Plant Breeding
Recruitment and Education:
A Puerto Rico-North Dakota Collaborative Initiative

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Plant Breeding is Many Activities

- Collect germplasm (public)
- Research new breeding methods (public)
- Develop improved germplasm (public, private)
- Release new varieties (public, private)
- Training students (public, private?)
2002 Survey of 71 Landgrant Universities
(Wehner and Guner, Crop Science 2002)

- 47 universities have plant breeding programs
  - 53% of graduates from just 7 universities
- Public plant breeders remaining are poorly funded
  - Retiring public breeders often not replaced because of emphasis on basic (molecular biology) vs. applied (plant breeding) science
  - Fewer plant breeders/plant breeding research = fewer plant breeders being trained
# Plant Breeding Degrees Per Year

<table>
<thead>
<tr>
<th>All universities</th>
<th>US</th>
<th>International</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Ph.D.</td>
<td>M.S.</td>
<td>Ph.D.</td>
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<tr>
<td>All universities</td>
<td>124</td>
<td>25</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>1. U Wisconsin-Madison</td>
<td>12</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2. North Carolina State U</td>
<td>11</td>
<td>1</td>
<td>4</td>
<td>4</td>
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<tr>
<td>3. U Nebraska-Lincoln</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>4. Cornell U</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>5. U Minnesota</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6. Iowa State U</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7. Texas A&amp;M U</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Michigan State U</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9. North Dakota State U</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10. Oregon State U</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>15. U Puerto Rico-Mayaguez</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
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</table>
Does Demand for Plant Breeders Exceed Supply?

- 3000 plant breeders in U.S.
- To maintain current levels we need 100 new graduates/year (based on a 30 yr career)
- We graduate only 50-60 per year
- National need to educate more plant breeders (Ph.D. and M.S.) and plant breeding technicians (B.S.)
Plant Breeders Have Taken Action!

2002 - Wehner & Gruner paper published
2003-2004 – Group discussions at national horticulture & agronomy meetings
2005 – Michigan State Workshop on Plant Breeding Education
2006 - Plant Breeding Coordinating Committee (PBCC) formed
   Multi-state coordinating committee (SCC-080)
   National in scope, membership open to all (public, private)
February 2007 - First PBCC workshop held in Cary, NC
   Plant breeding education becomes a major action area
2008, 2009 – annual meetings of the PBCC continued
2009 – National Association of Plant Breeders formed (allows advocacy)

THIS APPROACH CAN BE TRANSFERRED TO OTHER DISCIPLINES
Plant Breeding in Puerto Rico
Why a PR-ND collaboration?

- **Puerto Rico**
  - Very small plant breeding program (only M.S. level)
  - Insular
  - 365 days a year for plant breeding

- **North Dakota State**
  - Among top 10
  - Difficulty in recruiting both U.S. and international Ph.D. students (Fargo in the winter!)
How was collaboration developed?

- **Summer 2004** – first formal meeting in Fargo
- **Winter 2005** – NDSU breeders and administrators visit PR
- **Fall 2005** – Formal MOA signed (for Collaborative Plant Breeding PhD program)
- **All steps included participation of committed faculty from both institutions**
Funding Sources

• Initial problem: finding common research interests
• USDA-NIFA-Hispanic Serving Institutions Education Grants Program
  – Awarded a multi-institution grant in 2006
• USDA-NIFA-AFRI
• NSF
• Dept. Plant Sciences, NDSU
Objectives – HSI Project

• The overall goal of the project is to recruit and train Puerto Rican students for careers in plant breeding.

• Unstated goal for NDSU: Recruit graduates from the University of Puerto Rico at Mayaguez into graduate programs at NDSU
Specific Objectives

- Promote careers in plant breeding
- Undergraduate plant breeding research
- Support students at M.S. and Ph.D. level
- Upgrade laboratories at UPRM.
- Plant breeding courses and curriculum for a UPR plant breeding Ph.D. program.
- UPRM faculty professional improvement
Promote Careers in Plant Breeding

- Visits to schools, agricultural fairs, field days
Promote Careers in Plant Breeding

- Plant Breeding Career Days (undergrads)

Pioneer Hi Bred, Salinas, PR
Undergraduate/Graduate Student Research & Support

- NDSU summer internship program
Undergraduate/Graduate Student Research & Support

- UPRM BS & MS research projects
Undergraduate/Graduate Student Research & Support

• Support to attend professional meetings
Graduate Student Training

- M.S. assistantships and research support (6 students)
- Ph.D. assistantship at NDSU
Faculty Professional Improvement

• Large number of M.S. level faculty at Mayaguez
  – Evaluate and maintain germplasm collections
  – Participate on Graduate Committees

• Two workshops
  – “Introduction to Plant Breeding Concepts and Their Application to Genetic Resource Management”
  – “Introduction to Molecular Markers for Germplasm Evaluation”
Impact to Date:

- >500 high school students have learned about plant breeding & career opportunities in plant breeding
- >30 students have improved their English speaking skills, learned about temperate ag systems and/or acquired new skills by traveling outside PR
- Undergraduate students from Biology are enrolling in plant breeding
- Applications for M.S. program in plant breeding has increased
- Better trained faculty
- 7 former UPR-Mayagüez students are enrolled in the Ph.D. program at NSDU (6 in plant breeding, 1 assistantship paid by HSI project)
Impact to Date:

- “The University of Puerto in Mayagüez is a top agricultural school that turns out a steady stream of quality scientists and agronomists.”
  - John Schoper, Pioneer Vice President (April 2010)

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**Pioneer Hi-Bred to expand R&D in Puerto Rico**

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The Puerto Rico Industrial Development Co. (Pridco) and Pioneer Hi-Bred, a DuPont business, announced plans Tuesday to establish a second Pioneer research & development center in Salinas.