Minutes: SCC80 (PBCC) Annual Meeting (July 22, 2024)
Leader: Iago Hale, PBCC Chair

The Plant Breeding Coordinating Committee (SCC80) held its annual business meeting from 4:30-6:00 PM (CDT) on July 22, 2024, during the NAPB annual meeting in St. Louis, MO.

A total of 51 people attended the in-person meeting (**Appendix A**), a significant increase over previous years. As reflected in the meeting agenda (**Appendix B**) and slides (**Appendix C**), the two main objectives of this year's meeting were to

1. Provide an update on the committee's activities since the last Business Meeting (July 2023)
2. Lay the foundation for SCC80's pending renewal (2025)

The session was opened and facilitated throughout by PBCC Chair Iago Hale, who began by welcoming the attendees, some of whom (including students) knew little about the PBCC but were interested in becoming involved in its work. The Chair continued with a brief overview of the remit, scope of work, and internal organization of the PBCC before proceeding with an update on its official membership. Concerted effort over the previous year had resulted in essentially doubling SCC80 membership, from only 21 states represented in the project in September 2023 to a current total of 40 states and territories (see Appendix C, Slide 6), some of which had never been part of SCC80 before. The 11 states without representation in the project remain a challenge, despite multiple attempts to invite participation. In many of these cases, confusion appears to exist at the state level, either for individual researchers or SAES officials, regarding the implications (Hatch budgetary, etc.) of an individual's involvement in SCC80. Brief disussion of this matter highlighted the need for the PBCC to clarify these points when recruiting new members.

The meeting continued with a reminder of the four current objectives of the SCC80 (Resource Analysis, Genetic Resources Conservation and Utilization, Education, and Communication – see **Appendix B, Slide 7**), followed by a brief update on the PBCC's activities over the past year, organized by initiatives that cut across the PBCC's four objectives:

1. Germplasm Transitions [Objectives 2 and 4]

Building on the extensive feedback received during the 2023 Annual Business Meeting and under the leadership of Mikey Kantar and Iago Hale, the PBCC successfully secured a USDA Conference Grant and led a day-long conference on the topic of supporting successful transitions in public plant breeding programs. The conference, held two days before the Business Meeting, on July 20, 2024, in St. Louis, MO, brought together 36 participants from the public, private, non-profit, and government sectors. As shown in the conference program (**Appendix D**), the morning was dedicated to consideration of eight in-depth transition case-studies, followed by a full afternoon of small group discussions and reporting out on the following four focus areas:

1. Data management for successful breeding program transitions
2. Designing strategic personnel overlap
3. Best practices in program valuation and IP management
4. Documenting breeding program methods and operational knowledge

The conference ended with a plan for developing and submitting a white paper on the subject by the end of the calendar year. In addition to serving as a needed resource for the public plant breeding community, the envisioned paper is also expected to provide concrete guidance to the PBCC for the identification of specific future initiatives.

2. Plant Breeding Capacity Survey [Objectives 1 and 4]

This past year, the PBCC conducted a 5-year follow-up survey of plant breeding capacity at US public institutions. Following initial curation by Dorrie Main, a total of 244 survey responses had been received by the mid-March deadline (compared to 278 for the initial survey in 2018). Survey analysis is currently underway by Michael Coe and Soon Li Teh, with results to be ready for dissemination by the end of the year.

3. Success Stories [Objectives 2 and 4]

Two more plant breeding success stories, one focused on NIR-based quantitation of dry matter in cassava and the other on breeding for sawfly resistance in wheat, were created, distributed at the NAPB meeting, and are now digitally available on the PBCC website (https://www.nrsp10.org/PBCC_plant_breeding_outputs)

4. Plant Breeding Core Concepts [Objective 3]

Progress continues in developing a set of core educational concepts for training/educating plant breeders at the MS and PhD levels.

