COLLABORATIVELY GROWING THE LANDSCAPE OF PLANT-BASED PROTEINS

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Mission

The mission of the Plant Protein Innovation Center (PPIC), **first of its kind in the nation**, is to bring together interdisciplinary researchers and industry partners to deliver to the supply chain new nutritious and functional plant protein ingredients and products, working all the way from breeding and genetics to processing, formulation, and marketing.

Approach

PPIC addresses industry-identified plant-protein challenges and opportunities to develop a wealth of fundamental science leading to a low emission food industry.
Why PPIC? Why Now?

The PPIC strives to not only bring economic gain to the industry but to also address the consumer desire for nutritious and healthy food, have a positive impact on the environment by seeking and utilizing sustainable crops, provide additional sources of protein for the growing population, and provide revenue to farmers.
How? The PPIC Model

- Research is mainly **Pre-Competitive** and **Non-Proprietary**
- Research focuses on fundamental science that addresses industry needs and consumers demands

**Total funds acquired:** over $8,000,000
The PPIC Model: Coming Together to Grow Research
Areas to be Addressed

- Understand how novel proteins can replace or be combined with traditional protein ingredients in various food products to deliver optimal nutrition, functionality, and flavor.

- Determine viable (cost effective) extraction (wet and dry) and processing/functionalization technologies for producing functional protein ingredient from novel sources.

- Investigate crop diversity and breed for protein quality traits.

- Unveil unique characteristics and applications.

- Develop prediction models to link protein structure to function.

- Upcycle by-products and waste streams.

- Secure abundant and sustainable supply.
Identified Research Priorities

**Production**
*Primary research focus areas related to breeding, sustainability of the supply, and crop diversity*

**Processing & Formulation**
*Primary research focus areas related to extraction methods, unique processing, co-products, food systems, high value end use*

**Application**
*Primary research focus areas related to flavor, functionality, and nutrition*
Research Advances

PPIC Funded Research

- Four successful RFPs resulting in nine projects, submitted by PPIC researchers, funded for up to $50,000 per year

- Link to research summaries
Research Advances
Examples of Externally Funded Projects
(~ 3 million dollars)

Proposal funded by Good Food Institute (2020)
- Title: Characterizing and texturizing proteins from pulses to form fibers with textures that mimic chicken
- Funds granted: $250,000

Proposal funded by Foundation for Food & Agricultural Research (FFAR) (2020)
- Title: Legumes of the future: Developing methodologies and germplasm to enhance the functionality and nutritional quality of pea protein
- Funds granted: $800,000

Proposal funded by PepsiCo (2020)
- Title: Protein Profiling and Characterization across Diverse Oat Lines
- Funds granted: $355,000

Proposal funded by MN Dept of Agric. (2022)
- Title: Hemp grain characterization for food applications
- Funds granted: $250,000

Proposal funded through Forever Green Initiative (2022)
- Title: Protein Blending: Impact on Functionality Nutrition and Flavor Attributes
- Funds granted: $350,000
Research Advances
Examples of Externally Funded Projects
(~ 3 million dollars)

Proposal funded by USDA ARS (2023)
Title: Enhancing Pea Protein Functionality through Glycation Following a Novel and Efficient Upcycling Approach
Funds granted: $335,325

Proposal funded by Northarvest Beans Association (2023)
Title: Evaluating Dry Kidney Beans as a Source of high Quality/Value Protein as a Food Ingredient
Funds granted: $87,812

Proposal funded by Forever Green Initiative (2024)
Title: Feeding the Future: Maximizing the Value of Alfalfa Protein by Controlling Endogenous Protease Activity and Evaluating the Quality of all Streams from Protein Extraction
Funds granted: $339,625

Proposal funded by MDA Specialty Crop Block Grant (2024)
Title: Developing high-quality protein ingredients from dry beans for food applications
Funds granted: $124,618
Who?

Industry Members

PPIC Partners

[Logos of various companies]
Industry Members

Associate Members

Who?
Who?

Industry Members

Affiliate Members
Who?

Supporters & Collaborators

- Agricultural Utilization Research Institute (AURI)
- BRIDGE2FOOD
- Canada Consulate General Consulat général
- CROWN
- DIL
- ExAlt R&D, LLC
- Forever Green
- The Future of Protein Production
- hartman GROUP
- IMPROVE
- Luke Natural Resources Institute Finland
- Naturally Minnesota
- Protein Highway
- Plant Based Foods Association
- Schwan’s Company
- University of Manitoba
- VTT
- Wageningen University & Research
Who?

Researchers

- 39 interdisciplinary researchers across the University of Minnesota and from external institutions!

https://ppic.cfans.umn.edu/expertise/researchers

Senior Scientists, Postdocs, and Students
Become a Member of the PPIC!

With investment and collaborative effort between industry and researchers, we can innovate!

**Affiliate**
- Start-up companies with an annual revenue of less than $2 million
- A yearly membership fee of $3,000/year for 3 years
- (Sponsorship available through [application](https://ppic.cfans.umn.edu/members-supporters/membership-options))

**Associate**
- Companies with less than $5 million* in annual revenue from plant/alternative protein ingredients and products, and for organizations
- A yearly membership fee of $6,000/year for 3 years
  
  *A company that makes more than $5 million annual revenue may join at an associate level for a one-year trial period, non-renewable, for $10,000 one-time membership fee.

