 20,000 progeny rows will be planted during May/June of 2019 in Columbia, MO or Novelty, MO. These plots will be derived from F_4 plant populations grown in Ponce, Puerto Rico during the 2018/2019 winter season. F_4 plants will be harvested in March/April of 2019 and the $F_{4:5}$ progeny rows will be grown in Columbia, MO or Novelty, MO during the summer of 2019. Plant rows will be selected and harvested in October of 2019.

3. Preliminary Yield Tests

Approximately 1500 conventional and RR2 experimental lines will be planted in four- or two-row yield plots with one replication at 5 locations in Missouri and three locations in Nebraska, Iowa, and Illinois during 2019. Based on yield performance, approximately 100 lines will be selected for advanced yield trials in northern Missouri and surrounding states during 2020. The majority of the lines are early maturity group IV and mid- to late-maturity group III conventional lines.

4. Advanced Yield Tests

Approximately 100 advanced lines with high yield potential and modified protein and oil traits will be planted in four-row yield plots with three replications at 6 locations in Missouri including

Columbia, Novelty, Rock Port, Corning, Albany, and Portageville in May and early June during 2019. Some lines (the MG III material) will also be planted in replicated trials at three locations in Nebraska, Iowa, and Illinois during 2019 and in the USDA northern and southern regional uniform trials planted across the nation during the spring of 2019. Based on yield performance, several lines will be selected for advanced yield trials in northern Missouri and across the nation during 2020 and potentially released as varieties and/or germplasm.

II. Briefly address the need for the project, including an explanation of the specific challenge or commercialization opportunity driving the project. If appropriate, include a brief literature review and citations.

This project addresses the need for a public soybean breeding program at the University of Missouri focused on germplasm and variety development for northern Missouri and nationwide. Not only does the breeding program focus on a current market need in the form of conventional maturity group 3 and early group 4 varieties, but it also works with other public and private soybean research and breeding programs by supplying extremely valuable germplasm for continued profitability and productivity for US and Missouri farmers.

III. Provide a project budget, detailed by project year, including: salaries and wages, fringe benefits, equipment, supplies, travel and other identified expenses. Please note that the principle investigator's salary, indirect costs and student tuition may not be charged to the grant.

The budget listed below is for continuation of MSMC project #11-340, North Missouri Soybean Breeding Program, for the time period July 1st, 2019 – June 30th, 2020.

Table 1. Budget details and breakdown of expenses for Fiscal Year 2020

Expenses	2019/2020
Salary and Wages	$215,000
Fringe Benefits	$78,884
Supplies	$60,000
Equipment Maintenance	$10,000
Travel	$25,000
Greenhouse space rental	$1,500
Land rent	$15,000
Total	**$405,384**

Salary and Wages are needed for 4 full time benefit eligible positions including one assistant research professor ($87,000) to lead operations of the project which includes parental selection for crossing, management of the off-season nursery, yield testing, disease screening, line advancement, etc., and two research specialists ($48,000 and $50,000) and one research technician ($30,000) to carry out the everyday tasks assigned by the assistant research professor and research specialists that include data collection and analyses, seed packaging, plot planting, crossing, plot harvest, plot weed control, seed purification, and breeder seed increases. These positions are essential for field breeding activities and supporting molecular markers and laboratory screening assays.

Fringe Benefits are calculated at 36.69% for full time benefit eligible employees

Supplies include greenhouse supplies, herbicides, fertilizer, insecticides, harvest bags, harvest tags, stakes, planting seed, planter and combine parts and rather expensive chemical reagents to conduct marker assisted breeding, gas chromatography, and high performance liquid chromatography.

Equipment maintenance is for parts and/or labor associated with preventative annual maintenance of all field and lab equipment.

Travel includes travel expenses such as lodging, meals, and transportation for associated faculty, staff, and students to manage plots at off-campus research stations and to present research findings at regional, national, or international meetings and conferences.

Greenhouse rental is to make crosses, pest screenings, growing plants for DNA extraction, and other greenhouse evaluations.

Land rent is for 100 acres of land at $150 per acre.

IV. Identify any individual or entity which may have rights or ownership to the information or processes expected to be developed as a result of this research, education or demonstration project, and explain the extent of those rights or ownership. If this project has been submitted for funding consideration to another source, please disclose that relationship as well.

Material from this project is solely owned by the University of Missouri and MSMC.

V. Briefly describe the uniqueness of this project and identify related work that has been conducted in this area by you or other researchers.

This project supports the only in-state soybean breeding program for northern Missouri. Please see the attached CV for work related to this project that I have been involved with including soybean variety development.

I. Provide a project budget, detailed by project year, including: salaries and wages, fringe benefits, equipment, supplies, travel and other identified expenses. Please note that the principle investigator's salary, indirect costs and student tuition may not be charged to the grant.

The budget listed below is for continuation of MSMC project #11-340, North Missouri Soybean Breeding Program, for the time period July 1st, 2019 – June 30th, 2020.

Table 1. Budget details and breakdown of expenses for Fiscal Year 2020

Expenses	2019/2020
Salary and Wages	$200,000
Fringe Benefits	$73,380
Supplies	$75,120
Equipment Maintenance	$10,000
Travel	$25,000
Greenhouse space rental	$1,500
Land rent	$15,000
Winter Nursery	$57,500
Total	**$457,500**

Salary and Wages are needed for 4 full time benefit eligible positions including one assistant research professor ($87,000) to lead operations of the project which includes parental selection for crossing, management of the off-season nursery, yield testing, disease screening, line advancement, etc., and two research specialists ($40,000 and $43,000) and one research technician ($30,000) to carry out the everyday tasks assigned by the assistant research professor and research specialists that include data collection and analyses, seed packaging, plot planting, crossing, plot harvest, plot weed control, seed purification, and breeder seed increases. These positions are essential for field breeding activities and supporting molecular markers and laboratory screening assays.

Fringe Benefits are calculated at 36.69% for full time benefit eligible employees

Supplies include greenhouse supplies, herbicides, fertilizer, insecticides, harvest bags, harvest tags, stakes, planting seed, planter and combine parts and rather expensive chemical reagents to conduct marker assisted breeding, gas chromatography, and high performance liquid chromatography.

Equipment maintenance is for parts and/or labor associated with preventative annual maintenance of all field and lab equipment.

Travel includes travel expenses such as lodging, meals, and transportation for associated faculty, staff, and students to manage plots at off-campus research stations and to present research findings at regional, national, or international meetings and conferences.

Greenhouse rental is to make crosses, pest screenings, growing plants for DNA extraction, and other greenhouse evaluations.

Land rent is for 100 acres of land at $150 per acre.

Winter Nursery is to pay for services provided by our winter nurseries including Hawaii, Puerto Rico and Costa Rica for advancing soybean populations in our breeding program. The services provided include planting, note taking, and harvesting soybean research experiments. There are also substantial charges for shipping.