2019

Extension Board of Public Overseers: Status and Challenges of the Cranberry Industry and Activities of the UMass Cranberry Station

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Extension for the Cranberry Industry

UMass Extension
Board of Public Overseers
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Outline

• Industry Overview
• Challenges for the industry
• UMass Cranberry Station activities
Cranberry natural history

- Native to North America
- Range north into Canada, south to NJ (further at elevation)
- South limited due to chilling requirement
Vaccinium macrocarpon
American or Large-Fruited Cranberry
Wetland plant, grown in converted or created wetlands
Perennial vine, trailing habit, fruit on upright shoots
U.S. Cranberry Production 2017

~ 42,000 A
RI / ME /CT small acreage
Additional production from Canada (0.33 M) & Chile (0.043 M)

Total US production: 8.321 million bbl
World Cranberry Acres: 2014

- Atlantic Provinces Canada
- Chile
- Washington
- Oregon
- New Jersey
- British Columbia
- Eastern Canada
- Wisconsin
- Massachusetts
How do we compare?

- Corn: 84 M acres
- Sorghum: 5 M acres
- Rice: 3.5 M acres
- Grapes: 1 M acres
- Cranberries: 0.042 M acres (~ 65 sq mi.)
Liechtenstein  (62 sq. mi.)

Marshall Islands  
(70 sq. mi.)
US Producing Acreage – Small Fruits
(1,000 acres)

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Acreage (1,000 acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cran</td>
<td>43.9</td>
</tr>
<tr>
<td>High Blue</td>
<td>96.2</td>
</tr>
<tr>
<td>Straw</td>
<td>67.5</td>
</tr>
<tr>
<td>Rasp</td>
<td>23.1</td>
</tr>
<tr>
<td>Black</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Source: NASS, 2012 Census Data
New England Acreage – Small Fruits
(1,000 acres)

Source: NASS, 2012 Census Data
Growing Cranberries in Massachusetts

- Urbanization
  
  3rd most densely populated state in US

- Competition for water resources

- Strict environmental laws at federal, state and local levels

- Lack of Agricultural literacy
  
  72% of consumers know little to nothing about agriculture

- Higher cost of production due to taxes, labor, land cost.

  MA costs 60% higher than Wisconsin
Growers produce fruit

WET harvest
PROCESSED

>95%

Frozen and stored

Cranberry Sauce
Dried Sweet
Juice
Cereals

Sells / Delivery to Handler
Ocean Spray, Decas, others

Bagged and sold to consumer

3-5%

DRY harvest
FRESH

Packaged and sold to consumer
Proximity to water resources
Massachusetts Cranberries

State total: 14,100 acres in 2017

Carver 3,400 acres
Wareham 1,600 acres
Middleboro 1,400 acres
Plymouth 1,200 acres
Rochester 1,100 acres

Estimates 2014
Demographics of MA Industry

- 70% of growers farm less than 20 acres

- Ownership: 25% of growers under age of 50; exactly half are 50-64 & 25% are 65+

- 22% of growers have farmed over 40 years

- 35% of growers are independent/commodity producers
Every acre of active cranberry bog is supported by roughly 3-4 acres of uplands and wetlands. Supports diverse wildlife habitat.

Provides for Climate Resilience
Flood Storage
Groundwater Recharge
Wildlife Habitat

62,000 Acres of Cranberry Lands
Neighbors
Multiple uses of water

Due to unique practices – gross water use averages ~10 acre/feet per year

~4 ft from rain, some recycling as well
Water is so central to production that 9 out of 25 BMPs published by Cranberry Station are directly related to **Water Use**

- **Management activities BMPs**
  - Flood management
  - Irrigation management
  - Frost management
  - Water control structures
  - Harvest management
  - Chemigation

- **Water protection / conservation BMPs**
  - Erosion and sediment control
  - Prevention of fuel and oil spills
  - Water resource protection and enhancement
Current Challenges/Opportunities

