# Table of Contents

## Project Administration and Governance

Advisory Board .............................................................................................................. 8

## Research Related Project Activities

### Objective 3.1 - Agronomic Management

- **Objective 3.1.1 - Yield Tradeoff Leveraging Crop Residue Management and Desiccants** ........................................................................................................................................... 11
- **Objective 3.1.2 - Corn Residue Management** .......................................................................................................................... 11
- **Objective 3.1.3 - Novel Seed Treatment for Improve Pennycress Performance** ........................................................................... 12
  - Ohio State University
- **Objective 3.1.4 - Tools for Integrated Weed Management** ........................................................................................................... 14
  - Minnesota ................................................................................................................. 14
  - Western Illinois University ....................................................................................... 15
- **Objective 3.1.5 - Monitor Soybean Cyst Nematode (Heterodera Glycines, SCN) in the cropping rotation** ................................................................. 16
  - CoverCress ............................................................................................................. 16
  - Illinois State University .......................................................................................... 17
  - Minnesota ............................................................................................................. 17
- **Objective 3.1.6 - Contribute to the identification and development of soybean varieties specifically adapted to pennycress inter-cropping systems** ........................................................................................................... 18
  - USDA-ARS .......................................................................................................... 18
  - University of Wisconsin – Platteville ..................................................................... 19

### Objective 3.2 - Breeding and Genomics – Pennycress Improvement

- Illinois State University ............................................................................................. 23
- University of Minnesota ........................................................................................... 25
- Western Illinois University ....................................................................................... 28
Objective 3.3 - Characterization of Pennycress Ecosystem Services

Illinois State University ........................................................................................................30

Objective 3.4 - Life Cycle Supply Chain Development ..................................................32

EDUCATION, EXTENSION AND OUTREACH ACTIVITIES

Objective 3.5 - Education and Objective 3.6 - Extension and Outreach

Objective 3.5.1 - Create, deploy, and test pennycress modules and exploration for 4-H clubs and other agriculture-related events in areas where pennycress will be launched.

........................................................................................................................................33

Illinois State University ........................................................................................................33
Ohio State University ............................................................................................................33
University of Minnesota .......................................................................................................33

Objective 3.5.1.1..................................................................................................................33

Illinois State University ........................................................................................................33
Ohio State University ............................................................................................................34
University of Minnesota .......................................................................................................34

Objective 3.5.1.2..................................................................................................................34

Illinois State University ........................................................................................................34

Objective 3.5.1.3..................................................................................................................34

Illinois State University ........................................................................................................34

Objective 3.5.1.4..................................................................................................................34

Illinois State University ........................................................................................................34
Ohio State University ............................................................................................................34
University of Minnesota .......................................................................................................34

Objective 3.5.2 - Prepare a bioeconomy workforce by leveraging current pennycress research to develop resources, curriculum, and instruction for high school, community college, undergraduate, and graduate level education

........................................................................................................................................35

Ohio State University ............................................................................................................35
Objective 3.5.2.1
Ohio State University ................................................................. 35
University of Minnesota ............................................................. 35

Objective 3.5.2.2
Ohio State University ................................................................. 35
University of Minnesota ............................................................. 35

Objective 3.5.2.3
Ohio State University ................................................................. 36
University of Minnesota ............................................................. 36

Objective 3.5.2.4
University of Minnesota ............................................................. 36

Objective 3.5.2.5
University of Minnesota ............................................................. 36

Objective 3.5.2.6
Ohio State University ................................................................. 36
University of Minnesota ............................................................. 36

Objective 3.5.3 - Disseminate developed materials to institutions through posting to open forums such as MERLOT and to current and future farmers ................................. 36

Ohio State University ................................................................. 36
University of Minnesota ............................................................. 36

PHOTOS
Photo 1. IPREFER Project Director Win Phippen addresses the August 2019 IPREFER Kickoff Meeting at Illinois State University ................................................................. 6

Photo 2 Attendees at the August 2019 IPREFER Kickoff Meeting, Illinois State University .7

Photo 3. IPREFER Project Announcement at Western Illinois University, Sept. 17, 2019 From Left: WIU Provost Bill Clow; Macomb, IL Mayor Michael J. Inman; Illinois State

Senator Jill Tracey; Martin Abraham, WIU Interim President; Illinois State Representative Norine Hammond; Jack Elfrink, WIU Dean, Business & Technology); Andy Baker, WIU Director, School of Agriculture (Credit: Western Illinois University).................................7

Photo 4. Advisory Board member Steve Csonka addresses the August 2019 IPREFER Kickoff Meeting at Illinois State University .................................................................8

Photo 5. Rep. Darin LaHood (IL 18) WIU Interim President Martin and IPREFER Project Director discuss pennycress’ commercial potential .........................................................9

Photo 6. Rep. LaHood (IL 18) is eager to discuss what IPREFER can bring to the District ..10

Photo 7: Samples of biodiesel made from different feedstocks ........................................22

Photo 8. Students from UW-Platteville Sustainability and Renewable Energy Systems program on a tour at Western Dubuque Biodiesel LLC with Tom Brooks, GM.................22

Photo 9. Students from UW-Platteville Sustainability and Renewable Energy Systems program on a tour at Western Dubuque Biodiesel LLC.......................................................23

Photo 9. Students from UW-Platteville Sustainability and Renewable Energy Systems program on a tour at Western Dubuque Biodiesel LLC.......................................................23

EXHIBITS

Exhibit A. IPREFER Project Roster

Exhibit B. Kickoff Meeting Materials

Exhibit C. IPREFER Announcement Press Releases (Western Illinois University and Illinois University State University)

Exhibit D. IPREFER Program Policies
Integrated Pennycress Research Enabling Farm and Energy Resilience (AFRI-CAP 2019-69012-29851)

Quarterly Report: August 1, 2019 – October 31, 2019

PROJECT ADMINISTRATION AND GOVERNANCE

To get the project off to an effective start, the IPREFER Project Director Win Phippen and the Executive Leadership Team (ELT) scheduled a significant amount of “project management” tasks to be accomplished in the first quarter.¹

1. Planned Activities

The following activities were scheduled to be accomplished during the first quarter:

- Hold an All Hands Kickoff Meeting (“First Annual Meeting”) with all project partners.
- Hire a program manager.
- Hold a formal award announcement at Western Illinois University.
- Establish a project website.
- Initiate sub-award agreements and Material Transfer Agreements (MTAs) with all collaborating partners.
- Establish a project Advisory Board
- Establish IPREFER policies including codes of conduct.
- Conduct weekly meetings with Program Manager.
- Initiate social media and create a website media kit.

2. Actual Accomplishments

We also accomplished the following project governance and administrative tasks.

---

¹ The initial Executive Leadership Team is made up of Project Director Win Phippen and co-project directors David Marks (University of Minnesota), John Sedbrook (Illinois State University) and Scott Wells (University of Minnesota). See Exhibit A for additional information on project participants.
• First annual meeting (“All Hands Kick-off Meeting”) was held in Normal, IL hosted by Illinois State University (ISU) on August 11-13, 2019. (See Exhibit B).

• Program Manager Anne Kinzel, formerly of the CenUSA Bioenergy CAP was hired and a weekly meeting schedule between Project Director Phippen and Kinzel was established.

• Project Award was announced publicly at a large press conference on September 17, 2019 at Western Illinois University (See Exhibit C).

• Program website and logo was created: www.IPREFEERCAP.org A project website and logo were created (See https://www.iprefercap.org).

• All sub-award agreements with collaborating partners are complete except USDA-ARS MN who elected to start later due to federal fiscal year.

• Established a project Advisory Board (See below).

• IPREFER policies including codes of conduct been established and will continue to be developed as issues arise (See Exhibit D).

• Created an IPREFER Twitter account (@IPREFER_CAP) and a project media kit (https://www.iprefercap.org/news-events/media-kit/).

Photo 1. IPREFER Project Director Win Phippen addresses the August 2019 IPREFER Kickoff Meeting at Illinois State University

Photo 2. Attendees at the August 2019 IPREFER Kickoff Meeting at Illinois State University

Photo 3. IPREFER Project Announcement at Western Illinois University, Sept. 17, 2019 From Left: WIU Provost Bill Clow; Macomb, IL Mayor Michael J. Inman; Illinois State Senator Jill Tracey; Martin Abraham, WIU Interim President; Illinois State Representative Norine Hammond; Jack Elfrink, WIU Dean, Business & Technology; Andy Baker, WIU Director, School of Agriculture (Credit: Western Illinois University)
3. Advisory Board

• **Advisory Board.** The initial Advisory Board has been established to provide guidance and suggestions to the Project Director and the Executive Leadership Team for improving program effectiveness and impact with pennycress producers and end users. The initial Advisory Board has four members with an additional Northern Producer to be added shortly. We believe we will be adding additional Advisory Board members in the second quarter (Nov. 1, 2019 – Jan. 1, 2020).

The initial Advisory Board members are:

- **Steve Csonka.** Csonka is the Executive Director of the Commercial Aviation Alternative Fuels Initiative (CAAFI) where he leads this public/private consortium working toward the development, introduction and wide-spread commercialization of sustainable aviation fuels (SAF) for the entire aviation enterprise. With over 27 years of broad airline and aviation OEM experience prior to taking the helm of CAAFI in 2012, Csonka is a strong industry advocate who seeks pragmatic solutions to the challenges of aviation growth – resulting in his current focus on SAF as the leading technology to allow for the near-term decoupling of carbon growth from operational growth.

- **Gary Haer.** Gary Haer is the Vice President of Sales and Marketing at the Renewable Energy Group (REG) and is past-Chairman of the National Biodiesel
Board. As Vice President, Sales and Marketing, Haer is responsible for developing, implementing and maintaining effective and profitable biodiesel sales and customer service with biodiesel customers, distributors and manufacturers. Haer earned his bachelor’s degree from Northwest Missouri State University and an MBA from Baker University.

- **Jerry Steiner.** Jerry Steiner has been CEO of CoverCress Inc since early 2015. Prior to CoverCress, Steiner was EVP for Monsanto, focused on Global Corporate Affairs including government industry and public affairs sustainability and new business models for soybeans. He spent 30 years at Monsanto and two years with the genomics startup Celera. Jerry served on the boards of numerous industry organizations including BIO and was a founder of various agricultural sustainability initiatives such as *Field to Market*. Jerry grew up on a Wisconsin farm, received BS in Ag Economics from the University of Wisconsin and an MBA from Washington University in St Louis.