Following this brief summary of activites over the past year, the remainder of the meeting (~1 hour) was dedicated to the topic of SCC80's pending renewal (2025-2030). In light of the recent release of NAPB's new 5-year Strategic Plan, the Chair suggested that SCC80's renewal is a good opportunity to re-articulate the distinct strengths and unique roles of the PBCC to reduce overlap and enhance complementarity with related organizations (e.g. NAPB, NGRAC, etc.). To this end, a slightly revised set of four project objectives were presented for discussion:

1. **Resource Analysis** - Collect, analyze, and disseminate information about the evolving capacity, scope, impact, and needs of US public plant breeding programs.
2. **Best Practices** - Develop and promote individual, programmatic, and institutional best practices (data, personnel, IP, methods, etc.) to prevent loss of invested value and ensure ongoing impact of plant breeding in the public sector.
3. **Education** - Track US plant breeding graduate education capacity across public universities, identify gaps, and develop strategies for achieving relevant and more uniform teaching capacity.
4. **Communication** - To ensure needed ongoing support of public plant breeding capacity, facilitate effective communication of public plant breeding impacts and needs to federal-state-local agencies, LGU/SAES administrators, and the broader public.

Meeting participants discussed this proposal in six small groups, along with a proposed formal shift in PBCC's operational structure, away from participants as members of sub-committees (one for each objective) and toward participants as contributors to discrete intitiatives that cut across multiple objectives (see Appendix B, slide 22). After discussing these ideas in small groups for 20 minutes, each group reported out. There was unanimous support for both the revised objectives and proposed shift in operational structure. Detailed feedback from the groups is summarized below:

Ideas for initiatives/activities

Addressing the importance of conventional plant breeding as the core of crop improvement to counter the over-emphasis on tools (versus process) in breeding. In the end, such a re-focus may increase the rate of succesful translation of tools to breeding.

Ideas for initiatives could be generated via surveys of PBCC state representatives.

PBCC needs to work to ensure that education in Plant Genetics is sufficiently supported.

Is there an oportunity for PBCC to pursue an initiative related to urban gardening? This suggestion was part of a larger question of how the PBCC might increase its audience to include historically under-represented populations (e.g. inner city kids), thereby a facilitating an on-ramp for them into the field of public breeding.

Within Best Practices (Obj. 2), the PBCC may want to consider a Data Management initiative. Toward this end, we should connect with people with database expertise and strive to adopt some of the standardized practices and language used by the broader Plant Genetic Resource community.

Can PBCC help identify diversity gaps (demographic and disciplinary) among plant breeding graduate students, perhaps via a survey of enrollment?

Can PBCC help clarify what it means to be a modern plant breeder today? What does the training look like?

Can the PBCC play a role in connecting universities with one or few breeding programs to help them gain critical mass and exchange experiences?

Can the PBCC develop infographics of Plant Breeding statistics to reach a broader audience with the importance of public plant breeding?

Ideas for internal organization and process

For each initiative that the PBCC decides to pursue, an accountable leader should be appointed from among PBCC state reps to coordinate the work and summarize the progress and results.

Is it possible for graduate students to contribute to PBCC initiatives? Historically, students have not been included in this work; but there is interest!

Questions and concerns (things to consider)

When fleshing out the details of the new objectives for the upcoming renewal, the line between “best practices” and “advocacy” must be clarified.

How can resources be obtained or allocated for the development and promotion of plant breeding education core concepts? It is such important work!

Opportunities

Can multi-state projects complement or extend PBCC initiatives?

The meeting ended at 6 PM.

APPENDIX A

Roster of the 51 in-person attendees of the 2024 SCC80 (PBCC) Annual Business Meeting, including insitutional affiliations.

