



**AG2PI**  
Agricultural Genome to  
Phenome Initiative

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FLORIDA A&M UNIVERSITY  
**VITICULTURE  
& SMALL FRUIT RESEARCH**  
COLLEGE OF AGRICULTURE AND FOOD SCIENCES

**N**

Institute of Agriculture and Natural Resources · College of Engineering  
**BIOLOGICAL SYSTEMS ENGINEERING**

# Developing Education, Research, and Extension Training on Precision Agriculture Phenotyping Tools at HBCU Communities

**Presenter: Dr. Jingqiu Chen,**

Assistant Professor

Biological Systems Engineering (BSE)

College of Agriculture and Food Sciences (CAFS)

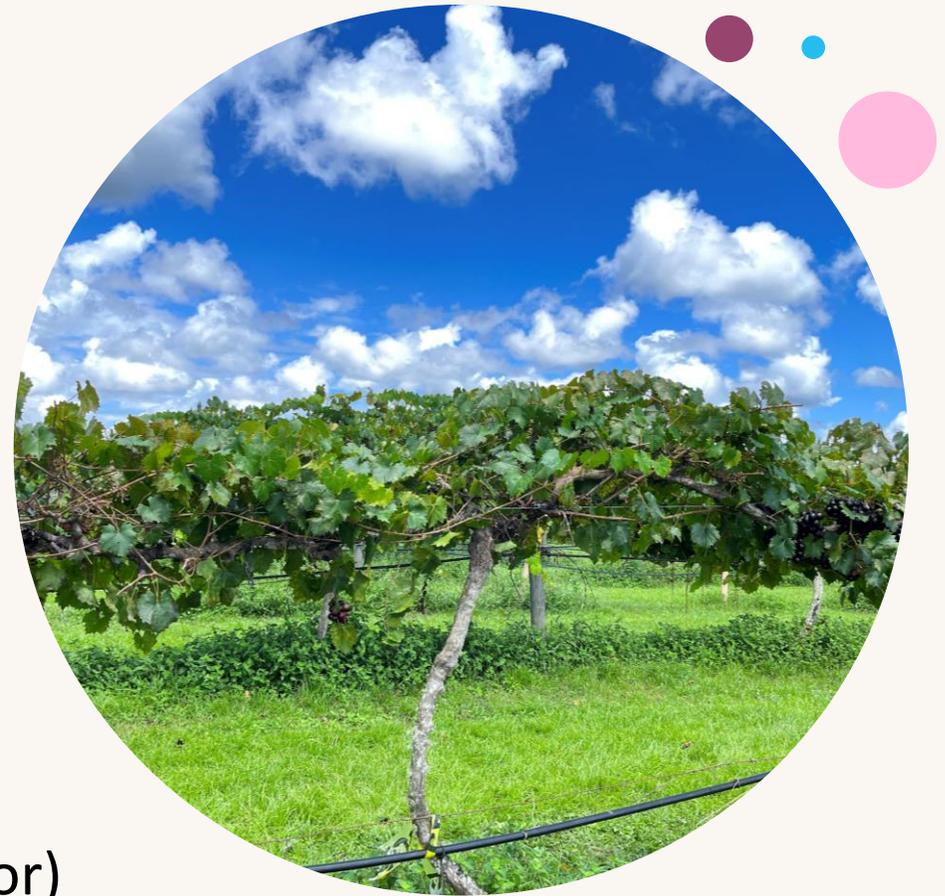
Florida A&M University (FAMU)

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# Acknowledgement

Support from Agricultural Genome to Phenome Initiative (AG2PI), which is funded by USDA-NIFA award 2020-70412-32615 & 2021-70412-35233

**Team:** Dr. Jingqiu Chen (FAMU, PI)  
Dr. Violeta Tsoлова (FAMU, Co-PI)  
Dr. Wei-zhen Liang (UNL, Co-PI)  
Dr. Jian Jin (Purdue, Co-PI)  
Ms. Conchita Newman (FAMU, Collaborator)  
Mr. Frank Humphries (FAMU)



# Background

- Precision agriculture aims to improve crop yields and assisting management decisions using high-technology sensors and analysis tools (Finger et al., 2019).
- Data acquisition, data processing, and data analysis expertise of crops to determine associate crop solutions and outcomes.
- Data such as phenotyping, leaf pigments, crop pigments, plant stress, soil water content, etc. can be utilized to perform such analysis.