- **Alan Weber.** Alan Weber is a founding partner of MARC-IV, a consulting company that fosters the development of bio-based innovations that benefit agricultural and enhance our environment. Active with biodiesel commercialization since 1991, Weber assisted with the establishment of the National Biodiesel Board’s (NBB) Washington, DC office (2006-07) and continues to provide economic and technical support to their efforts. He was appointed by the U.S. Secretaries of Agriculture and Energy to serve on the Biomass Research & Development Initiative Technical Advisory Committee in 2012. Weber also operates and manages his family’s farm in central Missouri.

*Photo 5. Rep. Darin LaHood (IL 18) WIU Interim President Martin and IPREFER Project Director discuss pennycress’ commercial potential. (Credit: Western Illinois University)*
• **Congressional Visit.** Rep. Darin LaHood (U.S. House District IL 18) visited WIU on October 11, 2019 to learn more about how federal funding was being spent at WIU. During his visit he met with IPREFER Project Director Win Phippen. Rep. LaHood is especially interested in the commercial roll out of pennycress as a cash cover crop.

4. **Explanation of Variance**

   Our initial project budget included a cooperate partner to begin supply chain issues and seed crushing. Unfortunately, at the initiation of our project, the partners identified a need to address the concern regarding pennycress as a host for Soybean Cyst Nematodes (SCN) and water quality addressing nitrogen run-off which was not included in the original proposal. To address this concern, the project director has elected to redirect funds from the cooperate partner in YR1 and YR2 to support research efforts by ISU and CoverCress on SCN and water quality.

5. **Plans for Next Quarter**

   • Continue building content for the IPREFER website.

   • We will continue the Advisory Board quarterly meetings, the monthly Executive Leadership Team meetings and the weekly program manager meetings between Project Director Win Phippen and Program Manager Anne Kinzel.
OBJECTIVE 3.1 - AGRONOMIC MANAGEMENT

1. Objective 3.1.1 - Yield Tradeoff Leveraging CRM and Desiccants

Recent work suggests that corn grain yield and grain moisture at harvest are increased by 88 kg ha\(^{-1}\) (1.4 bu ac\(^{-1}\)) and 0.5% respectively, per one-day increase in corn relative maturity (CRM) [26]. Although early-maturing corn hybrids have lower yield potential than full-season counterparts, they can be harvested earlier (e.g., late August). Application of desiccants can further shorten the time for corn to reach harvestability. The team will assess corn and pennycress yield trade-offs through evaluating a range of corn CRM by assessing varieties differing in relative maturity in Ohio, Minnesota, and Illinois during Project Years 1 – 3.

A. Planned Activities

No activities were planned for this first quarter.

B. Actual Accomplishments

Land for next spring corn deployment is identified at RROC and USDA-ARS in MN.

C. Explanation of Variance

Our pilot data suggest that desiccation timings should be reduced to black layer only. Otherwise there is nothing to report.

D. Plans for Next Quarter

CRM project will be deployed spring of 2020. The team will meet over the winter to lock in corn CRM and Minnesota will source the corn for all locations.

E. Publications, Presentations, and Proposals Submitted

None at this time.

2. Objective 3.1.2 - Corn Residue Management (DISC)

\[\text{DISC is the abbreviation we will use for the IPREFER corn stover management project. This IPREFER objective is led by Nicholas Heller at the University of Minnesota.}\]
An increasing number of farms are now practicing no-till and other conservation tillage farming due to ecological and economic benefits. Establishing pennycress in no-till fields is a struggle, largely due to the sheer amount of corn residue remaining after harvest. Several corn residue treatments will test the hypothesis that the residue can be sized small enough to not interfere with pennycress establishment. Pennycress establishment and subsequent seed yield in high-residue environments will be compared to reduced-surface stover treatments where its production has been proven to be successful (e.g., silage corn removal and prepared seedbeds).

A. Planned Activities

The DISC project will be deployed spring 2020.

B. Actual Accomplishments

Land for next spring’s DISC deployment has been identified at RROC and USDA-ARS in MN. We will meet over the winter and review the pilot data.

C. Explanation of Variance

Based on the delay in receiving funding and two pilot projects in the works the team decided to deploy the DISC project across the region spring 2020. In addition, the team will review the pilot data this winter and refine treatments if needed.

D. Plans for Next Quarter

We will meet over the winter and review pilot data. We will use data to suggest improvements to the DISC study.

E. Publications, Presentations and Proposals Submitted

Nothing to report.

3. Objective 3.1.3 - Novel Seed Treatment for Improve Pennycress Performance ("PELLET")

The use of seed coating and fungicide treatments in concert with the aforementioned strategies may improve establishment, especially if planted in fall when rain can be sporadic. In other species like Brassica juncea, hydro-priming (controlled pre-planting hydration)

---

4 “PELLET” is the abbreviation we will use for the “Novel Seed Treatment for Improve Pennycress Performance part of the project. This IPREFER objective is led by Alex Lindsey at Ohio State University.
improves germination even in water-stressed environments. Another issue that may impact pennycress production is crown disease. Deterioration of the crown may impact maturation, induce lodging, and hamper mechanical harvest. Preventing infection of a pathogen causing crown rot or other seedling pathogens in the fall through use of seed treatment may improve establishment, crown integrity, and minimize losses at harvest due to lodging. A field trial will be established in Ohio, Illinois, and Minnesota to determine the impact of seed treatments on fall establishment, spring crown integrity, and lodging.

A. Planned Activities (Ohio State University)

The PELLET project will be deployed fall 2020. Initial activities include:

- Secure Material Transfer Agreement (MTA) for research activities.
- Begin conversation with Germains regarding seed treatment activities.
- Obtain necessary equipment to facilitate research activities.
- Recruit a graduate student for work on the project.
- Establish field research trials in Hoytville, OH.

B. Actual Accomplishments

- The MTA agreement has been sent to OSU Technology Commercialization Office. Discussions have begun for approval.
- A seed treatment questionnaire was sent to Germains related to seed priming, dormancy, and treatment interest. Dale Krolikowski said this would be discussed at their planning meeting at the end of October 2019.
- A program truck has been ordered to transport Interseeder.
- Graduate student Nasib Koirala was recruited and will begin IPREFER work in Summer 2020.
- Established a variety trial September 10, 2019 at the Northwest Agricultural Research Station in Hoytville, OH.
- Discovered *Thlaspi arvense* is still listed on the Ohio Restricted Seed list. We contacted the Ohio Seed Improvement Association secretary for advice on the issue.

C. Explanation of Variance

The agronomic field trial establishment was delayed until Fall 2020 due to the logistical issues of starting these trials in Fall 2019.

D. Plans for Next Quarter

- Obtain research trial space for Fall 2020 season.
- Begin conversation with Germains regarding seed treatment activities.
- Initiate contact with Ohio Department of Agriculture regarding *Thlaspi arvense* (field pennycress) status on Ohio Restricted Seed list.
- Obtain a finalized MTA.
- Collect field research notes on the variety trial established in Q1.

E. Publications, Presentations and Proposals Submitted

Nothing to report.

4. Objective 3.1.4 - Tools for Integrated Weed Management ("WEEDS")\(^5\)

Where herbicides are used as the primary weed management tool, there will be herbicide residues in the soil that may impact the successful establishment of pennycress similar to the impact that herbicide residues may have on the establishment of more traditional winter cover crops. We will evaluate commercial pennycress varieties for their tolerance to likely concentrations of common corn herbicides that will be found in the soils of pennycress fields. Identifying herbicides to which pennycress is less sensitive will allow us to develop herbicide recommendations for the preceding crop that will decrease the likelihood of pennycress injury or death during its establishment. We will test the effects of common corn herbicides used to control summer annual weeds and quantify pennycress population density and biomass in the fall, survival of plants the following spring and pennycress seed yield.

**Minnesota**

A. Planned Activities

Nothing to report.

---

\(^5\) “WEEDS” is the abbreviation we will use for the “Tools for Integrated Weed Management” work. This IPREFER objective is led by Mark Bernards at Western Illinois State University.
B. Actual Accomplishments

Nothing to report.

C. Explanation of Variance

Nothing to report.

D. Plans for Next Quarter

We will start greenhouse screening in January 2020. In the greenhouse screening we will use a simulated half-life dose-response experiment on residual herbicides commonly used in corn and soybean to estimate the period of time between herbicide application and a planting date when pennycress will be minimally affected by herbicide residues. Pennycress will be planted in field soil in pots, followed immediately by treatment with herbicide and incorporation of herbicide with water. Pennycress response will be evaluated 7, 14, and 21 days after emergence for % emergence and plant injury. This will provide data to design targeted field experiments with the most injurious herbicides.

E. Publications, Presentations and Proposals Submitted

Nothing to report.

Western Illinois University

A. Planned Activities

We will begin greenhouse screening in January 2020.

B. Actual Accomplishments

Identified student worker for the project.

C. Explanation of Variance

Poor spring weather set all planned fall activities behind.

D. Plans for Next Quarter

We will begin designing greenhouse studies.
5. Objective 3.1.5 - Monitor Soybean Cyst Nematode (*Heterodera Glycines*, SCN) in the cropping rotation (SCN)

Pennycress has been reported to be a poor to moderate host for SCN in greenhouse studies. Research is underway to determine its impact on SCN populations under field conditions in the corn-soybean production systems. Preliminary results indicate that there was no increase of SCN population density in pennycress as compared with no cover crop treatment. It is possible that pennycress as a winter cover crop does not support SCN reproduction, or it may even function as a trap crop during the cool season. Currently funded research is investigating the ability of SCN to infect pennycress in the field and is evaluating the role of temperature in SCN reproduction. Field-scale and microplot experiments are being conducted to evaluate the reproduction and life cycle development of SCN in the fall and spring months. Pennycress’ role as a trap crop or alternate host will be discovered through these experiments.

**CoverCress**

A. Planned Activities

CoverCress had the plan to SCN egg sample seven of our yield testing locations. Our protocol for sampling is attached along with a location map.