	University Faculty and Researchers			
1	Ana Maria Heilman-Morales	ND	North Dakota State U	ana.heilman.morales@ndsu.edu
2	Andrew Scabeo	MO	U Missouri	ScabooA@missouri.edu
3	Ann Murithi	IA	Iowa State U	amurithi@iastate.edu
4	Cecelia McGregor	GA	U Georgia	cmcgre1@uga.edu
5	David Baltensperger	TX	Texas A&M	dbaltensperger@tamu.edu
6	David Francis	OH	The Ohio State U	francis.77@osu.edu
7	Diego Jarquin	FL	U Florida	jhernandezjarqui@ufl.edu
8	Hannah Senior	UK	PBS International	hannah.senior@pbsinternational.com
9	Heather Manching	NC	NCSU	hkmanchi@ncsu.edu
10	Iago Hale	NH	U New Hampshire	iago.hale@unh.edu
11	Jamie Sherman	MT	Montana State U	jsherman@montana.edu
12	Jason Cook	MT	Montana State U	jason.cook3@montana.edu
13	JD Rossouw	MO	Bayer	jd.rossouw@bayer.com
14	Jenna Hershberger	SC	Clemson U	jmhersh@clemson.edu
15	Jenny Koebernick	AL	Auburn U	jenny.koebernick@auburn.edu
16	Jim McFerson	CO	NGRAC	jimmcferson@gmail.com
17	Juan Arbelaez	IL	U Illinois Urbana-Champaign	arbelaez@illinois.edu
18	Kate Evans	WA	Washington State U	kate_evans@wsu.edu
19	Ksenija Gasic	SC	Clemson U	kgasic@clemson.edu
20	Lukas Mueller	NY	Boyce Thompson Institute	lam87@cornell.edu
21	Mahendar Thudi	GA	Fort Valley State U	Mahendar.Thudi@fvsu.edu
22	Martin Bohn	IL	U Illinois Urbana-Champaign	mbohn@illinois.edu
23	Mary Lu Arpaia	CA	U California - Riverside	marylu.arpaia@ucr.edu
24	Mikey Kantar	HI	U Hawai'i Manoa	mbkantar@hawaii.edu
25	Nathan Fumia	HI	Hawai'i Ag Research Center	nfumia@harc-hspa.com
26	Naveen Puppala	NM	New Mexico State U	npuppala@nmsu.edu
27	Neil Anderson	MN	U Minnesota	ander044@umn.edu
28	Ramasamy Pesumal	KS	Kansas State U	perumal@ksu.edu
29	Roberto Fritsche Neto	LA	Louisiana State U	rneto1@lsu.edu
30	Somashekha Punnuri	GA	Fort Valley State University	punnuris@fvsu.edu
31	Stephanie Bolton	GA	U Georgia	-
32	Trevor Rife	SC	Clemson U	twrife@clemson.edu
33	Vagner Benedito	WV	West Virginia U	Vagner.Benedito@mail.wvu.edu
	USDA			
34	Amnon Levi	SC	USDA-ARS	amnon.levi@usda.gov
35	Gaurab Bhattarai	GA	USDA-ARS	gaurab.bhattarai@usda.gov
36	Jack C McCarty	MS	USDA-ARS	Jack.McCarty@usda.gov
37	Jacqueline Campbell	IA	USDA-ARS	jacqueline.campbell@usda.gov
38	Jixiang Wu	MS	USDA-ARS	Jixiang.Wu@usda.gov

...continued on next page

	Students			
39	Cameron Matthews	ND	North Dakota State U	-
40	Deysi Alvaro Ceja	CA	U California - Davis	-
41	Foster Kangben	SC	Clemson U	-
42	Garret Hall	MO	U Missouri	-
43	Jolean McClane	LA	Louisiana State U	-
44	Khushi Chawda	CA	U California - Davis	-
45	Raelyn Butter	IN	Purdue U	-
	Private Sector and Professional Associations			
46	Donn Cummings	IN	Monsanto (retired)	-
47	Jim Parks	IN	Corteva (retired)	-
48	Jonathan Shaver	MN	Envision Partners	-
49	Mary Fernandes	MO	Solis Agrosciences	-
50	Samuel Crowell	VA	ASTA	-
51	Timothy Burke	ID	Bayer	-

APPENDIX B

Agenda of the 2024 SCC80 (PBCC) Annual Business Meeting, circulated to all SCC80 members the week before the meeting.

PBCC Annual Business Meeting
St. Louis Union Station Hotel, Grand Ballroom C
Monday, July 22, 2024
4:30-6:00 PM CDT

AGENDA

1. Welcome and membership report (4:30-4:35)

    State representatives – an update on membership
    EC members – current EC composition and new Secretary

2. Recap of the PBCC's four objectives, under SCC80's 2020 renewal (4:35-4:40)

    Obj 1 - Resource analysis
    Obj 2 - Genetic resources conservation and utilization
    Obj 3 - Education
    Obj 4 - Communication

3. Update on 2023-2024 PBCC initiatives (4:40-5:00)

    Germplasm Transitions (Objs 2, 3, 4)
    Plant Breeding Capacity Survey (Objs 1, 2, 3, 4)
    Success stories (Objs 2, 3)
    Plant Breeding core curriculum (Obj 4)

4. PBCC's 2025 Renewal – forging a vision for the next 5 years (5:00-6:00)

Defining PBCC's unique roles relative to NAPB's 5-year Strategic Plan
How do our objectives hold up?

