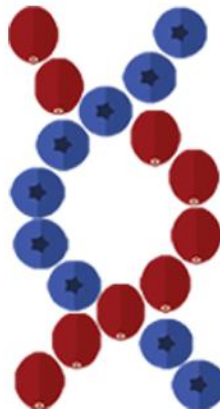
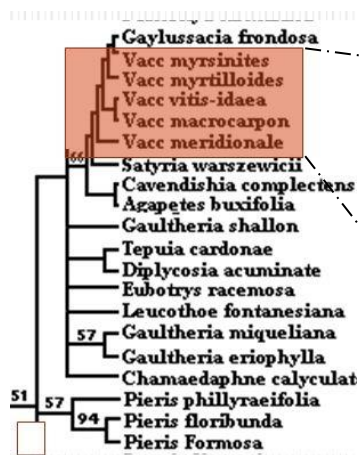


# What is the Vaccinium Coordinated Agricultural Project (VacCAP)?



- North America is the world's leading producer of blueberries and cranberries
- Consumers demand for fruit continues to increase

## Vaccinium



- **Cranberry**
- **Highbush blueberry**
- Rabbiteye blueberry
- Wild/low bush blueberry
- Lingonberry
- Bilberry

### Phenolics

- Hydroxycinnamic acids
- Flavonols
- Anthocyanin
- Pro-anthocyanin

### Terpenoids

- Iridoids

Anti-inflammation  
Anti-cancer  
Vascular protection  
Improve cognitive functions  
Glycemic control



[Blueberry health research](#)

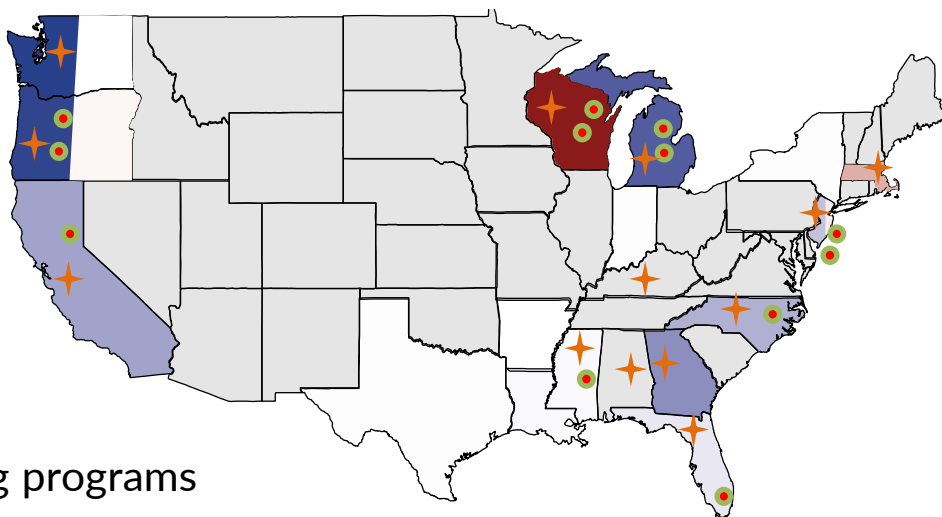


[Cranberry health research](#)

**Crop → Bioactives → Health**

# Blueberry and Cranberry Breeding

- Breeding is an industry top priority
- > 15 breeding programs in US, with >13 commodity groups supporting them
- No coordination (duplications and competition for limited federal funding)
- Breeding by traditional methods (phenotyping based)
- Limited DNA tools for Marker Assisted Breeding
- Limited standardized phenotyping methods



- Breeding programs
- ★ Commodity groups (e.g., grower associations)