# Background

- FAMU is an 1890 land-grant institution (#1 Public HBCU by U.S. News & World Report)
- FAMU CAFS Center for Viticulture and Small Fruit Research is recognized internationally for excellence in warm climate grape research and facilitator of outstanding academic programs for experiential learning and student training.
- Maintain the most extensive muscadine grape germplasm collection in the world and is serving as one of the five National Clean Plant Centers for Grapes.

# Outcomes

Produced four leading-edge precision agriculture phenotyping educational modules at FAMU:



Developed image processing algorithm to estimate grapevine canopy using RGB images



Website development for users to upload images from digital camera/smart phone and calculate canopy cover automatically



Hyperspectral imaging technologies for plant phenotyping and GIS server for geo-referenced imaging measurements



A Taste of Florida Viticulture

# Precision Agriculture Phenotyping Tool Development

Preliminary deliverable: <https://phrec-irrigation.com/#/>

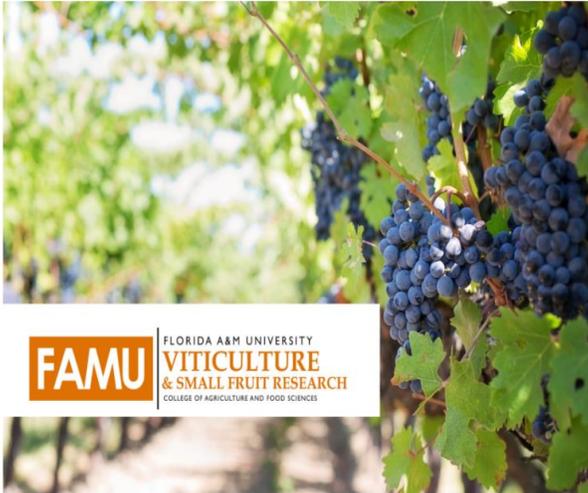
The screenshot shows the PHREC-AGLAB website with a navigation bar at the top containing 'Research Projects', 'Sensor Data', 'Gateways', 'Contact', 'Logout', and 'Farm Monitoring'. The main content area features six project cards:

- Weekly Crop Water Use Estimation for Panhandle Crops!**: Accompanied by an image of a center pivot irrigation system over a green field.
- Use our real-time alert monitoring system at your place to prevent cercospora leaf spot of sugar beet!**: Accompanied by a close-up image of a sugar beet leaf showing brown spots.
- Use this tool to estimate canopy cover percentage of sugar beet for estimation of crop stand, hail damage, etc.**: Accompanied by a stylized logo of a sugar beet root with a yellow cube inside.
- White Mold Image Collection**: A dark blue header above an image of a bean field with white mold.
- White Mold Monitoring**: A dark blue header above an image of a bean stem with white mold.
- Florida A&M Grapevine and Grape Detection**: A dark blue header above an image of a grapevine with a FAMU logo overlay.

# Precision Agriculture Phenotyping Tool Development

Preliminary deliverable: <https://phrec-irrigation.com/#/>

## Florida A&M Grapevine and Grape Detection



Developing Education, Research, and Extension Training on Precision Agriculture Phenotyping Tools at HBCU Communities!

PHREC-AGLAB

Florida A&M | Field 1 (Noble) | Good morning, Jingqiu

Dashboard | Field Management | Edit

Winery Way

version: 1.8.2

Leaflet

### Weather Info

60 °F

| Low | High | Humidity | Pressure | Wind |
|-----|------|----------|----------|------|
| 56  | 62   | 89       | 1017     | 0    |
| °F  | °F   | %        | hPa      | mph  |

