

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?)



Plant Breeding Education at Beginning of New Millennium

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 1995 – 2000 (Wehner & Gruner, 2002)

	Total	US		International	
		Ph.D.	M.S.	Ph.D.	M.S.
All universities	124	25	34	40	24
1. U Wisconsin-Madison	12	4	3	3	3
2. North Carolina State U	11	1	4	4	2
3. U Nebraska-Lincoln	10	1	2	5	3
4. Cornell U	9	3	1	5	1
5. U Minnesota	8	3	2	2	1
6. Iowa State U	7	2	2	2	1
7. Texas A&M U	7	1	2	3	1
8. Michigan State U	6	2	2	1	1
9. North Dakota State U	5	1	2	2	1
10. Oregon State U	5	1	1	3	1
15. U Puerto Rico-Mayaguez	3	0	1	0	2

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



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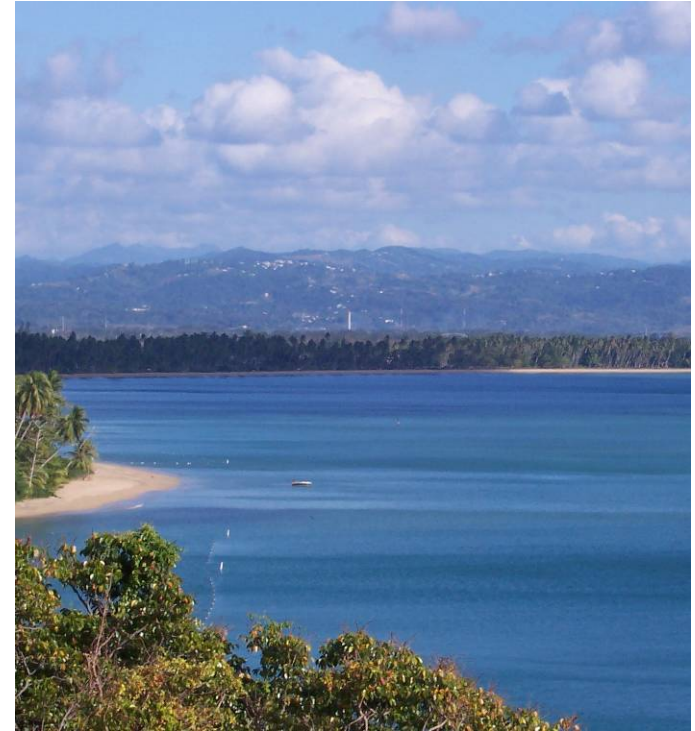


Bayer CropScience

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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**



United States
Department of
Agriculture

National Institute
of Food and
Agriculture



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**



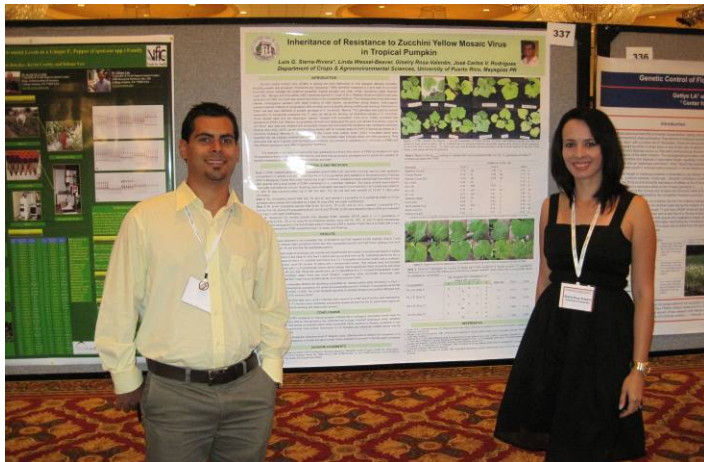
Undergraduate/Graduate Student Research & Support

- **UPRM BS & MS research projects**



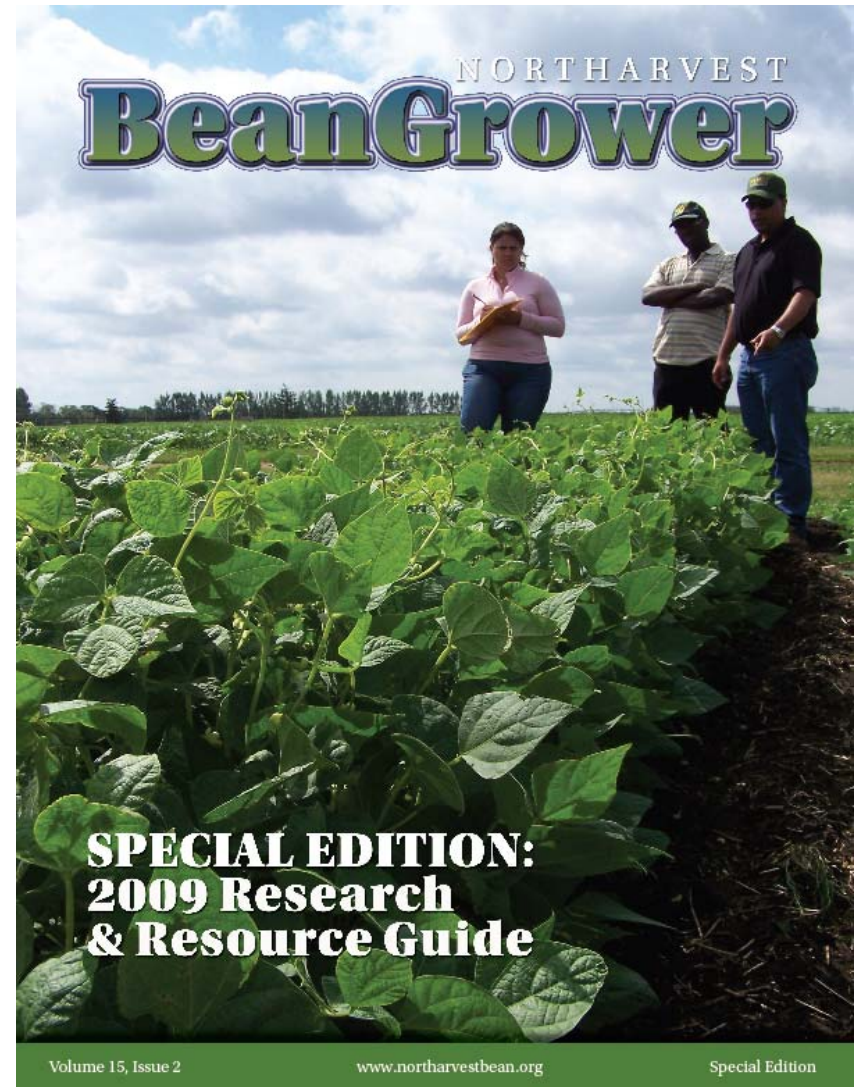
Undergraduate/Graduate Student Research & Support

- 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 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.