Attachment 1
Task Order #07-301-20

Missouri Soybean Merchandising Council
Research Pre-Proposal
October 2018

Project Title: Breeding Productive, Pest Resistant, Conventional and Herbicide Tolerant Group IV and V Soybeans	
Principal Investigator Name: Pengyin Chen	
Principal Investigator Title, Employer: Professor/Soybean Breeder, University of Missouri – Delta Center	
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Telephone Number: 573-379-5431	**Email Address:** Chenpe@missouri.edu

Co-Investigator Name: Andrew Scaboo
Co-Investigator Title, Employer: Assistant Research Professor, University of Missouri
Co-Investigator Name:
Co-Investigator Title, Employer:

New Project _____ **Ongoing Project** _____X___ MSMC Project No.____301_____	
Proposed Project Start Date: April 1, 2019	**Proposed Project End Date:** March 31, 2020
Total Funding Requested: Year 1 - $295,393 (2019/2020) Year 2 - $295,393 (2020/2021) Approved $387,500	
Description of Project: (*Limit to 150 characters)* To develop high-yielding group IV and V soybeans profitable for Missouri farmers and for licensing to other entities for sale in other states	
List of Project Partners, Institutions, Organizations, Businesses and Agencies: None.	
Principal Investigator: Pengyin Chen	**Authorized Organizational Representative:** Michelle L. Leaton, Assistant Pre-Award Manager
Signature: **Date:** November 1, 2018	**Signature** **Date** 10/26/18

MU Project# 00065118

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.

Overall goal:

- The goal of this project is to continue to develop high yielding group IV and V, conventional and herbicide tolerant, pest resistant soybeans providing Missouri farmers choices of profitable, lower cost alternative varieties for their farm operations. Emphasis will be placed on varieties adapted to southern Missouri and the southern USA.

Specific objectives:

- Develop group IV and V conventional and herbicide tolerant (RR1, RR2, and LL), pest resistant soybeans with equal or better yield than popular commercial varieties of similar maturity
- Provide Missouri farmers and seedsmen productive, pest resistant, non-GMO commercial varieties for export and sale in markets where non-GMO soybeans are in demand
- Provide Missouri farmers a choice of conventional and RR1 varieties which will give them more flexibility without intellectual property issues and opportunity to save seed costs
- Provide Missouri farmers royalties or a return on their investment in research from sale of these varieties

Project timeline:

2019- 2020:

- Identify best lines with high yield, diverse pedigree, pest resistance, and stress tolerance to use in crosses to develop new varieties
- Make over 150 crosses among diverse, conventional or herbicide tolerant parents to develop breeding populations with improved yield and pest resistance
- Advance breeding populations for variety development in off-season nurseries in Costa Rica and Puerto Rico
- Grow lines in progeny rows and select lines for yield tests based on agronomic traits
- Yield test and evaluate group IV and V lines for agronomic and disease resistance traits in advanced and preliminary tests in Missouri and other states
- Increase breeder seed of high yielding lines with pest resistance in preparation for release
- Release most promising lines and work with foundation seed program for seed increase and purification

Impacts to Missouri soybean producers:

Breeding high yielding, disease resistant, conventional and herbicide tolerant soybeans will offer growers an array of options to fit their farming operations. Productive, group IV and V herbicide tolerant and conventional soybeans with resistance to major diseases will improve profits for southern Missouri farmers. Because of the continuous funding by MSMC for this project, Seven group IV and V conventional and Roundup Ready varieties have been released in 2016 and 2017. Seed sales of varieties developed from this project is also generating royalty income for MSMC.

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.

Approximately a third of the Missouri soybeans are produced in southern Missouri and are primarily devoted to group IV and V soybean varieties. Herbicide tolerant traits including LL and RR2 Extend are predominant in farmer's fields and other herbicide tolerant traits are on the horizon. Although RR/Extend and LL varieties are predominant in southern Missouri, there is an increased interest in conventional and RR1 soybeans in southern Missouri in which cost of seed is often half of RR/Extend or LL seed. Private companies, from which most of the varieties are derived, commit limited resources to non-GMO, conventional or RR1 soybeans that are off-patent. With potential dicamba drift damage to non-target crop, LL soybean variety would serve an excellent choice for soybean farmers.

