NCSRP – report April, 2024

Team members:
- Ignacio A. Ciampitti, Principal Investigator. Kansas State University
- Matthew Carroll, co-PI, PhD. Sr. Analytics & Insights Lead. Iowa Soybean Association Research Center for Farming Innovations

Collaborators:
- John P. Fulton, PhD, Professor, Food, Agricultural and Biological Engineering, Ohio State University.
- Shaun Casteel, PhD, Associate Professor, Extension Soybean Specialist, Purdue University.
- Peter Kovacs, PhD, Assistant Professor, Precision Cropping Systems, South Dakota State University.
- Andre de Borja Reis, PhD, Assistant Professor, Division of Plant Sciences, University of Missouri.
- Scott Nelson, Sr. Research Agronomist, Iowa Soybean Association.
- Mark Seamon, Research Director, Michigan Soybean Promotion Committee.
- Maninderpal Sing, PhD, Assistant Professor of Cropping Systems Agronomy, Michigan State University.
- Randy Pearson, PhD, Professor, Southern Illinois University of Edwardsville.
- Michael Ostlie, PhD, Precision Agriculture Specialists, North Dakota State University.
- Laila Puntel, PhD, Assistant Professor, Department of Agronomy, University of Nebraska-Lincoln.
- Laura Thompson, On-Farm Coordinator, Extension Educator, University of Nebraska-Lincoln.
- Guillermo Balboa, Research Assistant Professor, Department of Agronomy, University of Nebraska-Lincoln.

Progress

Project goals:
1. Develop a multistate database to allow upscaling of soybean quality predictions to regional levels and benchmark agronomic practices, soybean genetics, management, and environmental conditions that can lead to large-scale improvements in soybean quality.
2. Communicate the economic value of soybean quality mapping to farmers and agronomists through an online interactive simulation tool, technical publications, and social media.

Accomplishments during the first half of year 3
The team of all the collaborators from multiple states (Ohio, Indiana, South Dakota, Missouri, Iowa, Michigan, Illinois, North Dakota, Nebraska, Iowa, and Kansas), including John Fulton, Shaun Casteel, Peter Kovacs, Andre Borja Reis, Scott Nelson, Mark Seamon and Mani Sing, Randy Pearson, David Kramar and Michael Ostlie, and Guillermo Balboa, helped on collecting all field sites for 2023 growing season.

All seeds were processed for seed quality traits, mainly protein and oil concentrations, from all fields were obtained and data share across all collaborators. Below is an example of the report developed for Michigan:

Mapping soybean protein and oil quality in farmer fields

*Ciampitti Lab, Department of Agronomy, Kansas State University.*

Introduction

- High protein and oil concentrations affect **seed quality**, in addition it can help in marketing efforts and increase the **economic value** of each bushel.
- To measuring soybean protein and oil concentration **require** the collection of soybean seed samples and laboratory analyses.
- Recent pilot projects were focused on calibrating an on-the-go protein NIR sensor to produce the first **soybean quality maps** in the USA.

Objectives

- Development multi-state database that allows **soybean quality prediction.**
- Improve the existing technologies for **mapping soybean quality** within fields and estimating potential economic of soybean quality differentiation at field levels.

Study area

Ciampitti Lab
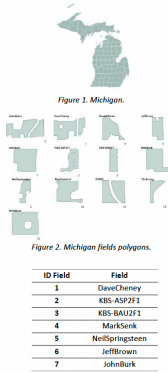
8	AlanMoore
9	DaveWilliams
10	TimBoring
12	WillWilson
13	SVREC
14	PeteDrawford

Table 1. Fields with their respective ID's.

Methodology

Results

Figure 1. Michigan.

Figure 2. Michigan fields polygons.

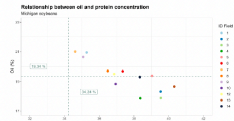| ID Field	Field
1	DaveCheney
2	KBS-ASP2F1
3	KBS-BAU2F1
4	MarkSenk
5	NeilSpringsteen
6	JeffBrown
7	JohnBurk

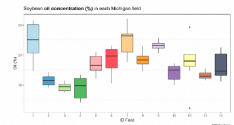*Figure 3. Dashed lines: average protein and oil (%) in export vessels (USSEC survey).*
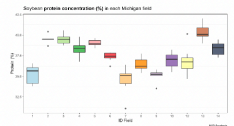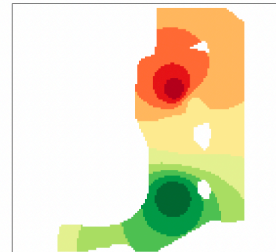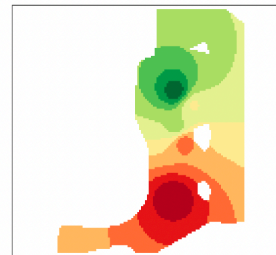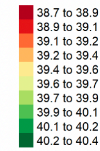
Figure 4. Soybean oil concentration (%) in each field.
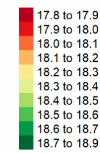
Figure 5. Soybean protein concentration (%) in each field.