B. Actual Accomplishments

- The SCN planting date screen was deployed at Southwestern Research and Outreach Center in Waseca, Minnesota and in Illinois.
- Soybean samples taken and submitted for testing.
- A field experiment was established in the fall of 2019 at Waseca, Minnesota to evaluate SCN reproduction in the field on pennycress.
- Collaborators are sampling fields in the fall of 2019 to identify potential field sites for the studies intended for 2020.

---

6 “SCN” the abbreviation we will use for the “Monitor Soybean Cyst Nematode (*Heterodera Glycines*, SCN) in the cropping rotation work.” This IPREFER objective is led by Senyu Chen and Cody Hoerning at the University of Minnesota.
• We were able to sample all seven of the intended locations. Only one site really had elevated levels of egg counts. A summary of our counts and the lab results are attached.

C. Explanation of Variance

Nothing to report.

D. Plans for Next Quarter

Two planting date treatments (September 15 and October 15) and a control will be assessed. Soil sampling at planting in each of the plots has already occurred. One more soil sampling collection will take place on or before November 15, 2019.

E. Publications, Presentations and Proposals Submitted

Nothing to report.

Illinois State University

Actual Accomplishments. Dr. Rhykerd and Dr. Perry sampled soil at ISU Research Farm (Lexington, IL) for this study. Data was shared with the team.

Minnesota

A. Planned Activities

SCN projects were slated to roll out this fall.

SCN Projects were slated to roll on in the fall of 2019. The collaborating teams at CoverCress and Illinois Western University are sampling fields this fall (2019) to check for viability of implementing the study at these locations next year. The supplemental funding needed to complete this project is being applied for through Minnesota Forever Green Funds. This funding is due October 25th, 2019 with a funding decision expected by January 1st, 2020.

B. Actual Accomplishments

The SCN planting date screen was deployed at Southwestern Research and Outreach Center in Waseca, MN, and in Illinois.

C. Explanation of Variance

None noted.
D. Plans for Next Quarter

A multi-state field experiment has been proposed to begin in 2020 to assess SCN reproduction on pennycress throughout the intended Midwest growing area. The experiment (four sites in total) will take place at two sites in Minnesota and two sites in Illinois. Potential collaborators have been contacted for this work. The logistics of the exact site locations are still being planned.

E. Publications, Presentations and Proposals Submitted

Nothing to report.

6. Objective 3.1.6 - Contribute to the identification and development of soybean varieties specifically adapted to pennycress inter-cropping systems (SELECT)\(^7\)

Minimizing yield trade-offs between pennycress and soybean in a relay cropping system is paramount. Recent research detected sizeable differences in light transmittance-related properties between pennycress crop canopies. This indicates that both canopies represent different stress environments for the relay-planted soybean, potentially requiring different soybean cultivars to be relay-planted. Further, the good performance of the relay-planted soybean cultivars suggests a stronger competitive ability that might decrease the yield potential of the cover crop. Taken together, those findings highlight the possibility to optimize the cover crop-cash crop associations by identifying summer crop-cover crop cultivar combinations that maximize yields. To address the yield gap, a soybean selection (i.e., SELECT) was initiated fall of 2019 with the bulk planting of pennycress ‘MN106’. A large number of soybean cultivars are slated for relay cropping into the pennycress spring of 2020 with the expressed goal of revealing large variations in soybean yield response to relay-planting. A large number of cultivars will therefore increase chances to identify uniquely superior cultivars. In addition, such group size will maximize the chances of identifying superior cultivars.

USDA-ARS

This is a new project that replaces the soybean management project. The project rolls out this fall.

A. Planned Activities

\(^7\) This IPREFER Objective will be referred to as the “SELECT” Objective. The Northern SELECT Objective is led by Aaron Lorenz.
An area at the Swan Lake Research Farm in Morris, MN has been designated as a site for this study. Pennycress (MN106-nonshattering) was planted in September 2019 with a non-till Interseeder employing 30" skip rows. Enough area was seeded for four replications of treatments.

B. Actual Accomplishments

A low shatter line of MNxxx was planted at RROC and USDA-ARS. A no-till skip-row drill was used. Pennycress was planted into wheat stubble.

A large plot was planted with MN106-nonshatter pennycress on September 19, 2019 at the USDA-ARS Research Farm. Seeds were sown with a no-till Interseeder drill with skip rows on 30” spacing.

C. Explanation of Variance

Nothing to report.

D. Plans for Next Quarter

We will meet over the winter to determine selection panel.

E. Publications, Presentations, and Proposals Submitted


University of Wisconsin – Platteville (UWP)

Project Management

A. Planned Activities

- Connect with growers and processes in Wisconsin and Iowa
• Establish connection with local media outlets to disseminate press releases about pennycress research.

B. Actual Accomplishments

• We identified two large scale farmers willing to trail pennycress in future years.
• We met with a biodiesel processor in Dubuque, Iowa.
• Three press releases went out to the public, one through a local news source in Platteville, WI, and the other two from the UWP media services.

C. Explanation of Variance

Through the press releases, two local farmers have made contact with our team and are willing to conduct large scale grow outs in the following years. The biodiesel processor had an interest in working with pennycress. However, pennycress would have to be pressed and flirted before it could be received by the processor.

D. Plans for Next Quarter

• Apply for two grants to help further fund pennycress work in Wisconsin.
• Contribute content to the IPREFER website in the form of an informational video on how to produce biodiesel from pennycress.

E. Publications, Presentations and Proposals Submitted

None at this time.

Research Activities

A. Planned Activities

• Establish research plots in Lancaster, WI for multi-state variety trials.
• Establish research plots in Madison, WI for variety trials at three planting dates.
• Collect germination and stand establishment data on all research plots.
• Find two students to sponsor for undergraduate student research projects.

B. Actual Accomplishments
• We planted UWP research plots in Lancaster, WI, for multi-state variety on September 6, 2019. Three replicated variety trials with ten varieties.

• UWP research plots were planted in Madison, WI, for a planting date trail with ten varieties replicated three times per planting date. Planting dates were September 7, 2019, September 21, 2019, and October 5, 2019.

• We hired two students to participate in a year-long undergraduate research project.

• Data was collected after the first frost on all research sites at Lancaster, WI and Madison, WI.

C. Explanation of Variance

All research objectives for the quarter were fulfilled.

D. Plans for Next Quarter

Train undergraduate research students to analyze collected data.

E. Publications, Presentations and Proposals Submitted

None at this time.

Education Activities

A. Planned Activities

Develop a two-week pennycress module to be taught in a 4000 level biofuels class.

B. Actual Accomplishments

Two-week pennycress model was delivered to a class of 11 undergraduate students.

C. Explanation of Variance

All education objectives were fulfilled.

D. Plans for Next Quarter

Train undergraduate research students to analyze collected data.

E. Publications, Presentations and Proposals Submitted
A two-week module was created to educate undergraduate students about pennycress and biodiesel in a 4000-level Biofuels class taught at UWP. The class module ran from November 11, 2019- December 3, 2019. 11 students were enrolled in the class. A field trip to a biodiesel processor was also included in the class that took place on November 25, 2019.

Photo 7. Samples of biodiesel made from different feedstocks (Credit: Pamela Tas)

Photo 8. Students from UW-Platteville Sustainability and Renewable Energy Systems program on a tour at Western Dubuque Biodiesel LLC with Tom Brooks, General Manager. (Credit: Pamela Tas)
Photo 9. Students from UW-Platteville Sustainability and Renewable Energy Systems program on a tour at Western Dubuque Biodiesel LLC. (Credit: Pamela Tas)

Photo 10. Students from UW-Platteville Sustainability and Renewable Energy Systems program examine biodiesels made from different feedstocks. (Credit: Pamela Tas)

**OBJECTIVE 3.2 - BREEDING AND GENOMICS – PENNYCRESS IMPROVEMENT**

1. **Illinois State University**

   A. Planned Activities
Our research teams have generated high-yielding pennycress breeding lines through multi-state testing and identified/validated trait-improving mutations and natural variants. We will:

- Utilize marker-assisted selection and CRISPR gene editing to complete introgression of these traits into elite breeding lines.

- Extend our replicated yield testing program to a cooperative regional program and rapidly identify the best lines for each Midwest location (IL, MN, OH, WI) in conjunction with a commercial launch.

- Perform field evaluations and seed increases of lines with commercial potential.

- Develop additional genetic/genomic resources for long-term breeding programs success.

**B. Actual Accomplishments**

- We are in the process of stacking into top breeding lines, via CRISPR gene editing, mutations in various combinations that improve the three core traits necessary for pennycress commercialization, namely low seed oil erucic acid, reduced glucosinolate, and low fiber. Field testing of transgene-free lines, confirmed by the USDA APHIS as not being regulated, has shown combined reduced erucic acid/reduced fiber lines grow and yield indistinguishably from wild type. Field testing of CRISPR-generated low glucosinolate lines will soon be underway.

- Reduced pod shatter is also an important trait to reduce pre-harvest seed loss. To date, knock-out lines affecting various pod shatter-related genes have either reduced shatter too much such that the seeds are not readily extractable during combining, or not enough. For genes where knockout produces too severe of a reduced pod shatter phenotype, we have generated CRISPR constructs to delete portions of the genes’ promoters with the goal of generating partial loss of function lines. We have also introduced rescue constructs into knockout lines; while we anticipate we will identify partial rescue at preferred levels, there may be regulatory hurdles in field testing these since the rescue lines will be transgenic. The above-mentioned lines are in various stages of development/evaluation.

- Strip plots were planted by Project Director Win Phippen at the ISU Horticulture farm. The planting was attended by about 20 students from collaborator Nicholas Heller’s undergraduate plant breeding and genetics course.
• A 50-foot-long, five-foot-wide strip of low erucic/low fiber seeds were planted at ISU for seed bulking for downstream analyses including possible feeding trials.

C. Explanation of Variance

The ISU plots were planted later than we would have liked (October 7, 2019), as the corn harvest was late due to a very wet spring and late corn planting. Time will tell as to how well the plots establish.

D. Plans for Next Quarter

We will continue moving forward the projects as stated above.

E. Publications, Presentations and Proposals Submitted

• Publications


• Professional Conferences and Meetings


• Proposals

None to report.