• Pest management
• Nutrient management and environment
• Water quantity and quality
• Market forces – the ‘perfect cranberry’
• Resilience in the face of climate change
• Sustainability
US Cranberry Prices 1980-2017
($/barrel)

2018: Prices < $15 for some growers

Prices per 100 pound barrel
Source USDA, AMS
Renovation is needed
Renovation

- Modernization
- Retooling
- Rehabilitation

- Removing old vine, squaring off bog, leveling. Cost $\geq 10,000/A
Water Savings

- Laser leveling surface
- Installing new irrigation system. $2,000–3,000/acre
- Low emission diesel engine $25–30,000

- Improved frost protection with computer automation
- Flooding utilizes majority of water resources; 40–50% reduction in water use
- Increased pesticide efficacy
Planting with Plugs

- Rutgers University varieties
  - Genetically Pure
  - Patented Hybrids (Non GMO)
  - Yield 350-450+ bbl/acre
  - Vine Cost $11-$13,000/acre
  - Royalties
Traditional Planting

• Non-Rutgers varieties
  – Stevens, Gryleski, Hy-Red
  – Cost $2,000-8,000/acre
MA Grower Experience

Yield per acre pre-renovation, compare to 3–4 year average post renovation.

![Bar chart showing yield comparison between pre and post renovation for three bogs: Bog 1, Bog 2, Bog 3.](chart.png)
Renovation Yield by Variety

2014-15 Yield per Acre

Large Fruit Varieties

Native Varieties

50% of Mass acreage

50% of Mass acreage

Barrels/Acre

Courtesy Ocean Spray Cranberries
Table 1. Percentage (and absolute value) of acreage planted in three designated groupings of cranberry varieties in Massachusetts.

<table>
<thead>
<tr>
<th>Variety grouping</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td><strong>Natives</strong></td>
<td></td>
</tr>
<tr>
<td>(Early Black + Howes)</td>
<td>66% (4,708 A)</td>
</tr>
<tr>
<td><strong>Hybrids</strong></td>
<td></td>
</tr>
<tr>
<td>(Ben Lear + Stevens)</td>
<td>27% (1,929 A)</td>
</tr>
<tr>
<td><strong>Super Hybrids</strong></td>
<td></td>
</tr>
<tr>
<td>(Mullica Queen+Crimson Queen+ Demoranville)</td>
<td>1% (66 A)</td>
</tr>
</tbody>
</table>

Data from Ocean Spray Cranberries, Inc., which represents approximately 60% of the MA cranberry acreage. The yearly percentage data are based on 7,099, 7,253, 7,880, and 7,593 acres, respectively. Mixed and unknown varieties make up the difference from what is represented by the three groupings.
Using a no-till planter
Sanding on ice
Barge sanding
Bog, Pump House, and Reservoir
Pump house and shut-off valves
Injection Port System (permanent)

Vacuum relief valve, irrigation line check valve, low pressure drain
Truck-mounted chemigation system
Dormant vines

Goal:
85% uniformity
Pop-up heads

Impact heads
Low – gallonage Boom Set-up
Aerial applications by helicopter

Efficacy dependent on pilot skills
Backpack sprayers
Hand-gun spray applicator
Innovative wiper (NJ)

Many applicators are hand-made
Adapted walk-behind sprayer
UAVs for applying materials or aerial scouting
HARVEST
Wet Harvesters
Walk-Behind
UMass Cranberry Station conducts critical research and provides practical applications to growers.

Established 1910

2 working cranberry bogs, 18 acres, research sites and retained revenue.
Rocky Pond Bog in Myles Standish Forest – operated by the UMass Cranberry Station
View as entering State Bog Road parking lot from Spectacle Pond Road. Gray Administrative Building and Green Lab Building beyond. Survey was conducted on 05/13/2016.