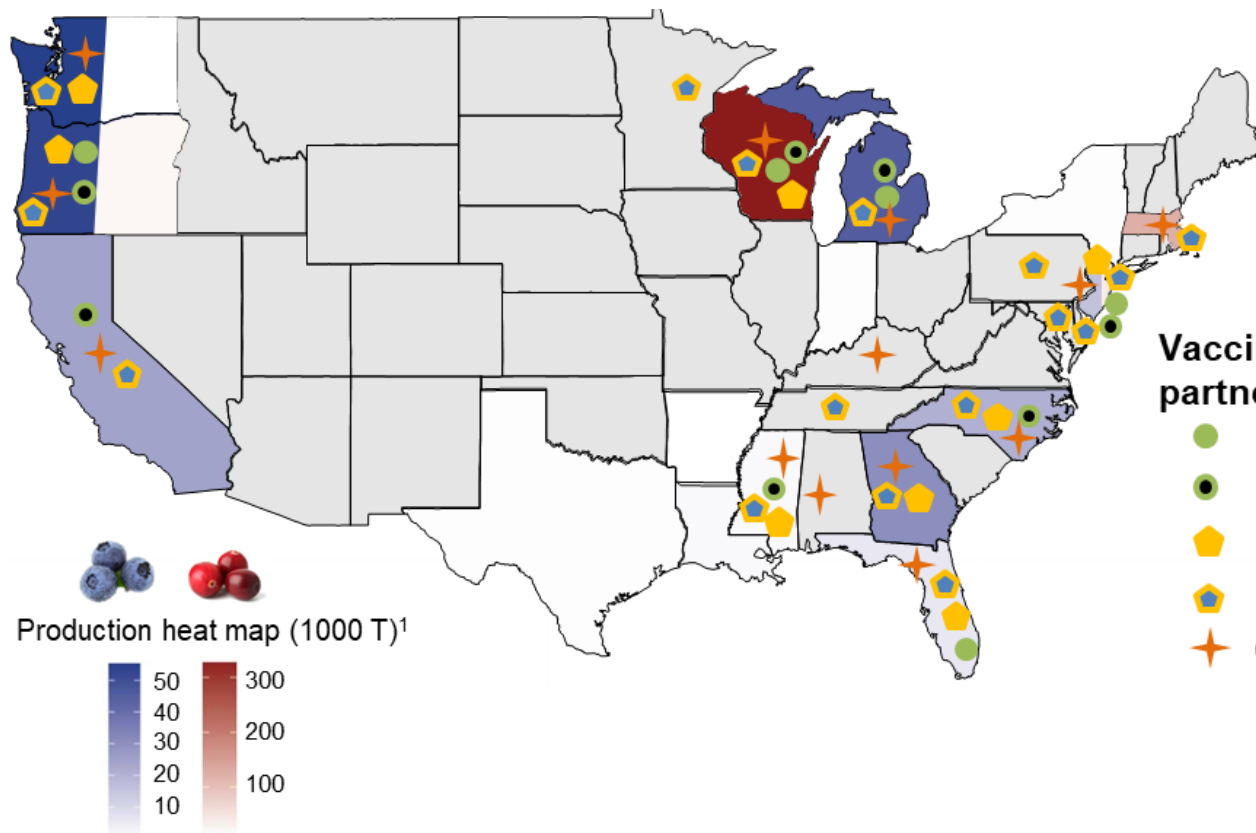
## Breeding targets:

- Disease resistance
- Pest resistance
- Fruit quality
- Stress tolerance
- Plant architecture and fruit attributes for machine harvestability

- Through a survey, improving fruit quality was highlighted as a top priority for the industry—prompting the establishment of VacCAP
- The Vaccinium Coordinated Agricultural Project (VacCAP) is a nationwide project aimed at developing new genetic tools to enhance breeding for improved fruit quality of cranberries and blueberries

**VacCAP**   
IMPROVING FRUIT QUALITY

## 2019-VacciniumCAP: Leveraging genetic and genomic resources to enable development of blueberry and cranberry cultivars with improved fruit quality attributes



**\$12.8 M**

\$6.4 M sponsor

\$6.4 M match

Team: 21 PIs, >50 partners, 25 institutions (US, Canada, New Zealand, Italy, Scotland)

# The Team

**UF** UNIVERSITY of FLORIDA



## 2. Discover

- Link DNA to FC
- Link FC to FQ (consumers, shelf life, mech. harvest)