2. University of Minnesota

A. Planned Activities
Our research teams have generated high-yielding pennycress breeding lines through multi-state testing and identified/validated trait-improving mutations and natural variants. We will:

- Utilize marker-assisted selection and CRISPR gene editing to complete introgression of these traits into elite breeding lines.
- Extend our replicated yield testing program to a cooperative regional program and rapidly identify the best lines for each Midwest location (IL, MN, OH, WI) in conjunction with commercial launch.
- Perform field evaluations and seed increases of lines with commercial potential.
- Develop additional genetic/genomic resources for long-term breeding programs success.

B. Actual Accomplishments

- We are in the process of stacking alleles into MN106 and two elite breeding lines using allele-specific markers (KASP). We are focusing on the traits that will improve the oil quality (reduced glucosinolates and reduced poly-unsaturated fatty acids), reduce glucosinolate levels in the seeds, reduce seed pod shatter, mature early and low fiber in the seeds. We already have several combinations of alleles stacked in MN106. Field testing is on-going for the lines that have combined alleles of reduced erucic acid/reduced glucosinolate/reduced shatter. These lines grew indistinguishably from wild type in Fall 2019. Additionally, lines that have combined alleles of erucic acid/reduced glucosinolate/reduced shatter/early maturity in MN106 background are being increased in the chamber/greenhouse. Most of the alleles have been crossed at least once in each of the top breeding lines and progenies are being grown in the chamber to select for BC$_2$F$_1$s.

- The 2019-2020 variety strip trial was planted in Rosemount and Morris, MN on September 19, 2019 and September 25, 2019 respectively. Emergence and uniformity data were scored in both locations and rosette width and leaf count data were collected in Rosemount only.

- We planted EMS treated plants in the field on September 15, 2019. A total 300 M$_1$ plants were transplanted into greenhouse. These will be propagated to the next generation and subject to whole-genome re-sequencing. We expect with 75% survival rates, we should be able to harvest at least 225 M$_2$ families. We should be able to
harvest additional 1,000 individual M1 plants in 2020 to support the gene mutation index project.

- We have selected 120 M2 individual plants from 2018 EMS treated M1 plants and were subject to resequencing. Sequence analysis is in progress for these and preliminary data suggests that we have achieved 3.9 mutations per Mb using 0.2% EMS concentration.

**C. Explanation of Variance**

Emergence in the Morris variety trial plots were spotty due to late planting, low seeding rates and cold weather after planting. We will continue to evaluate these plots for additional emergence in Spring 2020.

**D. Plans for Next Quarter**

We will continue moving forward the projects as stated above.

**E. Publications, Presentations and Proposals Submitted**

- **Publications**
  

- **Professional Conferences and Meetings**


• Proposals
  
  Two proposals were submitted to UMN-Forever Green Initiative to support the breeding program and evaluation of SCN susceptibility across different growing regions ($350,000 each).

  A proposal was submitted to the Foundation for Food and Agriculture Research (FFAR.) “Reducing pennycress seed phytic acid and sinapate to promote the creation of a new eco-friendly source of plant protein.” ($343,610).

3. Western Illinois University

A. Planned Activities

  • Hire a plant breeder.

  • Establish research plots in Macomb, IL.

  • Establish multi-state variety trials with collaborators.

  • Initiate purchase of a plot combine.

B. Actual Accomplishments
• We are still in the process of hiring a plant breeder. The position closed on November 1, 2019 and candidates still being reviewed.

• Planted WIU research plots in Macomb, IL on August 31, 2019 for winter varieties and September 27, 2019 for spring varieties.

• Replicated variety trial with 51 varieties, fungicide trial with 2 varieties, nitrogen trails with 6 rates of nitrogen and sulfur, and bulk seed planting for seed increases for two varieties.

• Establish multi-state variety trials with collaborators.

• Organized and distributed seed for multi-state replicated strip trials with top 10 breeding lines at eight locations throughout Midwest (1 OH, 2 WI, 3 IL, 2 MN).

• Planted WIU Multi-state strip trial, August 31, 2019 in Macomb, IL.

• Planted ISU Multi-state strip trial, October 7, 2019 in Normal, IL.

• Planted two variety demonstration plot at Richland Community College, Decatur, IL October 6, 2019.

• Distributed seed to 2 research entities

C. Explanation of Variance

None noted.

D. Plans for Next Quarter

Begin greenhouse breeding line seed increases for ISU for traits of interest, including seed coat color, early flowering, and seed oil traits.

E. Publications, Presentations and Proposals Submitted

• Education Presentations
  o Phippen, Winthrop. Classroom guest lecturer in AGRI-120 Agriculture in today’s society regarding pennycress production. 50 undergraduate students, 50 min lectures to 2 sections of the class. Western Illinois University, September 26, 2019.
- Phippen, Winthrop, John Sedbrook, and Nicholas Heller. Class laboratory presentation and demonstration to ISU agronomy class on day of planting. Illinois State University, October 7, 2019.

- **Professional Conferences and Meetings**

**Objective 3.3 - Characterization of Pennycress Ecosystem Services**

1. **Illinois State University**

   **A. Planned Activities**

   The goals of the ecosystem services cover crop project were first to install experimental plots and plant pennycress in the pennycress and pennycress plus nitrogen treatments. We also planned to collect soybean cyst nematode (SCN) population estimates and baseline soil chemistry data in all plots. Finally, we hoped to recruit graduate and undergraduate students to work on the project.

   **B. Actual Accomplishments**

   The nutrient retention project has installed nine replicate experimental plots each with their own individual tile drainage systems equipped with agridrains (tile interceptors) to estimate water and nutrient losses from tile systems. Initially, we had planned to test pennycress as a cover crop compared to a reference no cover crop plot. We have now added in a treatment where we will fertilize pennycress with 56 kg/ha (50 lb/acre) of spring applied nitrogen.

   We have also received quotes for automated samplers to collect water samples autonomously from the agridrains during periods of high flow. We are now working to obtain funding for this more intensive sampling approach to the project. We have taken three samples (each from 20 individual cores 6 cm deep and 2.54 cm diameter that were homogenized) in each plot for SCN population estimates. We have also taken three samples (each from 20 individual cores 15 cm deep and 2.54 cm diameter that were homogenized) to estimate soil organic carbon, nitrate, ammonia, phosphate and micronutrients. Finally, we have used a drone to collect aerial imagery and a 1 cm
resolution digital elevation model of the site. This may allow us to estimate sediment losses from the plots with and without pennycress.

C. Explanation of Variance

We have deviated from the original planned activities by including an additional treatment of pennycress plus spring applied nitrogen and increased sampling efforts of tile water and pore water. We have added in a treatment to better assess nutrient losses in tile water if spring applied nitrogen is required to attain a yield of pennycress that exceeds 1793 kg/ha (1600 lb/acre). We are also working to obtain funding to increase the sampling effort of tile water to capture water samples at all flows better represent water losses during high flow events.

We have also started to sample SCN populations in the plots to determine if either population size or race types change after the use of pennycress as a cover crop. We are currently testing the races of SCN that are present in our plots at the University of Illinois – Champaign Urbana – Plant Clinic.

We have used drone technology for several reasons. First, it will provide detailed digital elevation models of the site and examining changes in soil elevation from samples before and after the pennycress season in treatment and reference plots will allow us to estimate sediment loss from the site. We are also hoping to be able to estimate pennycress (or other plant biomass) in the treatments using drone technology.

D. Plans for Next Quarter

**Nutrient Retention.** The primary goal is to ensure that we have good stands of pennycress growing on the plots and we will apply spring nitrogen as the weather dictates. We will be monitoring pennycress biomass four times during the spring. We will compare the pennycress biomass to biomass estimates using a drone fitted with a multispectral sensor. After the harvest we will assess soil ammonia and nitrate concentrations.

We will be capturing water samples to determine nutrient losses from the plots beginning in February as the soil begins to thaw and runoff occurs. We anticipate changes in tile water export of nutrients to take more than one year using pennycress as a cover crop. Because of this longer response time, we will also analyze pore water nutrients in the plots using lysimeters (porous ceramic cups on the end of PVC tubes). This has been done in experiments in the sandy soils of Minnesota but not in the more organic rich soils of Illinois. This will allow us to compare the responses of porewater nutrient
concentrations which may respond faster to pennycress as a cover crop than tile water nutrient concentrations.

E. Publications, Presentations and Proposals Submitted

- Publications and Professional Conferences/Meetings
  None to date.

- Proposals
  Internal Illinois State Grant to the Student Sustainability Fund for $22,000 (In preparation)

OBJECTIVE 3.4 - LIFE CYCLE SUPPLY CHAIN DEVELOPMENT

A. Planned Activities

The team planned to meet in person during the quarter but was unable to.

B. Actual Accomplishments

While the team was unable to meet in person, multiple discussions did take place towards Objective goals. Cristine Handel was named the group leader and will establish a monthly calendar for the topics in this area. Initially the life cycle report that CoverCress Inc. had contracted will be used as a baseline. CoverCress Inc. has also started conversations with suppliers on large amounts of grain transportation, cleaning / drying, delivery to the crush site, as well as other relevant topics.

C. Explanation of Variance

The team was unable to meet in person but has taken steps to allow for ongoing conversations.

D. Plans for Next Quarter

The plan for next quarter is to put together a final definition of the need for a deeper life cycle analysis and have the detailed plan on each step of the value chain established with dates and people responsible for the topics.

E. Publications, Presentations and Proposals Submitted
OBJECTIVE 3.5 AND 3.6 - EDUCATION, EXTENSION AND OUTREACH

1. Objective 3.5.1 - Create, deploy, and test pennycress modules and exploration for 4-H clubs and other agriculture-related events in areas where pennycress will be launched

Illinois State University. Some ideas for creation exist already, we have a few contacts for deployment, and we will test pennycress modules and exploration for 4-H clubs and other agriculture-related events in areas where pennycress will be launched. Deliverables for Year 1 include:

- Creating an inventory of existing cover crop education materials.
- Drafting, reviewing and completing one 4H module in the first two project months. We will promote it over two months and then implement. One module will be scheduled for January-February 2020. Then we will possibly draft a second module based on what was learned in preparing the first module.