Panoramic view of Lab and Administrative Buildings from the State Bog Road parking

Front view of the Lab Building from the Spectacle Pond Road.
Research at the UMass Cranberry Station:
Find solutions to real-life problems
Our Mission

• Maintain and enhance economic viability of MA cranberry industry through research and extension.

• To serve public welfare by supporting economic development and protection of the environment.
Cranberry Station Staff


- Extension Professors
- Technicians (FT/PT)
  - Support Staff (FT/PT)
  - Graduate Students
  - Seasonal help
Graduate Students
Summer Helpers
Pest Management is Fundamental to producing high quality fruit
Cranberry Entomology

• Dr. Anne Averill and Ms. Marty Sylvia

Insect behavior
Reduced risk insecticides
Cultural management
Pollinators
Emerging insect pests
Scale insects
Cranberry fruitworm: new management recommendations
Native bee species are very diverse
Getting ready to spray
Paul Robbins, visiting scientist from Cornell, digging grubs
Plant Pathology

• Dr. Sai Sree Uppala
  – Fruit rot disease
    • Fungicide timing, resistance management
    • Epidemiology
    • Forecasting
    • Maximum residue levels (MRLs)
Fungal fruit rot

- Up to half of all pesticide applications
- Biggest impediment to producing high quality fruit demanded by handlers
- Interacts with heat stress
- Predicted to worsen with climate change
Spraying fungicide plots for fruit rot
Fairy ring disease
Phytophthora root rot
Integrated Pest Management / Weed Biology

- Drs. Hilary Sandler and Katie Ghantous
  - Managing dodder
  - Weed ecology
  - Perennial weed management:
    - Poison ivy
    - Dewberries
    - Grasses
Dodder – “Priority 1” Weed
Poison Ivy: Severe infestation and treated area
Poverty Grass
(Andropogon virginicum and Schizachyrium scoparia)

Little Blue Stem
Broom sedge
Poverty Grass
(Andropogon virginicum and Schizachyrium scoparia)

Little Blue Stem
Broom sedge

Persists even in winter conditions!
Flame Cultivation
(thermal weeding)

• Ideal for:
  - Organic systems
  - Herbicide resistant weeds
  - Ecologically sensitive areas
Using FC to manage emerged dodder in NJ
Whole Plant Physiology

• Dr. Peter Jeranyama
  – Crop water stress index
    plant water use / needs
  – Photosynthesis and
    crop production
  – Automated frost management
Frost management
Automated Intermittent Cycling

- Pump starts automatically, based on temperature settings
- Pumps then cycle on and off as temperature fluctuates
New technology – more efficient, improved production

- frost protection
- tensiometer
- weather monitoring
- soil moisture status

Soil: Sandy Soil
Water Content: 20%
Soil Tension: 5 cbar
Result: Non-stressed Plant
Cranberry Hydrology

- Dr. Casey Kennedy
  USDA ARS
  - Quantifying water use
  - Improving water quality
  - Drainage study with Cranberry Station faculty team
Installing H-flume at Rocky Pond
Installing flow meters
Securing flow equipment
Horticulture

• Dr. Giverson Mupambi
  – Canopy Management
  – Fruit Color
  – Firmness
    • Driven by handler demands
  – Use of Plant Growth Regulators
Grower – made Pruner with Rear Rake
Extension Activities at the Cranberry Station
Extension Activities

• Workshops: Annual and special
• Fact sheets / management guides
• Lengthier publications
• Diagnostic services
• Web site; IPM phone updates
• IR-4 work / EPA permits
• 1 – on – 1 assistance
• Insurance claims
Tech support... I’d like to report a FARMER IN THE DELL!

12% do not own a computer
5% do not own a cell phone
Use of Electronic / Social Media

From January 2013 survey
Every Spring, we publish the Cranberry Chart Book Management Guide.

Distributed free to all cranberry growers in Massachusetts.

Available as PDF.
BMPs

• Station, Industry and NRCS scientists draft BMPs. Focus was balance btw hort & env requirements.
• Grower org. supported BMP adoption.
• Research to fill gaps.