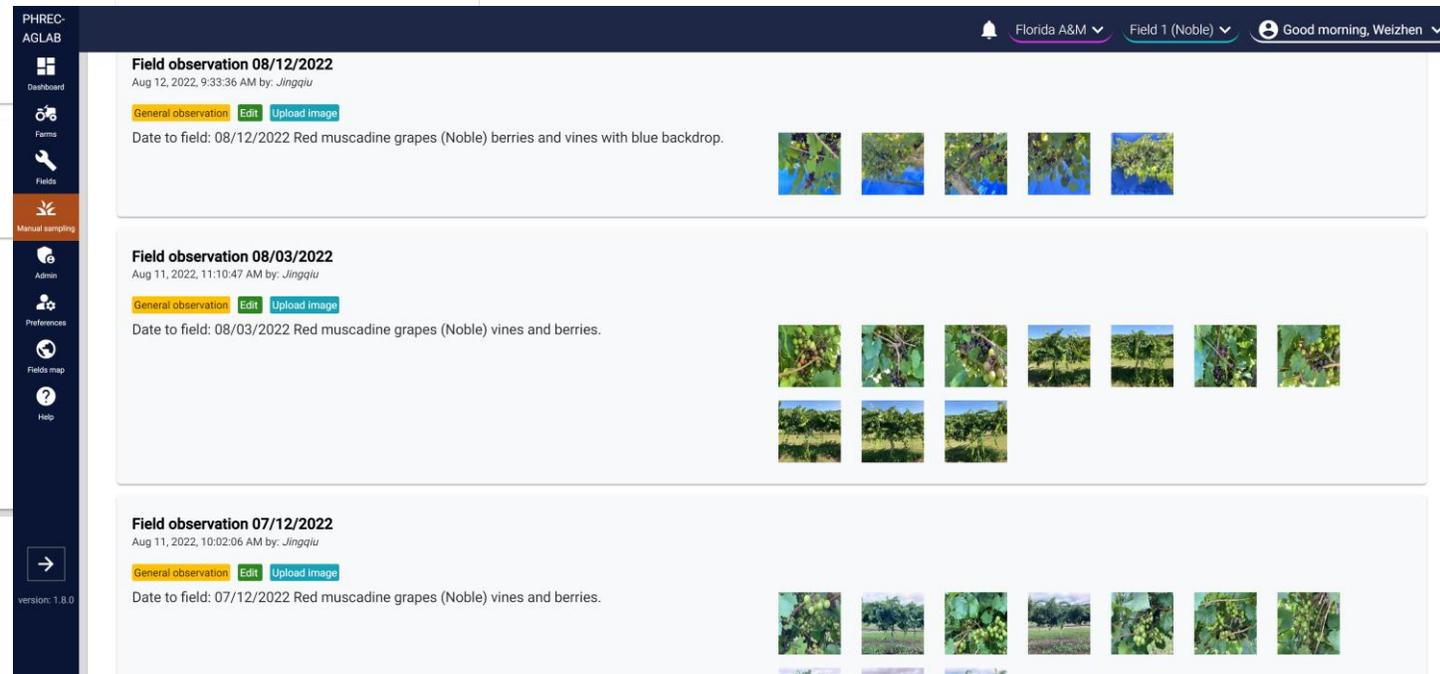
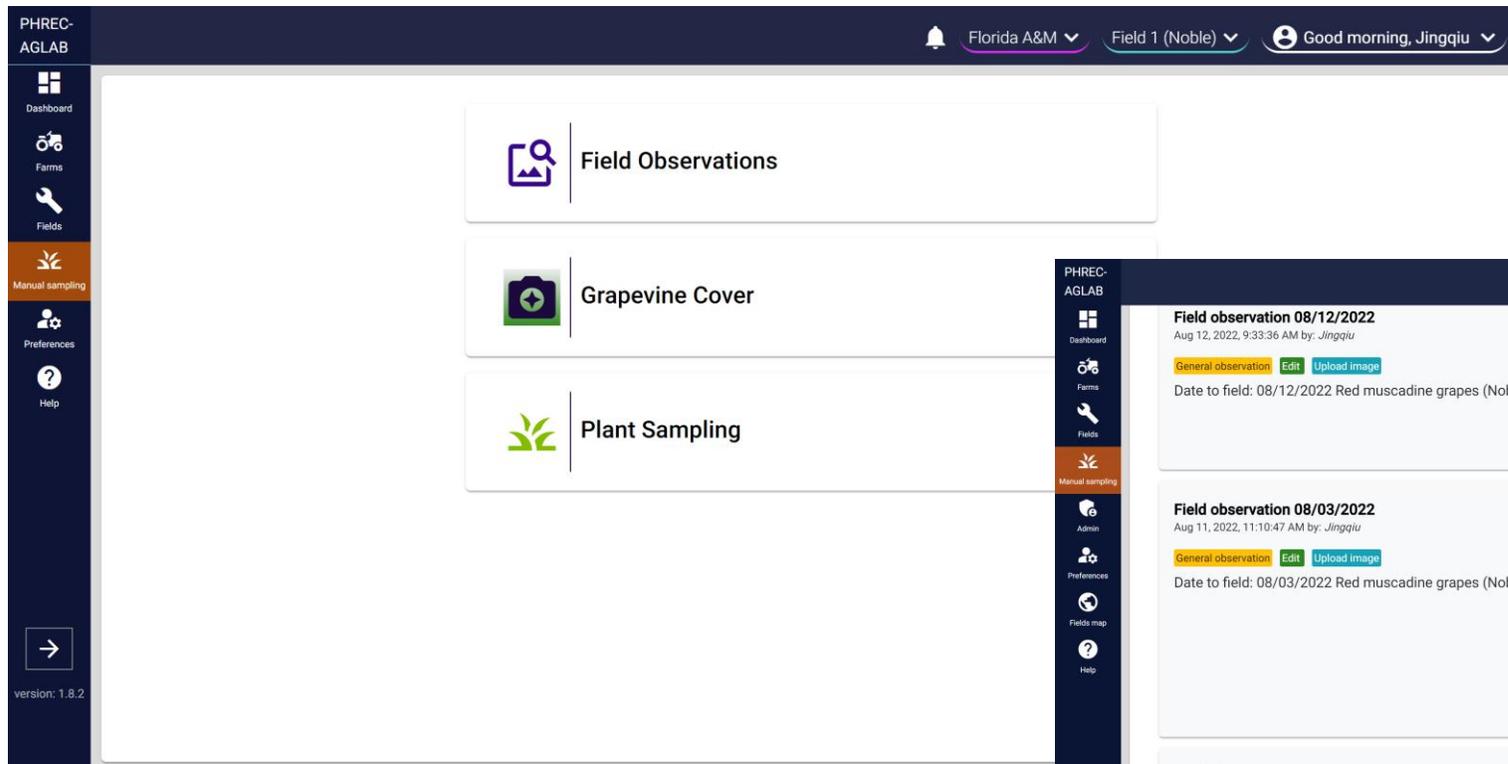
### Notifications