Ohio State University. We plan to help develop two modules for use in FFA rooms, and work to deploy developed modules from other groups to FFA and 4-H. We participated in conference calls to discuss Objective efforts which will be developed in future quarters.

We also discussed pennycress informally in two lecture periods in courses at OSU (Seed Science and Introduction to Agronomy). Formal materials have not yet been developed.

University of Minnesota. 4-H clubs will be contacted during Years 1 and 2 with general information regarding pennycress production and use. These efforts will focus on areas of Minnesota that agronomy researchers indicate are most likely to be receptive to pennycress. Where undergrad labs can be modified as 4-H club activities and not duplicate materials developed by ISU or OSU, we will do so. A target will be two modules for 4-H clubs.

A. Objective 3.5.1.1 - Over 1,000 4-H club members, their parents and educators at 50 4-H clubs in Illinois, Ohio, and Minnesota will gain knowledge of the biology and production, processing, market potential and environmental benefits of pennycress

Illinois State University. Most of the 50 clubs will be organized by ISU with a few as one to three clubs in Year 1 and with 5-10 in Year 2. Perhaps the number of clubs doubles every year which would get us close to 50 clubs.
• **Year 1 Deliverable**: Conduct a short introductory activity for one to four 4H clubs.

**Ohio State University.** We will work to initially connect to three 4-H and two FFA chapters, with a potential to expand with more modules. Planned chapters include Springfield OH, Columbus, OH and Dublin, OH.

**University of Minnesota.** Work with FFA chapters will focus on areas where growers are most likely to consider pennycress production. Introduction of materials will be extended to additional FFA clubs upon request.

B. **Objective 3.5.1.2 - 50-100 4-H club members will conduct projects on aspects of pennycress**

**Illinois State University.** Most of the 50-100 4-H club members will be coordinated by ISU. As few as five in Year 1, with 10 in Year 2. Perhaps the number projects doubles every year which would get close to 100.

• **Year 1 Deliverable**: We anticipate a total of one to three students, but there may be more.

C. **Objective 3.5.1.3 - Parents of 50-100 4-H club members will become familiar with pennycress as an emerging crop**

**Illinois State University.** The participants should be the farmer/parents of the 4H club members who are engaged in an IPREFER project.

D. **Objective 3.5.1.4 - Educators, students, and parents of 75 4-H clubs throughout the Midwest will receive educational materials and become familiar with pennycress**

**Illinois State University.** We anticipate involved individuals will hear presentations and participate in initial pennycress activities, but they (or their children/students) may not necessarily engage in their own projects.

• **Year 1 Deliverable**: Conduct a short introductory activity for parents attending one to four 4H club meetings in January/February 2020, with a larger number of clubs to follow in early Fall 2021.

**Ohio State University.** We can contribute to this goal through a limited number of 4H chapters.

**University of Minnesota.** 75 4H clubs will get exposure to pennycress as an emerging crop.
2. **Objective 3.5.2 - Prepare a bioeconomy workforce by leveraging current pennycress research to develop resources, curriculum, and instruction for high school, community college, undergraduate, and graduate level education**

   **Ohio State University.** We plan to develop four modules for inclusion in agronomy courses. The focus will be on 1) planting, 2) growth and development (stages), 3) in-season management (i.e., fertility, Integrated Pest Management (IPM), weed issues), and 4) harvest. Two modules will be related to seed science: 1) dormancy controls within the seed, and 2) effect of seed treatment on growth and development. We plan to incorporate some materials into graduate courses as well. We also plan to develop videos in Year 5.

   **University of Minnesota.** Pennycress case studies and hands-on labs will be developed for four undergraduate courses in agronomy and crop growth/development. Inquiry-based labs will feature challenges related seedling establishment, breeding, harvest, and processing.

   - **Year 1 Deliverable:** Prepare the groundwork for internships.
   - **Year 1 Deliverable:** Outline intern applications that lead to five poster presentations at IPREFER annual meeting in the Summer of 2020.

A. **Objective 3.5.2.1 - Train more than 1,100 undergraduate and 11 graduate students in agricultural and non-agricultural elements of the pennycress supply chain.**

   **Ohio State University.** We commit to reaching 200 undergraduates directly through instruction, and 15 graduate students through courses and direct training.

   **University of Minnesota.** We need to identify programs/courses that are interested in using materials related to pennycress supply chain.

B. **Objective 3.5.2.2 - Develop curricula for 6 course-based labs involving work with pennycress.**

   **Ohio State University.** Three labs are planned. One will be on planting, one will be on stand assessment and growth stages, and a third will be on dormancy controls and release.

   **University of Minnesota.** Course-based research experiences will be developed around authentic research questions such as germination and stand establishment, genetics and other. Materials will be implemented in three courses and we will provide research experience for 120 students/year in Years 2 – 5.

C. **Objective 3.5.2.3 - Develop 20 educational modules on pennycress growth, maturation, harvest, and processing.**
Ohio State University. We will develop a minimum of six modules (see list in Objective 3.5.2), four for use in agronomy, and two for use in seed science.

University of Minnesota. Materials, including video clips will be developed and used in association with course-based undergraduate research experiences.

D. Objective 3.5.2.4 - Collaborate with 2 to 3 community colleges in MN to develop curricula on pennycress and other bio-based energy sources.

University of Minnesota. We will work with instructors at Central Lakes College, Worthington CC and Century CC to identify materials that can be incorporated into programs in agronomy and farm-business management.

E. Objective 3.5.2.5 - Develop and implement pennycress production and processing skills with 25 students from diverse disciplinary and social backgrounds.

University of Minnesota. We will create cohorts of undergraduate students from diverse STEM programs who will learn about agriculture and conduct research on pennycress breeding and genetics, ecosystem impacts and processing.

F. Objective 3.5.2.6 - Develop 10 pennycress activities for an interdisciplinary undergrad course that uses course-based undergraduate research experience.

Ohio State University. We will discuss opportunities with Ag Engineering faculty for inclusion for a supply chain assessment activity.

University of Minnesota. See Objective 3.5.2.2.

3. Objective 3.5.3 - Disseminate developed materials to institutions through posting to open forums such as MERLOT and to current and future farmers.

Ohio State University. We will work to develop a consolidated posting area to showcase modules and teaching resources through MERLOT.