**Partner**
- A yearly membership of $20,000 for 3 years for companies that have $5-100 million annual revenue;
- A yearly membership of $40,000 for 3 years for companies with more than $100 million in annual revenue

[https://ppic.cfans.umn.edu/members-supporters/membership-options](https://ppic.cfans.umn.edu/members-supporters/membership-options)
Benefits to Members

For All Members PPIC offers:

• Visibility on our website and networking opportunities
• Waived registrations to PPIC events*
• Opportunity to host booths at annual meetings at no additional cost
• Expert advice and support for troubleshooting processing/product development challenges
• Facilitated collaboration with other PPIC member companies

For Associate & Partner members PPIC also offers:

• A Welcome package** that offers a complimentary project custom designed to meet your research needs
• A 20% discount on any subsequent projects to continue reaching research goals
• High-priority project timelines
• Customized hands-on training on various analytical techniques
• Support with setting up new R&D labs for protein research

For Partner members PPIC also offers:

• Having an R&D scientist on the Technical Committee
• Contribution to and development of the center Research Priorities
• Receiving quarterly updates on PPIC Funded projects
• Involvement in decision making to fund research proposals

*Waived Event Registrations
Partners: Three waived registrations to PPIC annual meetings, two waived registrations to PPIC short course; a total value of $5,000 - $7,000/annually; Associate Members: Two waived registrations to PPIC annual meetings, one waived registration to PPIC short course; a total value of $3,000 – $4,500/annually; Affiliate Members/Supporters: Two waived registrations to PPIC annual meetings; a total value of $1,500 - $3,000/annually

**Welcome package
Partners: A welcome package of $8,000 value is offered for a complimentary project; Associate Members: A welcome package of $4,000 value is offered for a complimentary project

https://ppic.cfans.umn.edu/members-supporters/membership-benefits
# PPIC Capabilities

Check out our webpage for a full list of capabilities

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[https://ppic.cfans.umn.edu/capabilities-overview](https://ppic.cfans.umn.edu/capabilities-overview)
Research Outputs
Since 2021 PPIC has produced:

Several publications from both PPC and externally funded sources

- **Pea protein globulins: Does their relative ratio matter?**
  Holly Husband, Sun Ferreira, Fan Bu, Samira Feyzi, Baraem P. Ismail
  Food Hydrocolloids, 2024, 148, 109429

- **Improving functionality and texturization potential of novel pennycress (Thlaspi arvense) protein by inducing polymerization**
  Rachel M. Mitacek, Job Ubbink, Baraem P. Ismail
  Food Hydrocolloids, 2024, 154 110152

- **Hemp (Cannabis sativa L.) protein: Impact of extraction method and cultivar on structure, function, and nutritional quality**
  Laura Eckhardt, Fan Bu, Adam Franczyk, Tom Michaels, Baraem P. Ismail
  Current Research in Food Science 2024, 8 100746

- **Transglutaminase-induced Polymerization of Pea and Chickpea Protein to Enhance Functionality**
  Brigitta P. Yaputri, Samira Feyzi and Baraem P. Ismail
  Gels 2024, 10, 11.

- More can be found on our website: [https://ppic.cfans.umn.edu/research-outputs](https://ppic.cfans.umn.edu/research-outputs)

A patent on Method for Producing Functional Pea Protein

- Alissa Schneider, B. Pam Ismail, 2020. **Method for Producing Functional Pea Protein.** Provisional Patent Filed Oct 30th 2020, Application number: 63/107,797, developed at the University of Minnesota

Several literature reviews on novel plant protein sources
Outreach will allow for the exchange of knowledge between the public and private sphere.

Annual PPIC events include:

- Research Spotlight Meeting
- Protein short courses and hands on experiences
- Workshops on
  - Commercialization
  - Process Scale Up
  - Abundance of supply challenges
What PPIC Offers the Community

- Networking opportunities during events with companies across the value chain (Ingredient suppliers, processors, and CPG companies)
- Interaction with scientists from various disciplines
- Research advancement and innovation
- Development of new and successful protein ingredients and applications
- Post-farm processing technologies that add value along the entire value chain
- Scaling plant protein from regenerative Agriculture
- Development of environmentally sustainable protein crops
- Securing supply chain
- Training the next generation of plant protein scientists
Thank You to Our: Technical Committee

Elizabeth Nguyen
Senior Scientist, Alternative Proteins
Aron Daniels Middendorf Company

Kazuhiko Furukawa
Business Development Manager
Amauno Enzymes

Chris Fields
Chief Science Officer
Applied Food Science

Robert Mitchell
Senior Process Engineer
Bulbier

Nathan Knutson
Nutrition Center of Expertise & PPD Lead
for the Americas, Cargill

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Handkeid, Conagra Brands

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Roquette Amorica, Inc.

Zheng You
Principal Scientist, Health & Wellness R&D
Tate & Lyle

Jason Lupoi
Director of Laboratory Operations
Agricultural Utilization Research Institute

Lilly Occhiino
Senior Food Scientist
University of Minnesota
Thank You to Our: Executive Board
Partner with us today to change the landscape of plant protein tomorrow!

PPIC