No new notifications

# Precision Agriculture Phenotyping Tool Development

Preliminary deliverable: <https://phrec-irrigation.com/#/>

## Field Observation



# Precision Agriculture Phenotyping Tool Development

Preliminary deliverable: <https://phrec-irrigation.com/#/>

## Grapevine cover

PHREC-AGLAB

Florida A&M | Field 1 (Noble) | Good morning, Weizhen

← Back

### Grapevine Canopy Calculator

Choose Files No file chosen

Extra description (Not required):  
Eg Plot 1, field top...

Date:  
08/19/2022 04:08 AM

PHREC-AGLAB

Dashboard

Farms

Fields

Manual sampling

Admin

Preferences

PHREC-AGLAB

Florida A&M | Field 1 (Noble) | Good morning, Weizhen

### Grapevine Canopy Calculator

Choose Files Grape2 8-12-2022.jpg

Extra description (Not required):  
test

Date:  
08/19/2022 03:54 AM

Canopy: 62.59% Grape: 19.24%

PHREC-AGLAB

Dashboard

Farms

Fields

Manual sampling

Admin

Preferences

Fields map

Help

→

version: 1.0.0

# Students' Experiential Learning in the vineyard and tool application

- August and September 2022: Five field visits at FAMU CAFS Center for Viticulture and Small Fruit Research
- Focused on two red varieties: Floriana (6) and Noble (5)
- Physiological parameters measurements: PH, Soluble Solids, and titratable Acidity
- Leaf Area Index Measurement



# Students' Experiential Learning in the vineyard and tool application

- August and September 2022: Five field visits at FAMU CAFS Center for Viticulture and Small Fruit Research
- Focused on two red varieties: Floriana (6) and Noble (5)
- Grape harvest and yield measurements
- Image acquisition
- Image data analytics using developed website
- Statistical analysis