Objective 3.6

University of Minnesota
Project Co-PI M. Scott Wells discussed the IPREFER project at the 2019 Iowa Integrated Crop Management program, exposing the project to 200 interested parties.
<table>
<thead>
<tr>
<th>Name</th>
<th>Role(s)</th>
<th>Affiliation</th>
<th>Email/Contact Information</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Win Phippen</td>
<td>Project Director, Breeding &amp; Genetics</td>
<td>Western Illinois University</td>
<td><a href="mailto:wb-hippen@wiu.edu">wb-hippen@wiu.edu</a></td>
<td>(o) 309.298.1251 (m) 309.255.9435</td>
</tr>
<tr>
<td>Jim Anderson</td>
<td>Collaborator, Breeding &amp; Genetics</td>
<td>University of Minnesota</td>
<td><a href="mailto:ander319@umn.edu">ander319@umn.edu</a></td>
<td>(o) 612.625.9763</td>
</tr>
<tr>
<td>Chris Aulbach</td>
<td>Collaborator, Agronomic Management, Education/Extension/Outreach</td>
<td>CoverCress, Inc.</td>
<td><a href="mailto:caulbach@covercress.com">caulbach@covercress.com</a></td>
<td>(m) 636.795.8052</td>
</tr>
<tr>
<td>Jeff Bender</td>
<td>Collaborator (Staff), Agronomic Management</td>
<td>Illinois State University</td>
<td><a href="mailto:jabende@ilstu.edu">jabende@ilstu.edu</a></td>
<td>(o) 309.275.6259 (m) 309.275.6259</td>
</tr>
<tr>
<td>Mark Bernards</td>
<td>Collaborator (LEAD Weeds), Agronomic Management</td>
<td>Western Illinois University</td>
<td><a href="mailto:ml-bernards@wiu.edu">ml-bernards@wiu.edu</a></td>
<td>(o) 309.298.1569 (m) 309.313.5917</td>
</tr>
<tr>
<td>Mary Brakke</td>
<td>Collaborator, Education/Extension/Outreach</td>
<td>University of Minnesota</td>
<td><a href="mailto:brakk001@umn.edu">brakk001@umn.edu</a></td>
<td>(o) 612.625.1251</td>
</tr>
<tr>
<td>Constance (Connie) Carlson</td>
<td>Collaborator, Product Development</td>
<td>University of Minnesota</td>
<td><a href="mailto:carl5114@umn.edu">carl5114@umn.edu</a></td>
<td>(o) 612.301.1678 (m) 612.709.6790</td>
</tr>
<tr>
<td>Senyu Chen</td>
<td>Collaborator (SCN Northern Lead), Agronomic Management</td>
<td>University of Minnesota</td>
<td><a href="mailto:chenx099@umn.edu">chenx099@umn.edu</a></td>
<td>(o) 507.837.5621</td>
</tr>
<tr>
<td>Ratan Chopra</td>
<td>Collaborator (MN - LEAD Genomics Efforts), Breeding &amp; Genetics</td>
<td>University of Minnesota</td>
<td><a href="mailto:rchopra@umn.edu">rchopra@umn.edu</a></td>
<td>(o) 612.625.7773 (m) 551.689.5299</td>
</tr>
<tr>
<td>Steve Csonka</td>
<td>Advisory Board</td>
<td>CAAFI</td>
<td><a href="mailto:Csonka.CAAFI.ED@gmail.com">Csonka.CAAFI.ED@gmail.com</a></td>
<td>(m) 513.800.7980</td>
</tr>
<tr>
<td>Rebekka Darner</td>
<td>Collaborator - LEAD, Education/Extension/Outreach</td>
<td>Illinois State University</td>
<td><a href="mailto:rldarne@ilstu.edu">rldarne@ilstu.edu</a></td>
<td>(o) 309.438.3071 (m) 352.214.4601</td>
</tr>
<tr>
<td>Maliheh Esfahanian</td>
<td>Graduate Student (Ph.D.), Breeding &amp; Genetics</td>
<td>Illinois State University</td>
<td><a href="mailto:malihe.esfahanian@gmail.com">malihe.esfahanian@gmail.com</a></td>
<td>(o) 309.438.3088 (m) 561.480.6599</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
<td>Email</td>
<td>Phone</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>------------------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>Frank Forcella</td>
<td>University of Minnesota</td>
<td><a href="mailto:Frank.Forcella@ars.usda.gov">Frank.Forcella@ars.usda.gov</a></td>
<td>(o) 320.292.9558</td>
<td></td>
</tr>
<tr>
<td>Katherine Frels</td>
<td>University of Minnesota</td>
<td><a href="mailto:kfrels@umn.edu">kfrels@umn.edu</a></td>
<td>(o) 612.624.8774</td>
<td>(m) 641.740.0270</td>
</tr>
<tr>
<td>Liza Gautam</td>
<td>Illinois State University</td>
<td><a href="mailto:bgautam@ilstu.edu">bgautam@ilstu.edu</a></td>
<td>(o) 309.438.3088</td>
<td>(m) 320.287.0571</td>
</tr>
<tr>
<td>Russ Gesch</td>
<td>USDA-ARS-NCSRL</td>
<td><a href="mailto:russ.gesch@ars.usda.gov">russ.gesch@ars.usda.gov</a></td>
<td>(o) 320.585.8427</td>
<td>(m) 320.287.0571</td>
</tr>
<tr>
<td>Brad Glenn</td>
<td>CoverCress, Inc.</td>
<td><a href="mailto:brad.glenn@frontier.com">brad.glenn@frontier.com</a></td>
<td>(m) 309.275.7178</td>
<td></td>
</tr>
<tr>
<td>Gary Haer</td>
<td>REG</td>
<td><a href="mailto:Gary.haer@regi.com">Gary.haer@regi.com</a></td>
<td>(o) 515.239.8057</td>
<td></td>
</tr>
<tr>
<td>Matthew Hagaman</td>
<td>Illinois State University</td>
<td><a href="mailto:mthagam@ilstu.edu">mthagam@ilstu.edu</a></td>
<td>(o) 309.438.8627</td>
<td>(m) 319.804.8341</td>
</tr>
<tr>
<td>Cris Handel</td>
<td>CoverCress, Inc.</td>
<td><a href="mailto:chandel@covercress.com">chandel@covercress.com</a></td>
<td>(o) 314.691.9152</td>
<td>(m) 314.691.9152</td>
</tr>
<tr>
<td>Alex Hard</td>
<td>University of Minnesota</td>
<td><a href="mailto:hardx006@umn.edu">hardx006@umn.edu</a></td>
<td>(m) 612.594.8293</td>
<td></td>
</tr>
<tr>
<td>Nicholas Heller</td>
<td>Illinois State University</td>
<td><a href="mailto:njhelle@ilstu.edu">njhelle@ilstu.edu</a></td>
<td>(o) 309.438.8095</td>
<td>(m) 217.232.0779</td>
</tr>
<tr>
<td>Cody A. Hoerning</td>
<td>University of Minnesota</td>
<td><a href="mailto:hoern012@umn.edu">hoern012@umn.edu</a></td>
<td>(m) 920.809.6663</td>
<td></td>
</tr>
<tr>
<td>William (Willy) Hunter</td>
<td>Illinois State University</td>
<td><a href="mailto:wjhunte@ilstu.edu">wjhunte@ilstu.edu</a></td>
<td>011-61-473-144-135</td>
<td></td>
</tr>
<tr>
<td>Brice Jarvis</td>
<td>Illinois State University</td>
<td><a href="mailto:bajarvi@ilstu.edu">bajarvi@ilstu.edu</a></td>
<td>(o) 309.438.3088</td>
<td>(m) 847.463.0262</td>
</tr>
<tr>
<td>Name</td>
<td>Title/Role</td>
<td>Institution</td>
<td>Contact Information</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------</td>
<td>--------------------------------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>Gregg Johnson</td>
<td>Collaborator, Agronomic Management, Life Cycle/Supply Chain Development</td>
<td>University of Minnesota</td>
<td><a href="mailto:johns510@umn.edu">johns510@umn.edu</a> (o) 507.835.5617 (m) 507.837.9111</td>
<td></td>
</tr>
<tr>
<td>Anne Kinzel</td>
<td>Program Manager</td>
<td></td>
<td><a href="mailto:annekizel@iprefercap.org">annekizel@iprefercap.org</a> (m) 515.554.6021</td>
<td></td>
</tr>
<tr>
<td>Jackie Kraft</td>
<td>Collaborator, Agronomic Management (Watershed Coordinator)</td>
<td>McLean County Soil and Water Conservation District (SWCD)</td>
<td><a href="mailto:Jacqueline.Kraft@il.nacdnet.net">Jacqueline.Kraft@il.nacdnet.net</a> (o) 309.452.3848</td>
<td></td>
</tr>
<tr>
<td>Frances Lawrenz</td>
<td>Collaborator, Education/Extension/Outreach</td>
<td>University of Minnesota</td>
<td><a href="mailto:lawrenz@umn.edu">lawrenz@umn.edu</a> (o) 612.625.2046</td>
<td></td>
</tr>
<tr>
<td>Jason Lindbom</td>
<td>Collaborator (Staff), Agronomic Management</td>
<td>Illinois State University</td>
<td><a href="mailto:jmlindb@ilstu.edu">jmlindb@ilstu.edu</a> (m) 309.846.8274</td>
<td></td>
</tr>
<tr>
<td>Alexander (Alex) Lindsey</td>
<td>Co-PI (LEAD Pellet &amp; LEAD Southern Agronomy), Agronomic Management, Extension/Education/Outreach</td>
<td>Ohio State University</td>
<td><a href="mailto:lindsey.227@osu.edu">lindsey.227@osu.edu</a> (o) 614.292.3864 (m) 517.256.0836</td>
<td></td>
</tr>
<tr>
<td>Aaron Lorenz</td>
<td>Collaborator (Northern SELECT Lead), Breeding &amp; Genetics</td>
<td>University of Minnesota</td>
<td><a href="mailto:lore0149@umn.edu">lore0149@umn.edu</a> (o) 612.625.6754</td>
<td></td>
</tr>
<tr>
<td>Lauren Lurkins</td>
<td>Advisory Board</td>
<td>Illinois Farm Bureau</td>
<td><a href="mailto:LLurkins@ilfb.org">LLurkins@ilfb.org</a></td>
<td></td>
</tr>
<tr>
<td>Michaela McGinn</td>
<td>Collaborator, Breeding &amp; Genetics</td>
<td>CoverCress, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Danny Marchiafava</td>
<td>Graduate Student (Master's), Breeding &amp; Genetics</td>
<td>Illinois State University</td>
<td><a href="mailto:dmarchi@ilstu.edu">dmarchi@ilstu.edu</a> (o) 309.438.3088 (m) 847660.0330</td>
<td></td>
</tr>
<tr>
<td>M. David Marks</td>
<td>ELT, Co-PI (LEAD Northern Genetics), Breeding &amp; Genetics</td>
<td>University of Minnesota</td>
<td><a href="mailto:marks004@umn.edu">marks004@umn.edu</a> (m) 612.615.2477</td>
<td></td>
</tr>
<tr>
<td>Mark Messmer</td>
<td>Collaborator (MN - LEAD Weed), Agronomic Management, Breeding &amp; Genetics</td>
<td>CoverCress, Inc.</td>
<td><a href="mailto:mmessmer@covercress.com">mmessmer@covercress.com</a> (m) 314.724.6664</td>
<td></td>
</tr>
<tr>
<td>Deepika Mishra</td>
<td></td>
<td>CoverCress, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
<td>Institution</td>
<td>Email</td>
<td>Phone</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Matthew A. Ott</td>
<td>Collaborator</td>
<td>University of Minnesota</td>
<td><a href="mailto:ottxx142@umn.edu">ottxx142@umn.edu</a></td>
<td>(o) 612.625.6649</td>
</tr>
<tr>
<td></td>
<td>Breeding and Genetics</td>
<td></td>
<td>(m) 970.570.9540</td>
<td></td>
</tr>
<tr>
<td>William Perry</td>
<td>Co-PI (LEAD Ecosystems)</td>
<td>Illinois State University</td>
<td><a href="mailto:wlperry@ilstu.edu">wlperry@ilstu.edu</a></td>
<td>(o) 309.438.8160</td>
</tr>
<tr>
<td></td>
<td>Pennycress Ecosystem Services</td>
<td></td>
<td>(m) 630.672.3459</td>
<td></td>
</tr>
<tr>
<td>Mary Phippen</td>
<td>Collaborator</td>
<td>Western Illinois University</td>
<td><a href="mailto:ME-Phippen@wiu.edu">ME-Phippen@wiu.edu</a></td>
<td>(o) 309.298.1251</td>
</tr>
<tr>
<td></td>
<td>Breeding &amp; Genetics</td>
<td></td>
<td>(m) 309.255.1761</td>
<td></td>
</tr>
<tr>
<td>Krishan Mohan Rai</td>
<td>Collaborator</td>
<td>University of Minnesota</td>
<td><a href="mailto:kmohanra@umn.edu">kmohanra@umn.edu</a></td>
<td>(o) 806.283-2303</td>
</tr>
<tr>
<td></td>
<td>Breeding &amp; Genetics</td>
<td></td>
<td>(m) 806.283.2303</td>
<td></td>
</tr>
<tr>
<td>Rob Rhykerd</td>
<td>Collaborator</td>
<td>Illinois State University</td>
<td><a href="mailto:rrhyker@ilstu.edu">rrhyker@ilstu.edu</a></td>
<td>(o) 309.438.0744</td>
</tr>
<tr>
<td></td>
<td>Pennycress Ecosystem Services</td>
<td></td>
<td>(m) 309.530.5166</td>
<td></td>
</tr>
<tr>
<td>Emily Schoenfelder</td>
<td>Collaborator</td>
<td>University of Illinois</td>
<td><a href="mailto:eschoe@illinois.edu">eschoe@illinois.edu</a></td>
<td>(o) 309.347.6614</td>
</tr>
<tr>
<td></td>
<td>Education/Extension/Outreach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John C. Sedbrook</td>
<td>ELT, Co-PI (LEAD Southern Genetics)</td>
<td>Illinois State University</td>
<td><a href="mailto:jcsedbr@ilstu.edu">jcsedbr@ilstu.edu</a></td>
<td>(o) 309.438.3374</td>
</tr>
<tr>
<td></td>
<td>Breeding &amp; Genetics</td>
<td></td>
<td>(m) 309.533.2924</td>
<td></td>
</tr>
<tr>
<td>Jerry Steiner</td>
<td>Advisory Board</td>
<td>CoverCress, Inc.</td>
<td><a href="mailto:jsteiner@covercress.com">jsteiner@covercress.com</a></td>
<td>(o) 314.691-9152</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(m) 314.378.7556</td>
<td></td>
</tr>
<tr>
<td>Michael Stutelberg</td>
<td>Collaborator</td>
<td>Agricultural Utilization Research Institute</td>
<td><a href="mailto:mstutelberg@auri.org">mstutelberg@auri.org</a></td>
<td>(o) 218.281.7600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(AURI)</td>
<td>EXT 135</td>
<td></td>
</tr>
<tr>
<td>Pamela Tas</td>
<td>Collaborator</td>
<td>University of Wisconsin-Platteville</td>
<td><a href="mailto:tasp@uwplatt.edu">tasp@uwplatt.edu</a></td>
<td>(o) 608.342.1949</td>
</tr>
<tr>
<td></td>
<td>Agronomic Management</td>
<td></td>
<td>(m) 608.628.6437</td>
<td></td>
</tr>
<tr>
<td>Tim Ulmasov</td>
<td>Collaborator</td>
<td>CoverCress, Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breeding &amp; Genetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alan Weber</td>
<td>Advisory Board</td>
<td>MARC-IV</td>
<td><a href="mailto:aweber@marciv.com">aweber@marciv.com</a></td>
<td>(o)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(m)</td>
<td></td>
</tr>
<tr>
<td>M. Scott Wells</td>
<td></td>
<td>University of Minnesota</td>
<td><a href="mailto:mswells@umn.edu">mswells@umn.edu</a></td>
<td>(o) 612.625.3747</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(m) 919.741.9876</td>
<td></td>
</tr>
</tbody>
</table>
• ELT, Co-PI (LEAD Northern Agronomy, LEAD Data Management)
• Agronomic Management
• Education/Extension/Outreach