No matter the herbicide tolerance, soybean varieties with high yield and good resistance or tolerance to major pests and with lower seed costs are essential to soybean profitability in southeast Missouri. Soybean cyst nematode (SCN), root knot nematode, reniform nematode, frogeye leaf spot, sudden death syndrome (SDS), stem canker, phytophthora root rot and charcoal rot are important diseases in Missouri. Resistant varieties are the most economical means to reduce yield losses to diseases.

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 principal investigator's salary, indirect costs and student tuition may not be charged to the grant.

Budget: $295,393

	2019-20
Salary and Wages*	125,000
Fringe benefit**	45,863
Part time labor	20,000
Fringe benefit	1,530
Supplies	45,000
Variety testing fees	15,000
Land rent	18,000
Travel	25,000
Total	**295,393**

2020/2021
same budget

Budget Justification:

* Salary and wages are for two research associates to lead everyday operations of the project including the field and lab operations required by the project which includes computerized organization of all field plots, plot lay out, planting, harvesting, irrigation, spraying, data collection, crossing, yield testing, disease screening, performing protein and oil analyses and molecular analysis of plants to select for desired traits.

** Fringe Benefits are calculated at 36.69% of salary for research associates and at 7.65% of wages for part-time labor.

Part time labor to help during crucial times during the year- 1500 hours at $13.3 per hour.

Supplies needed include greenhouse supplies, irrigation poly-pipe, herbicides, insecticides, envelopes, harvest bags, harvest tags, stakes, planting seed, and combine, tractor and other equipment parts.

Variety testing fees are to fund testing in states that require a fee to enter soybean variety or disease tests.

Land rent is for 120 acres of land at $150 per acre.

Travel includes trips to plant, harvest, take notes and manage plots, travel to off-season nursery, and meetings to collaborate with other scientists for new ideas and observe Missouri lines being evaluated in other states.

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.

MSMC and MU will have the joint ownership of all the lines developed and released from this project. The released lines will be PVPed and/or patented as appropriate and licensed through exclusive or non-exclusive agreements to private entities for use in commercialization or breeding programs. Royalties from licensing of lines or use of germplasm in breeding or commercial sales will be shared between MSMC and MU based on units of seed sold for planting or volume of production for marketing.

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

The unique features of this project include a multi-line products (conventional, RR1, R2Y, and LL) with wide maturity coverage (early IV to mid V) and multiple disease resistance package. We are in a unique region that connects the North and South and our products can be moved to a wide area from lower mid-west to deep south. In addition, the defense package of our products include three nematodes, five major foliar and root diseases, and salt tolerance. Most other public breeding programs focus only on conventional variety with narrow maturity coverage and fewer defensive traits.

VI. Attach a copy of the brief curriculum vitae or resume for the proposed project's principal investigator

Salary and Wages	$150,405
Fringe Benefits	$ 55,065
Part-time Labor	$ 20,000
Fringe Benefits	$ 1,530
Supplies	$ 45,000
Variety Testing Fees	$ 15,000
Land Rent	$ 18,000
Travel	$ 25,000
Winter Nursery	$ 57,500
Total	**$387,500**

Budget Justification:

Salary and wages are for two research associates to lead everyday operations of the project including the field and lab operations required by the project which includes computerized organization of all field plots, plot lay out, planting, harvesting, irrigation, spraying, data collection, crossing, yield testing, disease screening, performing protein and oil analyses and molecular analysis of plants to select for desired traits.

Fringe Benefits are calculated at 36.61% of salary for research associates and at 7.65% of wages for part-time labor.

Part time labor to help during crucial times during the year- 1500 hours at $13.3 per hour.

Supplies needed include greenhouse supplies, irrigation poly-pipe, herbicides, insecticides, envelopes, harvest bags, harvest tags, stakes, planting seed, and combine, tractor and other equipment parts.

Variety testing fees are to fund testing in states that require a fee to enter soybean variety or disease tests.

Land rent is for 120 acres of land at $150 per acre.

Travel includes trips to plant, harvest, take notes and manage plots, travel to off-season nursery, and meetings to collaborate with other scientists for new ideas and observe Missouri lines being evaluated in other states.

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.