Cornell CALS
Life-Changing Research, Education and Outreach

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The Land Grant Mission in 2018: Why R&D innovation in ag matters to farmers & consumers in the future

In the year 2050, the world population will require 100% more food, and 70% of this food must come from efficiency-improving technology.
Rates of Groundwater Change in the US
Projections
Source: ClimAid, NYSERDA, DEC

Figure 1. Observed increase in precipitation 1958-2010.9

<table>
<thead>
<tr>
<th>Extreme event</th>
<th>Baseline</th>
<th>2020s</th>
<th>2050s</th>
<th>2080s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of days per year with max. temp. exceeding 90°F</td>
<td>10</td>
<td>14 (17 to 22) 23</td>
<td>22 (27 to 41) 50</td>
<td>27 (35 to 70) 82</td>
</tr>
<tr>
<td>95°F</td>
<td>1</td>
<td>1 (2 to 4) 7</td>
<td>3 (3 to 10) 18</td>
<td>3 (6 to 25) 42</td>
</tr>
<tr>
<td>Number of heat waves per year</td>
<td>1</td>
<td>2 (2 to 3) 4</td>
<td>3 (4 to 6) 7</td>
<td>4 (5 to 8) 9</td>
</tr>
<tr>
<td>average duration</td>
<td>4</td>
<td>4 (5 to 5) 5</td>
<td>5 (5 to 6) 6</td>
<td>5 (5 to 7) 9</td>
</tr>
<tr>
<td>Number of days per year with min. temp. ≤ 32°F</td>
<td>155</td>
<td>123 (127 to 136) 139</td>
<td>98 (104 to 119) 125</td>
<td>77 (84 to 109) 120</td>
</tr>
</tbody>
</table>

7. Saratoga Springs (Region 5). Full range of changes in extreme events: Low Estimate (10th Percentile), Middle Range (25th – 75th Percentile), High Estimate (90th Percentile).
The Next Norman Borlaug?

The Green Revolution in India

![Graph showing the Green Revolution in India with lines for Rice and Wheat production increasing over years from 1950 to 1980.]


Population (billions)


- Least Developed Countries
- More Developed Countries
- Less Developed Countries

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Why does this matter to your farm?

- Assuming favorable free trade conditions, there’s a lot of economic opportunity for NY farmers in the coming decades.
- We will have water.
- We will have reasonable weather.
- We will have access to markets.
But will we have technology?

Oklahoma State University survey in 2015 found that 80% of Americans surveyed believed that all foods containing DNA should be labeled.
Oklahoma State Food Demand Survey - Consumer Concerns

Awareness of Food Issues

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One-in-six Americans care a great deal about the GM foods issue

% of U.S. adults who say they care _____ about the issue of genetically modified foods

<table>
<thead>
<tr>
<th>A great deal</th>
<th>Some</th>
<th>Not too much</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>37</td>
<td>31</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Respondents who did not give an answer are not shown.
Source: Survey conducted May 10-June 6, 2016.
“The New Food Fights: U.S. Public Divides Over Food Science”
PEW RESEARCH CENTER
Land Grant Foci

- Digital Agriculture
- Plant Breeding
- CEA
- Food Science
Digital Ag Tools from Cornell

**FARMVIEW**

Ever wonder what type of soil your field has on it? Well wonder no longer! Our FarmView lets you find your fields on a map and view soil data, precipitation data and more! Sign up for an account, so you can save your fields for next time as well.

CHECK IT NOW

**JOHN DEERE OPERATIONS CENTER CONNECTED**

Ag-Analytics.Org @Cornell Integration with the John Deere Operations Center will allow farmers to securely and seamlessly integrate their precision agriculture data to extract deeper intelligence with the Ag-Analytics risk tools.

INTEGRATE WITH DEERE

**CROP INSURANCE**

We strive to be your all-in-one information resource on crop insurance. Better yet, all of our information can be accessed using your mobile device.