**Dalton Williams**
- Graduate Student (Master's)
- Breeding & Genetics
  - Illinois State University
dwill2@ilstu.edu
  - (o) 309.438.3088
  - (m) 217.972.6168

**Randy Wright**
- Collaborator (Staff)
- Agronomic Management
  - Illinois State University
  - rlwrigh1@ilstu.edu
  - (o)
  - (m)

**Undergrad Students Listed on the Project - Breeding and Genetics, Illinois State**

- Tate Barney
- Cameron De la Mora
- Anthony Dibartolo
- Meghan Freund
- Alex Hafner
- Kaitlin Janowiak
- Matthew Maynard
- Hannah Potter
- Alexis Showalter

IPREFER is supported by Agriculture and Food Research Initiative Competitive Grant No. 2019-69012-29851 from the National Institute of Food and Agriculture
## Annual (Kickoff) Meeting
August 11-13, 2019
Illinois State University, Normal, IL

### Name | Institution | Role
--- | --- | ---
Chris Aulbach | CoverCress, Inc. | Breeding/Crop Management
Jeff Bender | Illinois State University | Agronomy/Crop Management
Mark Bernards | Western Illinois University | Agronomy/Crop Management
John Baur | Illinois State University | Associate VP, Research
Mary Brakke | University of Minnesota | Education/Outreach
Ratan Chopra | University of Minnesota | University of Minnesota
Steve Csonka | Executive Director, CAAFI | Advisory Board
Bekky Darner | Illinois State University | Education/Outreach
Cameron De la Mora | Illinois State University | Breeding/Genetics
Mali Esfahanian | Illinois State University | Breeding/Genetics
Frank Forcella | University of Minnesota | Ecosystem Services
Katherine Frels | University of Minnesota | Breeding/Genetics/Crop Management
Meghan Freund | Illinois State University | Breeding/Genetics
Liza Gautam | Illinois State University | Breeding/Genetics
Russ Gesch | USDA ARS | Agronomy/Crop Management
Matthew Hagaman | Illinois State University | Education/Outreach
Cris Handel | CoverCress, Inc. | Life Cycle/Supply Chain
Alex Hard | University of Minnesota | Agronomy/Crop Management
Nicholas Heller | Illinois State University | Agronomy/Extension
Cody Hoerning | University of Minnesota | Ecosystem Services
Willy Hunter | Illinois State University | Education/Outreach
Brice Jarvis | Illinois State University | Breeding/Genetics
Gregg Johnson | University of Minnesota | Supply Chain/Extension
Jackie Kraft | McLean County SWCD | McLean County SWCD
Jason Lindbom | Illinois State University | Agronomy/Crop Management
Michaela McGinn | CoverCress, Inc. | Breeding/Genetics
Danny Marchiafava | Illinois State University | Breeding/Genetics
David Marks | University of Minnesota | Breeding/Genetics
Mark Messmer | CoverCress, Inc. | Breeding/Genetics/Crop Management
Deepika Mishra | CoverCress, Inc. | Breeding/Genetics/Crop Management
Matthew Ott | University of Minnesota | Breeding/Genetics
<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Position/Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill Perry</td>
<td>Illinois State University</td>
<td>Ecosystem Services</td>
</tr>
<tr>
<td>Mary Phippen</td>
<td>Western Illinois University</td>
<td>Agronomy/Crop Management</td>
</tr>
<tr>
<td>Win Phippen</td>
<td>Western Illinois University</td>
<td>Director, IPREFER</td>
</tr>
<tr>
<td>Krishan Mohan Rai</td>
<td>Krishan Mohan Rai</td>
<td>Breeding/Genetics</td>
</tr>
<tr>
<td>Rob Rhykerd</td>
<td>Illinois State University</td>
<td>Ecosystem Services</td>
</tr>
<tr>
<td>Jerry Steiner</td>
<td>CEO, CoverCress, Inc.</td>
<td>Advisory Board</td>
</tr>
<tr>
<td>Michael Stutelberg</td>
<td>AURI</td>
<td>Lifecycle/Supply Chain</td>
</tr>
<tr>
<td>Taylor Suo</td>
<td>Illinois State University</td>
<td>Breeding/Genetics</td>
</tr>
<tr>
<td>Pamela Tas</td>
<td>U. of Wisconsin-Platteville</td>
<td>Agronomy/Crop Management</td>
</tr>
<tr>
<td>Tim Ulmasov</td>
<td>CoverCress, Inc</td>
<td>Breeding/Genetics</td>
</tr>
<tr>
<td>Goutham Vemuri</td>
<td>AURI</td>
<td>Lifecycle/Supply Chain</td>
</tr>
<tr>
<td>Scotty Wells</td>
<td>University of Minnesota</td>
<td>Agronomy/Extension</td>
</tr>
<tr>
<td>Dalton Williams</td>
<td>Illinois State University</td>
<td>Breeding/Genetics</td>
</tr>
<tr>
<td><strong>INVITED GUESTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toby Ahrens</td>
<td>Larta Institute</td>
<td>Advisor</td>
</tr>
<tr>
<td>Michael Barrowclough</td>
<td>Illinois State University</td>
<td>Ag Economics (Modeling)</td>
</tr>
<tr>
<td>Bill Brady</td>
<td>Illinois Senate Minority Leader</td>
<td>Econ. Development</td>
</tr>
<tr>
<td>Dan Brady</td>
<td>Illinois House of Representatives</td>
<td>Econ. Development</td>
</tr>
<tr>
<td>Tyler Cravens</td>
<td>Aide to Congressman Rodney Davis</td>
<td>Econ. Development</td>
</tr>
<tr>
<td>Scott Hacker</td>
<td>Murphy and Associates Seed Equipment</td>
<td>Commercial Development</td>
</tr>
<tr>
<td>Rachel Hatch</td>
<td>Illinois State University</td>
<td>Media Relations</td>
</tr>
<tr>
<td>Anne Kinzel</td>
<td>COO, CenUSA Bioenergy</td>
<td>Guest Advisor</td>
</tr>
<tr>
<td>Drew Lugat</td>
<td>Illinois State University</td>
<td>Animal Science (Animal feeding studies)</td>
</tr>
<tr>
<td>Lauren Lurkins</td>
<td>Illinois Farm Bureau</td>
<td>Director of Natural and Environmental Resources</td>
</tr>
<tr>
<td>Ken Moore</td>
<td>Director, CenUSA Bioenergy</td>
<td>Keynote Speaker</td>
</tr>
<tr>
<td>Scott Murphy</td>
<td>Murphy and Associates Seed Equipment</td>
<td>Commercial Development</td>
</tr>
<tr>
<td>Justin Rickard</td>
<td>Illinois State University</td>
<td>Animal Science (Carcass composition analysis)</td>
</tr>
<tr>
<td>Jason Wagoner</td>
<td>Illinois State University</td>
<td>Research &amp; Sponsored Programs</td>
</tr>
</tbody>
</table>
September 17, 2019 WIU Announces $10 Million Bio-Fuel Federal Research Grant

MACOMB, IL – The Western Illinois University School of Agriculture announced today that Agriculture Professor Win Phippen is the recipient of a $10 million federal grant to investigate the use of the alternative crop, Pennycress, as a new cash cover crop in the Midwest.

The U.S. Department of Agriculture National Institute of Food and Agriculture (NIFA) grant will allow Phippen to further refine Pennycress as a new winter-annual cash cover crop for use by the biofuel industry. Researchers from Illinois State University, the Ohio State University, the University of Wisconsin-Platteville, and the University of Minnesota will join Phippen’s team to refine this high-yield oilseed crop. Phippen, who has been with the School of Agriculture and the director of the School’s Alternative Crops Program since 2000, has been growing Pennycress, and investigating its uses as a biofuel alternative, for 10 years.

"Pennycress is unique among cover crops as it can generate income, which incentivizes farmer participation. Integration of Pennycress into existing corn-soybean rotations extends the growing season on established cropland and avoids food crop displacement, all while yielding up to two billion gallons of oil annually," Phippen explained.