## 3. Deliver

- DNA markers
- F1 progenies to pyramid FQ traits

## Fruit quality breeding

## 5. Engage

- Transfer deliverables
- Foster collaborations
- Evaluate project

## 4. Assess

- Link FQ and FC to economic value

## 1. Establish

- DNA tools



Edger



Bassil



Chagne



Espley



Gallardo



Canales



Main



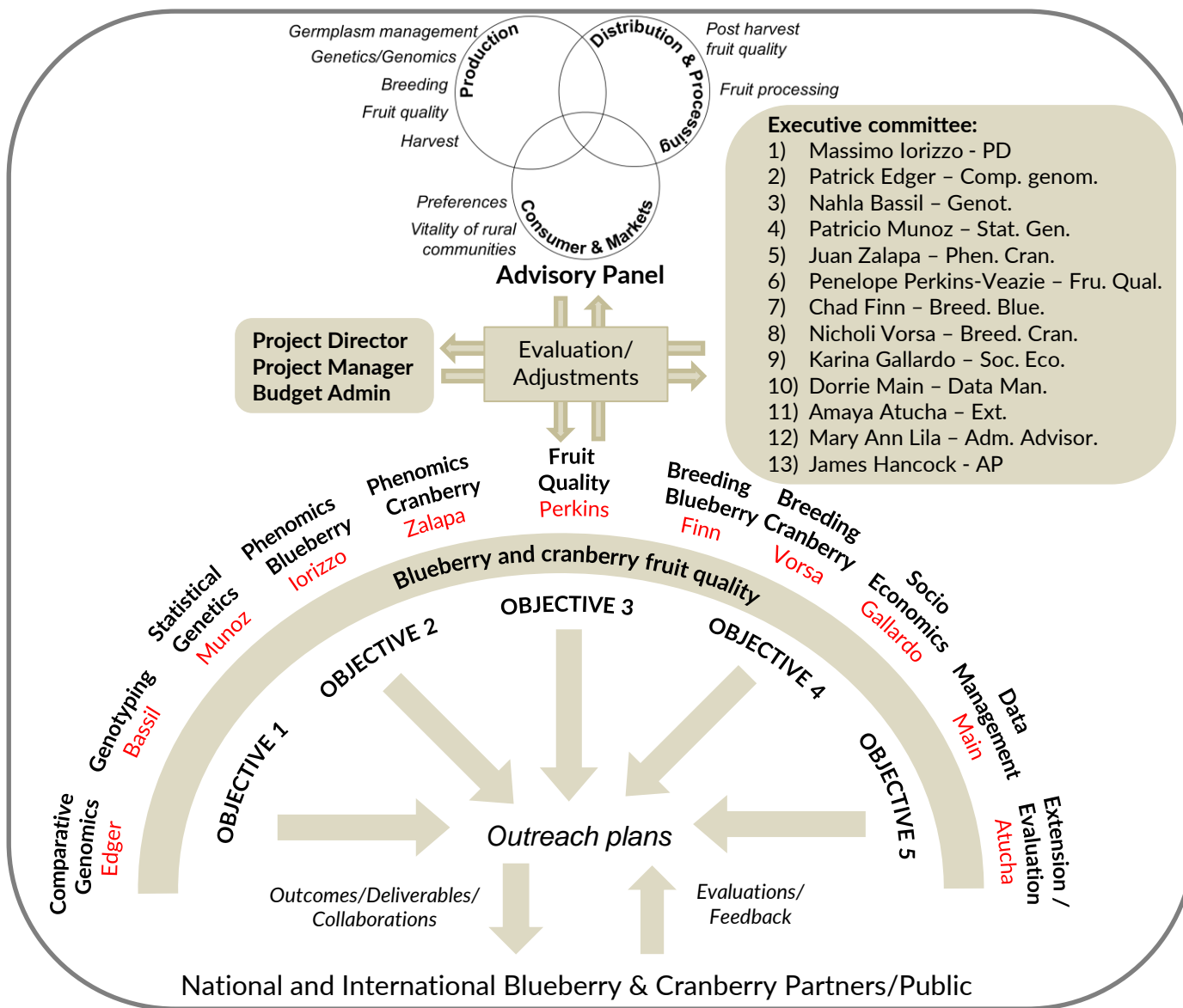
Wasko DeVetter



## Stakeholders

Breeders Allied scientists Mentees/Trainees Industry stakeholders

# Project Management



# Supporting Organizations



# VacCAP Advisory Panel

## Stakeholder Panel

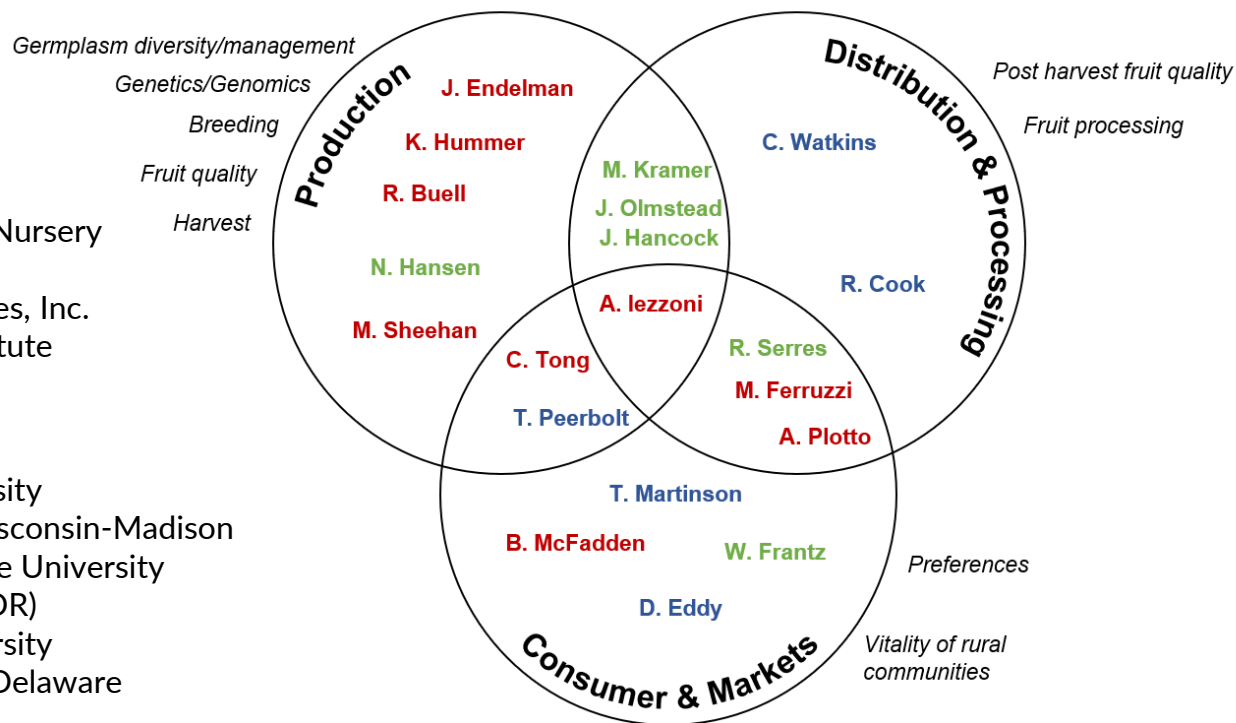
- James Hancock, Berry Blue LLC
- Nicole Hansen, Cranberry Grower
- Matt Kramer, Fall Creek Farm and Nursery
- James Olmstead, Driscoll's, Inc.
- Rod Serres, Ocean Spray Cranberries, Inc.
- William Frantz, The Cranberry Institute

## Scientific Panel

- Robin Buell, Michigan State University
- Jeffrey Endelman, University of Wisconsin-Madison
- Mario Ferruzzi, North Carolina State University
- Kim Hummer, USDA-ARS-NCGR (OR)
- Amy Iezzoni, Michigan State University
- Brandon McFadden, University of Delaware
- Anne Plotto, USDA-ARS (FL)
- Moira Sheehan, Cornell University
- Cindy Tong, University of Minnesota