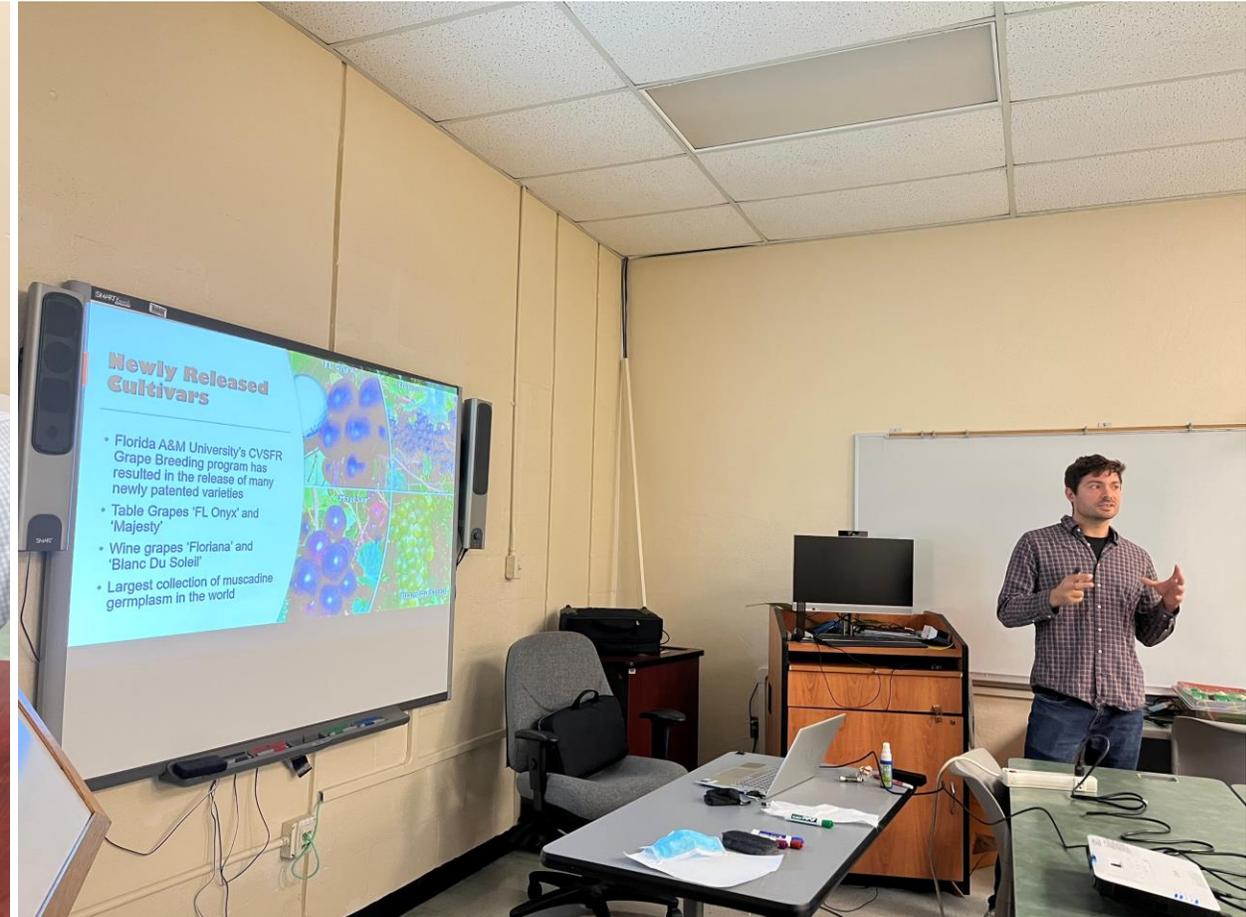
# Students' Experiential Learning on Extension and Outreach Using the Grapevine and Grape Detection

- August 20<sup>th</sup>, 2022: FAMU Grape Harvest Festival
- More than 500 event attendees viewed our website and about 50 participated in the “grape image collection competition” and tried our grape canopy and berry automatic detection function.
- More than 300 images were obtained from the field day uploading by the general public, and these images were used to refine the image processing algorithm.



# Students' Experiential Learning on the Muscadine Grape

- Guest Lecture of “A Taste of Florida Viticulture” by Mr. Frank Humphries on October 4<sup>th</sup>, 2022, at FAMU ABE 4034 Dr. Chen’s Class.



# Other Extension and Outreach Event Using the Grapevine and Grape Detection

- September 13, 2022: Resora, an oasis getaway, set on Cypress Pond Plantation at Albany, GA.
- Site visit at the Charles Sherrod Community Development
- Grapevine and Grape Detection Website showcase for future potential collaborations



# Outcomes

Other tangible deliverables include:

- (1) enhanced ABE 4034 Remote Sensing in Biological Systems Engineering course with leading-edge precision agriculture phenotyping educational modules in collaboration with cross-university experts;
- (2) an undergraduate research training program on precision agriculture phenotyping tools and applications for Minorities in Agriculture, Natural Resources, and related sciences at HBCU
- (3) Tailored public educational resources for underrepresented audiences including workshop and field day on precision agriculture phenotyping tools topic for FAMU 4-H Youth Development Summer Camp and for growers and producers to collect and analyze plant phenotyping data

# THANK YOU!

## Acknowledgement

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