Available on our web site: www.umass.edu/cranberry
Discussing planting density and weed management
New Extension Activities

• Web-based reporting and monitoring systems for pest management
• YouTube videos and Facebook
• On-line webinars and education
• Twitter: not quite there yet.
Oversight Committee

- 3 Members of Legislature
- 3 Representatives from the University
- 3 Growers

- Meets quarterly
- Charged with maintaining the scientific credibility of the Station ensuring work performed serves to maintain economic viability of the industry
Rep Wm Straus  
Chair

Senator Michael Rodrigues

Ag Commissioner  
John Lebeaux

Jody Jellison  
UMass-Amherst

John Hoey  
UMass-Dartmouth

Linda Rinta  
Grower

Jeff Kapell  
Grower

Peter Beaton  
Grower
Plans for New Building

Feasibility Study done in 2016
$5M supported in Environmental Bond Bill
But not yet funded
Feasibility Study

• Convert current library to 2 labs
• Move Admin offices
• New Conference Room
• 2 new faculty offices
• Pesticide Preparation room
USDA NIFA Crop Protection Pest Management Program (CPPM)

• supports projects that will ensure food security and respond effectively to other major societal pest management challenges with comprehensive IPM approaches that are economically viable, ecologically prudent, and safe for human health.

• addresses IPM challenges for emerging issues and existing priority pest concerns that can be addressed more effectively with new and emerging technologies.
CPPM

• IPM Centers
• Applied Research and Development Program (ARDP)
• Extension Implementation Program (EIP)
  – UMass EIP Team: Small fruit, Tree fruit, Vegetables, and Cranberry
  – 3-year grants, up to $900K
    • EIP14: $564K
    • EIP17: $867K
UMass EIP

- Supports 2-3 FTE for Professional staff
- Actively engages 8 Extension Educators, Extension Faculty and Tenured Faculty
- Trains summer students and growers

Ben Jankowski and Susan Scheufele set up pheromone traps to monitor sweet corn pests
Stakeholder Contacts-2018

- Extension personnel gave 78 IPM presentations to >2,900 growers
- >4,200 growers informed about IPM through newsletters, emails, webinars
- 6 peer-reviewed publications
- 13 non-peer reviewed publications

Katie Campbell-Nelson giving presentation on soil health
Fig. 1. 2016 survey data. Percentage of Mentor Farmers who indicated their knowledge and confidence increased either moderately or largely as a result of working with UMass IPM team.
Fig. 2. Top 3 priorities identified by EIP Stakeholder Advisory
CAFÉ Integrated Research and Extension Project

- Documenting the genetic variation of dodder species in MA cranberry bogs to optimize efficacy of dodder management
- Caicedo and Sandler, $40K
- Collaboration in truest sense
CAFÉ Summer Scholar Jacob Scott

Dr. Ana Caicedo
Biology
Research and Extension Experience for Undergraduates (REEU)

- Led by U. Maryland - $279K
- Collaboration of:
  - 1862 Institutions
  - 1890 Institutions
  - NE IPM Center
- Mentor 1-2 students over next 2 years
  - 1 Extension project
  - 1 Research project

Part of the USDA AFRI Program (Ag and Food Research Initiative)
Summary

• **Services provided to industry**
  – Projects geared specifically to needs.
  – Multidisciplinary staff are cranberry-focused.
  – 1-on-1 help provided on daily basis.
  – Highly competent staff are committed to serving industry in professional manner; **integrity**!
  – Station located in center of production area.
• **Challenges to Cranberry Production**
  – Farming in wetlands and suburbia
  – Economic fluctuations
  – Export restrictions / product development
  – Increasing concerns re: water quality / quantity
  – “Micro” crop
  – Numerous pests; perennial pests
  – Resistance management
  – “Learning curve” re: production practices
  – Few scientists work on cranberry
Questions?