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**FloraPulse**

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**Cornell CALS College of Agriculture and Life Sciences**
Improving Vineyard Management Using Touch Sensitive Robots
Justine Vanden Heuvel and Kirstin Petersen
Plant Breeding

Cayuga White – 1972
Geneva

Licensed by Double A Vineyards – Fredonia, NY

2011 production almost
2,000 tons, 2 million bottles

2011 production almost
2,000 tons, 2 million bottles

Ruby Frost
COOL • CRISP • CRAVEABLE

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Controlled Environment Ag - CEA
Food Science Innovation

Sam Alcaine, M.S. '07, assistant professor in the Department of Food Science, pours batches of alcohol brewed from acid whey. The various colors are derived from fruit and other natural ingredients added to the beer. Photo by Patrick Shanahan.
Company was founded – then called CherryPharm. Cornell partnered with founder to develop shelf-stable drink that retains anti-inflammatory, muscle-damage recovery powers of tart cherries.

Development with Cornell Food Venture Center began and product was finalized in November 2006.

CherryPharm begins selling products in stores. Moved to Cornell Ag and Food Tech Park as 1st tenant. Hired Cornell graduate student as director of product development.

CherryPharm changes name to Cheribundi.

Cheribundi attracted first major retailer – Kroger. Provide more manufacturing space at Tech Park to handle growing sales.

Costco, Target, and Walmart start selling Cheribundi. Sales jumped from $3 million to $15 million. Production went from 2-3 days a week to 7 days a week.

Cheribundi and Cornell Tech Park worked to relocate to new facility; a $4M investment. Added 35 jobs for total of 56 FT employees. Contributes to ag jobs across NYS and Michigan for total of 8M lbs. of cherries. ESD provided $700K in grants.

Over 200 pro and college teams use Cheribundi for pain relief, faster muscle recovery, and better sleep. Available in retailers nationwide. $20M in revenue and growing.

Love Beets partners with Cornell on vegetable disease management. Wegmans & Krogers sell Love Beets in US.

Love Beets expands distribution to 7K stores in North America.

Love Beets partners with LiDestri to build US plan and receives financial support from NYS.

Love Beets opens plant in Rochester, NY. Buys some beets from NYS farmers. Partners with new Cornell Tech Park tenant – Assured Edge Solutions – to turn beet byproduct into beet powders.

Love Beets grows employment to 125 FTE and helps beet farmers improve grow techniques and yields. More beets bought from NYS farmers resulting in $26M in sales.

Love Beets announces expansion of product lines and commits to adding 100 jobs in Rochester and buying most of its beets from local farmers. Partnering with NYS farmers to develop new products (radishes, etc.)
The Land Grant Mission in 2018: Why R&D innovation in ag matters to farmers & consumers in the future

In the year 2050, the world population will require 100% more food, and 70% of this food must come from efficiency-improving technology
Private vs. Public R&D

Private sector and public sector funding of R&D begins to diverge significantly in the early 2000s.

Annual spending on research is adjusted for inflation by a research price index constructed by ERS. R&D = research and development.

R&D Trends

• Since 2009 China has been outpacing the US in public spending on Ag R&D

• Brazil and Argentina spend more than US on Ag R&D

• In 2011, for the first time, over half (52%) of the Ag R&D on crop breeding, informatics, fertilizers, pesticides and food tech in rich countries was done by the private sector

• Since 2015 researchers in China have filed for more patent protections/licenses than researchers in the United States (not ag specific)
Less Research = Less Innovation

**USDA R&D, FY2014**

- ARS: $1,200 Millions
- NIFA: $800 Millions
- Forest Service: $400 Millions
- ERS: $200 Millions
- Other: $100 Millions

**Total R&D by Agency, FY2014**

- USDA: $30 Billions
- NSF: $15 Billions
- DOE: $10 Billions
- NASA: $5 Billions
- NIH: $1 Billion
R&D represents slightly less than 2% of the last Farm Bill

What's in the farm bill? (Costs from FY2014-2023)

- Food stamps and nutrition, $756 billion
- Crop insurance, $89.8 billion
- Conservation, $56 billion
- Commodity programs, $44.4 billion
- Everything else, $8.2 billion

NYS Matters

**Figure 1**

**RESEARCH EXPENDITURES - FY06 TO FY16**

- **FY06**: $119.8M
- **FY08**: $150.1M
- **FY10**: $174.4M
- **FY12**: $181.3M
- **FY14**: $198.5M
- **FY16**: $201.2M

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Questions?