ID Field	Field
2	KBS-ASP2F1

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MI_KBS-ASP2F1

Protein

38.7 to 38.9
38.9 to 39.1
39.1 to 39.2
39.2 to 39.4
39.4 to 39.6
39.6 to 39.7
39.7 to 39.9
39.9 to 40.1
40.1 to 40.2
40.2 to 40.4

MI_KBS-ASP2F1

Oil

17.8 to 17.9
17.9 to 18.0
18.0 to 18.1
18.1 to 18.2
18.2 to 18.3
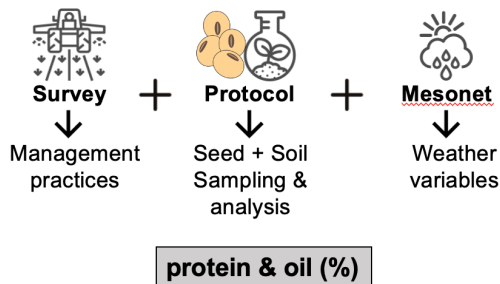18.3 to 18.4
18.4 to 18.5
18.5 to 18.6
18.6 to 18.7
18.7 to 18.9

For the last two growing seasons, 2022-2023, a total of 234 fields with complete data on soybean seed quality and relevant crop management has been collected and compiled across the US soybean producing region. The states in the southern part of the US (Louisiana, Mississippi, and Alabama) were collected via a grant provided by the United Soybean Board (USB). The rest of the states are all the ones included in the current project funded by NCSRP.

Assessing soybean protein and oil concentration in farmer fields across the United States

234 sites in 13 states – 2022 & 2023

Survey → Management practices

+

Protocol → Seed + Soil Sampling & analysis

+

Mesonet → Weather variables
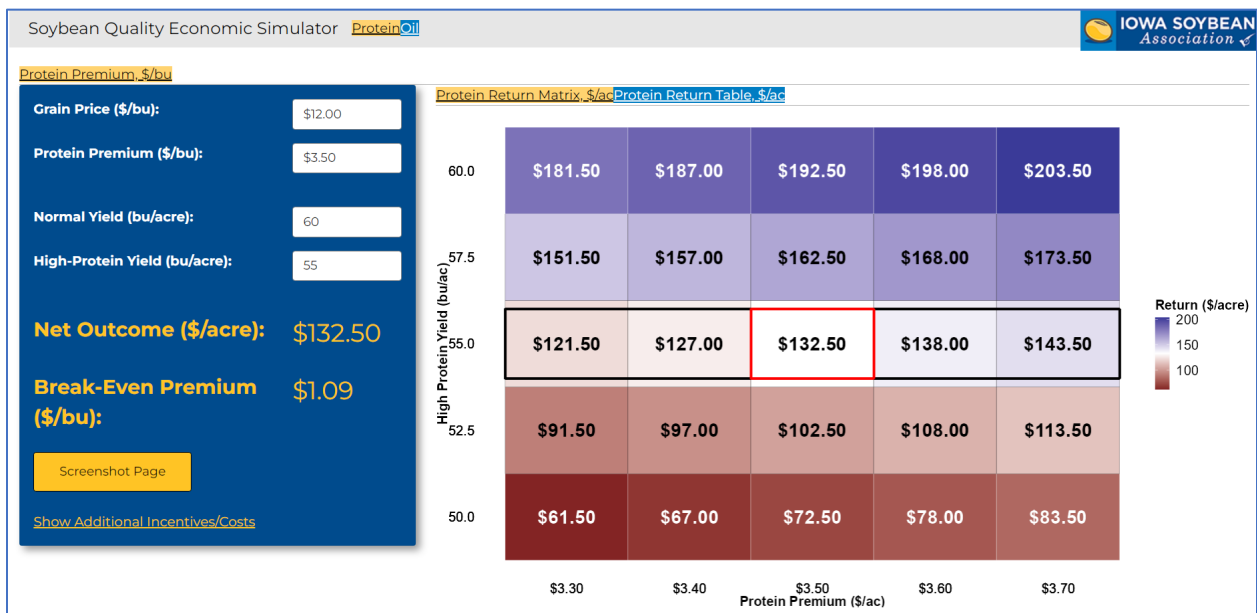
protein & oil (%)

- Farmer-level variation in soybean protein and oil concentration (%) not extensively reported across the US.
- Improving our understanding of the **main factors governing this variation** is needed to exploit future market value.