The goal is to produce 50 billion gallons of biofuel in the next 25 years. The integrated Pennycress crop program will work toward commercializing the crop within five years, according to Phippen. Research will focus on improving Pennycress genetics (germplasm) for plant breeding and preservation, agronomic management, ecosystems and supply chain management for post-harvest seed control.

"The integration of Pennycress as a cash cover crop will positively impact producers' profits, decrease soil erosion and nutrient runoff, which protects water systems, support pollinating species (bees and other pollinators), suppress weeds, diversify the nation's energy sources and contribute to rural economies," Phippen said. "We're very excited to further refine this powerhouse crop as an alternative for our Midwest farmers. I am most appreciative of the U.S. Department of Agriculture's faith in my research, and I look forward to leading a team of researchers with a solid background in alternative crop research."

Phippen's integrated program optimizes off-season Pennycress oilseed production by overcoming production and supply chain bottlenecks, with the goal of commercially launching Pennycress as a cash cover crop in 2021. CoverCress, Inc., of St. Louis, MO, is working closely with Phippen and his team for some of the breeding and post-production side of the research. Trial Pennycress planting in Illinois, Ohio, Wisconsin and Minnesota will begin this month, with the first harvest anticipated in May 2020. The alternative crop is planted immediately following a corn harvest. After harvest, Pennycress storage will be tested, along with the quantity and quality of oil extracted, and the shelf life of Pennycress oil. The oil and meal will be further studied to determine uses for fuel, feed and food applications.

"This grant is a phenomenal coup for Dr. Phippen and the School of Agriculture. We were lucky to hire Win 19 years ago to lead an alternative crops program, which at the time was still relatively new," said School of Agriculture Director Andy Baker. "His work and dedication to alternative crops is most deserving of this grant. Not only does this grant and research put our School and his program further on the map, it provides learning opportunities for our students that they will not find anywhere else."

U.S. Department of Agriculture Deputy Under Secretary Scott Hutchins said the $77.8 million in NIFA research grants, which have been awarded to eight U.S. universities, are aimed at integrating sustainable agricultural approaches covering the entire food production system.
"Investing in high-value research that promotes sustainably intensified agricultural practices, while addressing climate adaptation and limited resources, ensures long-term agricultural productivity and profitability and provides unprecedented opportunities for American farmers and producers," said Hutchins, who leads USDA’s Research, Education and Economics (REE) mission area. "USDA continues to support our nation’s farmers through investments that help strengthen our rural communities."

This research investment is part of a new program within NIFA's Agriculture and Food Research Initiative's (AFRI) Sustainable Agricultural Systems program, the nation’s leading and largest competitive grants program for agricultural sciences.

Other researchers part of Phippen's team include John Sedbrook, Bill Perry, Rebekka Darner, William Hunter, Nicholas Heller and Rob Rhykerd (Illinois State University); Jim Anderson, Ratan Chopra, Katherine Frels, M. David Marks and M. Scott Wells (University of Minnesota); Alexander Lindsey (The Ohio State University); Pamela Tas (University of Wisconsin-Platteville); and Cristine Handel, CoverCress, Inc. Project advisory board members include Steve Csonka, executive director, CAAFI, Greg Haer, VP Sales and Marketing, Renewable Energy Group, Jerry Steiner, CEO, CoverCress, Inc. Anne Kinzel of I-Prefer is the project manager.
ISU researchers part of $10 million USDA grant to implement new oilseed cover crop for fuel
Tuesday, September 17, 2019

Nearly 80 million acres of land in the Midwest are devoted to corn and soybeans in the growing season, which means millions of acres of land sit empty in the winter months. A $10 million grant from the United States Department of Agriculture (USDA) aims to protect that idle land and provide extra income to farmers. The grant will allow researchers to domesticate a plant into a winter cover crop that can be used to produce biodiesel, jet fuel, and animal feed.

“From the time you harvest corn and soybeans till you plant in May there’s mostly nothing in the ground,” said Illinois State University’s Professor of Genetics John Sedbrook, who has been working for years to convert what many consider a weed – pennycress – into a viable “cover crop,” or a crop that can be planted by farmers during the winter months. “Thlaspi arvense, or pennycress is an annual oilseed cover crop that has the potential to produce 3 billion gallons of fuel per year.”

With the grant, Illinois State researchers will work closely with the lead institution, Western Illinois University, as well as researchers at the University of Minnesota, the Ohio State University, the University of Wisconsin-Platteville, the USDA, and the St. Louis-based crop development company CoverCress, Inc. Working as a group known as the Integrated Pennycress Research Enabling Farm and Energy Resilience (IPREFER), Sedbrook said the goal is to have an infrastructure in place within five years, so farmers can plant and harvest pennycress as a cover crop, and processing companies can convert the seed to fuel and feed.

“The integration of pennycress as a cash cover crop will positively impact producers’ profits, decrease soil erosion and nutrient runoff which protects water systems, support pollinating species (bees and other pollinators), suppress weeds, diversify the nation's energy sources and contribute to rural economies,” said Western Illinois University’s Agriculture Professor Win Phippen, the main recipient of the grant. “We're very excited to further refine this powerhouse crop as an alternative for our Midwest farmers.”

(more)
At Illinois State, the grant will help support the ongoing work of Sedbrook’s lab. Over the years, the USDA has awarded Sedbrook’s work with more than $3 million in grants to bring out positive genetic traits in pennycress, ensuring seeds can be used for biofuel, and the seed remnants can be added to meal to feed animals. “We’ve made two key genetic changes to those seeds to make them edible and more nutritious,” said Sedbrook, whose lab at Illinois State is devoted to integrated plant biology and bioenergy. He noted the same process was used in the 1960s to convert rapeseed into canola oil, which is in widespread use today.

The USDA grant will help fund the work to domesticate and commercialize pennycress by expanding Illinois State’s team to include Professor of Water Ecology Bill Perry, Assistant Professor of Crop Science Nicholas Heller, and Professor of Soil Science Rob Rhykerd of the University’s Department of Agriculture.

“This is a very exciting project,” said Rhykerd. “In addition to providing a return to the farmer, this cover crop may help reduce erosion and nutrient runoff from agricultural fields, benefitting the environment.” Perry added the work fits in with the EPA hopes to protect water resources in Illinois and in downstream states. “Our research may help meet the goals of the Illinois Nutrient Reduction Strategy using pennycress as a cover crop that not only helps keep nutrients in the fields, but also provides an economic return to farmers during the offseason,” said Perry.

Grant funds will also support outreach to farmers and the agricultural community. Willy Hunter, Rebekka Darner, and Matthew Hageman of Illinois State’s Center for Mathematics, Science, and Technology (CeMaST) will begin the project by working with area 4-H programs.

Congressman Rodney Davis noted he was thrilled to hear about the grant. “This is welcomed news and I’m glad to see more of our local universities receiving NIFA grants,” said Davis. “These grants are a major asset to universities and our communities not only because of the research they fund, but because of the opportunities they create for our local farmers and our local economies. I proud to be an advocate for a 5 percent increase in NIFA funding in our last spending bills.”

“Pennycress offers an exciting opportunity for Illinois farmers, and demonstrates the exciting advances in agricultural technology,” said State Senator Bill Brady (R-Bloomington). “This grant will help our agriculture industry grow and advance, which will have a positive impact throughout Illinois.”

(more)
“Money for higher education means great things, and this grant is a great and collaborative opportunity for Illinois State University,” said State Representative Dan Brady. “The USDA grant will not only have a positive local impact, but regionally, and nationally as well.”

Along with the financial benefit to farmers, Sedbrook said cover crops such as pennycress need to be adopted more widely to help mitigate environmental damage. “Everyone knows that plants like pennycress take carbon dioxide out of the atmosphere to grow. By using plant products as fuel instead of digging it out of the ground from millions of years ago, you’re taking carbon that’s already there. So it’s a zero-sum game,” said Sedbrook, who added that plants also act to enrich the soil and mitigate nitrogen runoff that occurs after crops are harvested.

Sedbrook hopes the new crop will be a key player in the fight against climate change. “Science indisputably shows that climate change is a real and a present problem that we need to address as soon as possible,” he said. “Pennycress can help do that while providing extra income to rural communities. It’s a win-win.”

###
2019 - 2020 IPREFER Communication and Behavior Policies

No Publication Policy

To encourage open communication, each IPREFER member or IPREFER meeting attendee agrees that any information presented at IPREFER meetings that is stated as or meant to be confidential, whether in a formal talk, poster session, or discussion, is a private communication from the individual making the contribution and is presented with the restriction that such information is not for public use. Prior to quoting or publishing any such information presented at an IPREFER meeting, written or verbal approval of the contributing member must first be obtained. Each member of a meeting acknowledges and agrees to these restrictions when registration is accepted and as a condition of being permitted to attend an IPREFER meeting. Each member of an IPREFER meeting assumes sole responsibility for the protection and preservation of any intellectual property rights in such member’s contributions to an IPREFER meeting.

Inappropriate Behavior Policy

IPREFER encourages open and honest intellectual debate as part of a welcoming and inclusive atmosphere at every meeting. IPREFER does not tolerate illegal or inappropriate behavior at any related meeting, including harassment of any kind, including sexual harassment. IPREFER condemns inappropriate or suggestive acts or comments that demean another person by reason of his or her gender, gender identity or expression, race, religion, ethnicity, age or disability or that are unwelcome or offensive to other members of the community or their guests. If you believe you have been subjected to or have otherwise experienced behavior at your IPREFER event, please act promptly to report the issue so that steps may be taken to address the situation immediately. There are multiple methods you may use to report your concern. You may notify the event organizer, the IPREFER Director (Dr. Winthrop Phippen), or appropriate staff at your university, agency, or place of business.

IPREFER is supported by Agriculture and Food Research Initiative Competitive Grant No. 2019-69012-29851 from the National Institute of Food and Agriculture.
“Our mission is to optimize off-season pennycress oilseed production by overcoming production and supply chain bottlenecks.”

IPREFER is supported by Agriculture and Food Research Initiative Competitive Grant No. 2019-69012-29851 from the National Institute of Food and Agriculture.