## Extension Panel

- Rodney Cook, Ag-View Consulting, Inc.
- David Eddy, Master Media Worldwide
- Tim Martinson, Cornell University
- Tom Peerbolt, The Northwest Berry Foundation
- Christopher Watkins, Cornell University



DNA



200µm

(From Yung et al., 2018; Giongo et al., 2018)

## Fruit Characteristics (FC)

### Appearance:

- Size
- Shape
- Defect free (eg., disease, resistance to bruising)

### Texture:

- Firmness, softness
- Crispness

### Chemical composition:

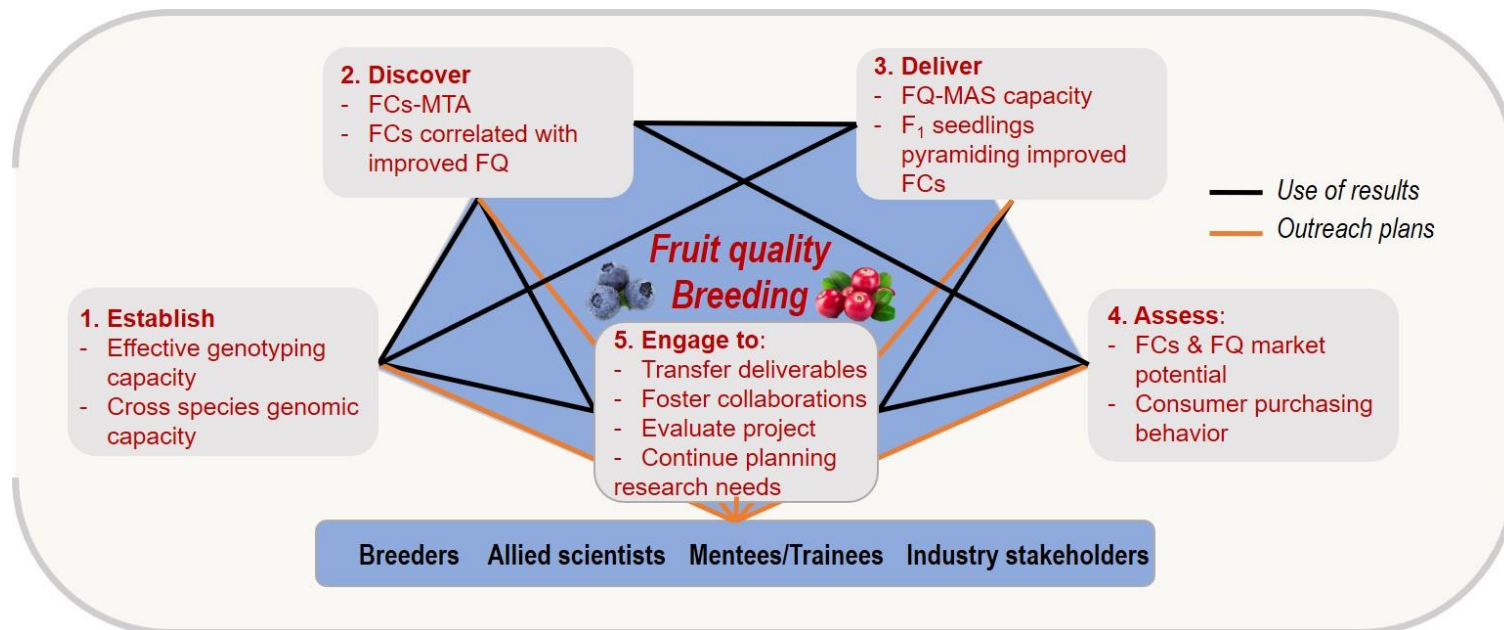
- Non-volatile (phytochemicals, sugar, organic acids)
- Volatile chemical composition

## Fruit Quality (FQ)

### Consumer experience:

- Taste
- Flavor/aroma
- Shelf life
- Health effects
- Consumer preferences and willingness to pay/buy