Opportunity: increasing domestic and international market value based on seed quality, **but as an initial step, segregation of quality at field scale needs to occur.**

Fields 2022 and 2023
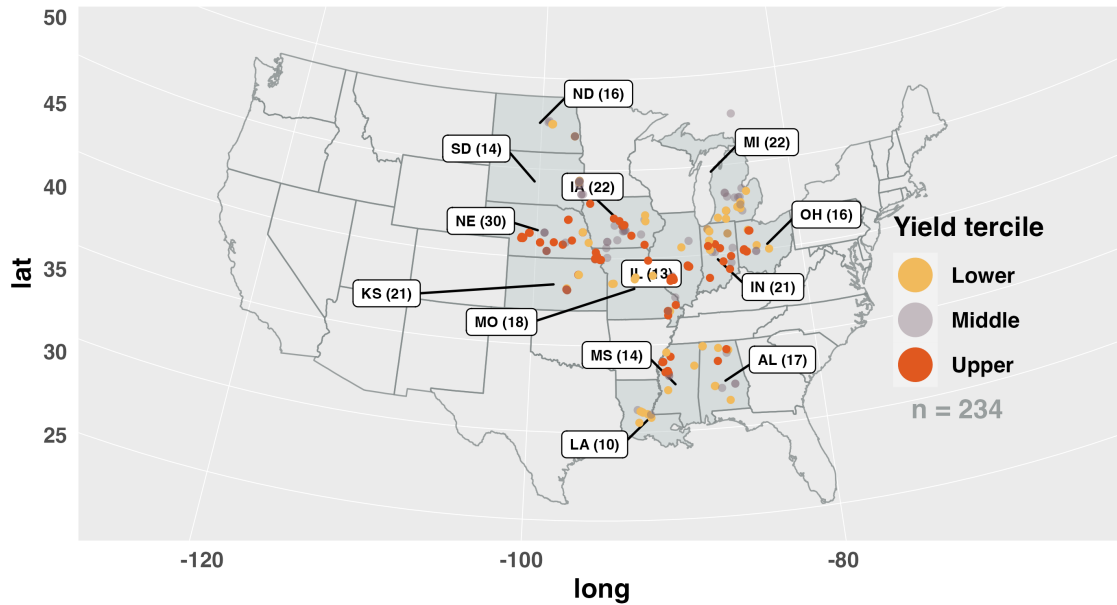
The soybean quality economic simulator has been updated and modified in two key areas. The first being that the oil quality portion of the tool has been built and is functioning well. The second update was to the existing user interface to make it more intuitive for users. Based on feedback from farmers the old version was difficult to understand what yield was used and how to add yield loss properly. We also added a break-even premium price so that farmers can quickly decide on if the premium they are receiving will have a positive ROI on their farm.

The last addition we made is that users can export their results in a pdf, csv, or XLSX document so they can save their work for future use.

IOWA SOYBEAN
Association

Protein Premium, $/bu

Grain Price ($/bu): $12.00

Protein Premium ($/bu): $3.50

Normal Yield (bu/acre): 60

High-Protein Yield (bu/acre): 55

Net Outcome ($/acre): $132.50

Break-Even Premium ($/bu): $1.09

Screenshot Page

Show Additional Incentives/Costs

Protein Return Matrix, $/ac Protein Return Table, $/ac

Copy | CSV | Excel | PDF | Print

Protein Premium ($/bu)	High Protein Yield (bu/acre)	Return ($/acre)	Normal Yield (bu/acre)	Grain Price ($/bu)	Added Costs ($/acre)	Added Incentives ($/acre)
All	All	All	All	All	All	All
3.3	50	61.5	60	12	0	0
3.3	52.5	91.5	60	12	0	0
3.3	55	121.5	60	12	0	0
3.3	57.5	151.5	60	12	0	0
3.3	60	181.5	60	12	0	0
3.4	50	67	60	12	0	0

Showing 1 to 6 of 25 entries

Previous | 1 | 2 | 3 | 4 | 5 | Next

Soybean Quality Economic Simulator

Protein Premium ($/bu)	High Protein Yield (bu/acre)	Return ($/acre)	Normal Yield (bu/acre)	Grain Price ($/bu)	Added Costs ($/acre)	Added Incentives ($/acre)
3.3	35	-239.5	65	12	10	15
3.3	42.5	-124.75	65	12	10	15
3.3	50	-10	65	12	10	15
3.3	57.5	104.75	65	12	10	15
3.3	65	219.5	65	12	10	15
3.4	35	-236	65	12	10	15
3.4	42.5	-120.5	65	12	10	15
3.4	50	-5	65	12	10	15
3.4	57.5	110.5	65	12	10	15
3.4	65	226	65	12	10	15
3.5	35	-232.5	65	12	10	15

The next steps are to develop a first database and publication of the within-field variation for soybean seed quality, protein, and oil, for farmer fields across the US. A new growing season, 2024, will be added to the dataset (with more than 100 fields) to complete the entire data collection and move into data processing, analysis, and visualization.