# Objectives



1. Establish genomic resources to enable effective association mapping studies in blueberry and cranberry
2. Discover DNA markers and fruit characteristics that maximize industry profitability and consumer preferences in blueberry and cranberry
3. Deliver molecular and genetic resources to improve blueberry and cranberry fruit quality traits that maximize industry profitability and consumers preferences
4. Assess the potential socio-economic impact of blueberry and cranberry fruit quality improvements on market demand
5. Engage U.S. Vaccinium breeders and stakeholder groups to transfer advanced phenomics and genomics tools to build a more efficient cultivar development system (in progress)

**Catch up on the latest news**

[Read more](#)

**What is VacCAP?**

The Vaccinium Coordinated Agricultural Project (VacCAP) is a nationwide coordinated transdisciplinary project focused on addressing major bottlenecks limiting the growth of the U.S. Vaccinium industry by developing and implementing marker assisted selection (MAS) capacity in breeding programs. This will enable breeders to select and pyramid fruit characteristics that positively contribute to fruit quality and market value. Long term, the scientific resources developed will increase production of fruit with improved characteristics that meet ever-changing industry, market, and consumer

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## Develop and integrate Website platforms

- Breeder tools, protocols
- Genetic and genomic resources and tools
- Advertise for events (webinars and workshops)
- Archived newsletters, and webinars

**News**

A Low Malic Acid Trait in Cranberry fruit: Genetics, Molecular Mapping, and Interaction With a Citric Acid Locus  
2021-02-01  
Summarized by: Josie Russo

**Authors**

Stephanie Kay Fong, Joseph Kovach, Yike Wang, Jennifer Johnson-Claude, James Polunchock, and Nichol Vorsa

*New Genetics & Genomes 17, 4 (2021)*

Piecing Together the Cranberry Genome Puzzle  
2021-02-01  
By Josie Russo

Over the last decade, Dr. Juan Zapata has been working on a puzzle—a 500-million-piece one. Zapata and others in his team—such as Luis Diaz-Garcia—are working to assemble the “Seymour”

**VacciniumCAP Twitter**

**Tweets** by @VacciniumCAP

VacCAP Released

**Blueberry Breeding** @BlueberryBreeding

Our colleague @Massimiliano1 presenting the @VacciniumCAP project to the NABC/US/IBC spring meeting! This project looks to further develop the genetics and genomics resources to improve the process of Vaccinium breeding!

**Newsletters**

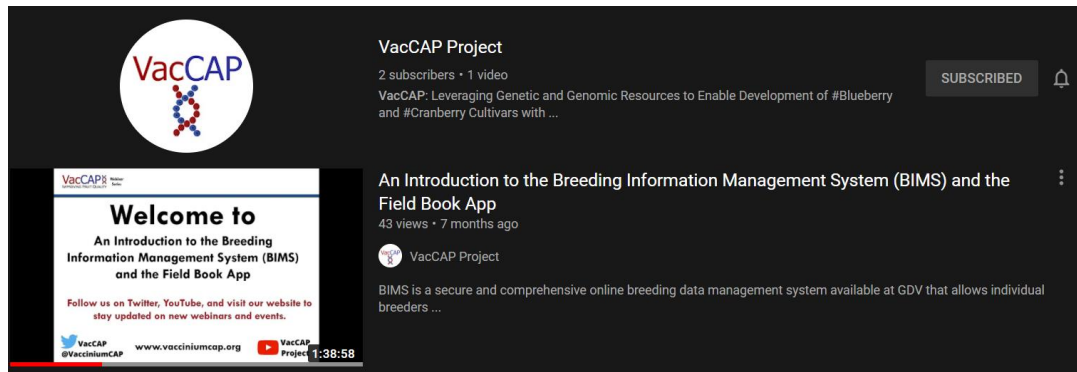
[Read the VacCAP newsletter](#)

**Project Outputs**

[Learn about the VacCAP project accomplishments](#)

[Read more](#)

[Read more](#)



## Newsletter

- Project activities
- Preliminary results
- Outcomes
- News
- Future Outreach events



## Webinars/video

- Phenotyping fruit texture
- Vaccinium Pan genome
- Introduction to breeding tools (GDV, Field book)
- Scoring SNP in polyploidy sp.
- Marker trait analysis in polyploidy sp.

- VacCAP project outputs will increase the knowledge of:
  - Cranberry and blueberry genome structure and evolution
  - Genetic mechanisms and genes controlling economically important traits including fruit characteristics
  - The relationships between fruit characteristics and fruit quality (shelf life, texture, bruising and sensory traits)
  - Consumer behavior and interests regarding blueberry fruit quality and cranberry products
  - New *Vaccinium* stakeholder priorities for the sustainability and profitability of the industry

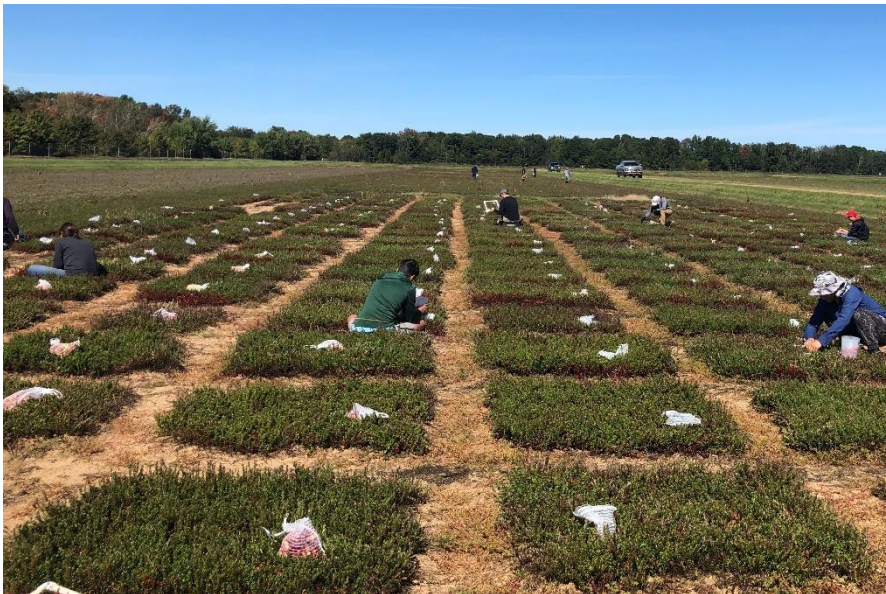


- VacCAP deliverables and outcomes will be used by the *Vaccinium* community for the following goals:
  - VacCAP DNA tools and phenotyping methods will be utilized by VacCAP PIs and the *Vaccinium* community worldwide to advance breeding and/or research programs
  - VacCAP outcomes will be used by growers, processors and distributors to plan production and distribution strategies
  - Funding of new off-shoot projects from VacCAP developed tools and deliverables with new collaborative alliances established



# What Success Would Look Like: Education

- The VacCAP team influences the next generation of breeders and scientists, increasing knowledge through collaborations:
  - MS/PhD students and post-docs are trained in plant breeding, genetics, fruit phenotyping, postharvest physiology, socio-economics, sensory analysis and extension practices, to become the next generation of breeders, scientists, and agriculture professionals



- Increased ability of blueberry and cranberry growers, processors and distributors to market a higher percentage of premium fruit using improved cultivars without increased production costs
- Increased consumption of blueberry and cranberry products in the US and worldwide due to improved fruit quality
- Increased efficiency of *Vaccinium* breeding programs for selection and improvement of fruit quality traits important to consumers and industry
- Increased profitability, competitiveness, and sustainability of *Vaccinium* industries

# Stay Engaged With Our Team

- Visit the [VacCAP web site](#)
- [Sign up](#) for and read our newsletters
- Find and use the latest genomic and breeding management resources on the [GDV website](#)
- Follow us on the Twitter account: [@VacciniumCAP](#)
- Subscribe to our YouTube channel: [VacCAP Project](#)