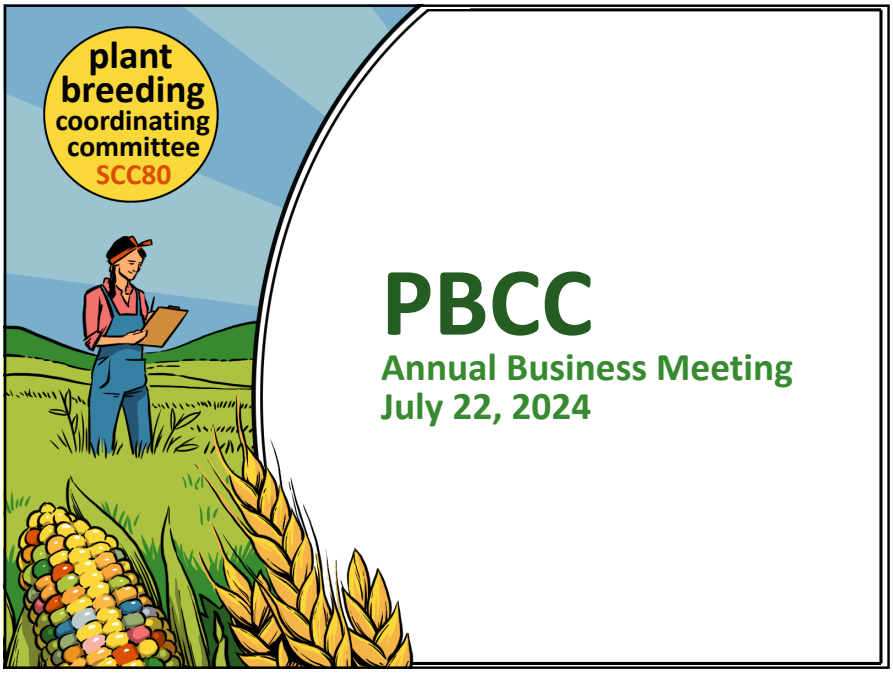
A shift from standing committees to discrete initiatives

Declaration of upcoming initiatives
What initiatives are of interest?

Identifying members interested in contributing to upcoming initiatives

APPENDIX C

Meeting slides (24) for the 2024 SCC80 (PBCC) Annual Business Meeting.



The Plant Breeding Coordinating Committee (PBCC)

is a Multistate Research Coordinating Committee and Information Exchange Group

SCC80: Imagining the Future of Plant Breeding

Since 2006, our mission has been to focus on issues facing public plant breeding and plant breeders at public universities while serving and addressing plant breeding issues affecting all organizations utilizing or served by the discipline.

The PBCC identifies needs and develops strategies to support public plant breeding

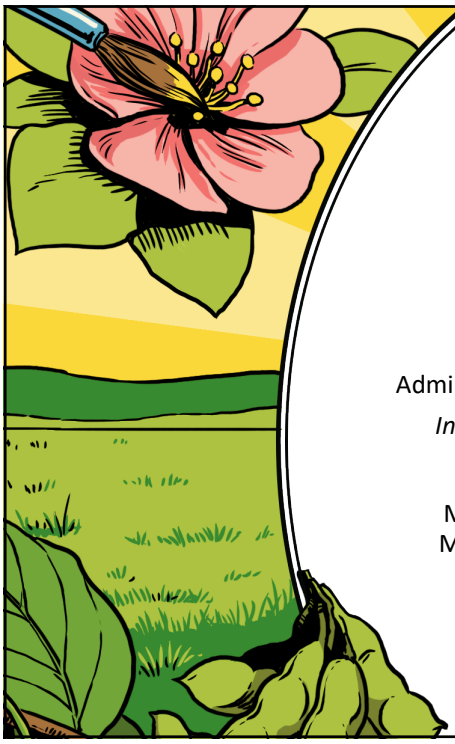
Initiatives
National Association of Plant Breeders

White Papers
IPR and Public Plant Breeding Recommendations

Journal articles
US PB capacity, plant genetic resources, IP standards , science communication

Symposia/Conferences
Unlocking Plant Genetic Diversity for Food and Nutritional Security

Information Gathering and Dissemination
Surveys of PB capacity, input to USDA and SAES, communicating impact



The People

Past Chair: Duke Pauli
Chair: Iago Hale
Vice Chair: Jenny Koebernick
Secretary: Juan Arbelaez

NIFA Reps: Christian Tobias
John Erickson
Administrative Advisor: Amir Ibrahim

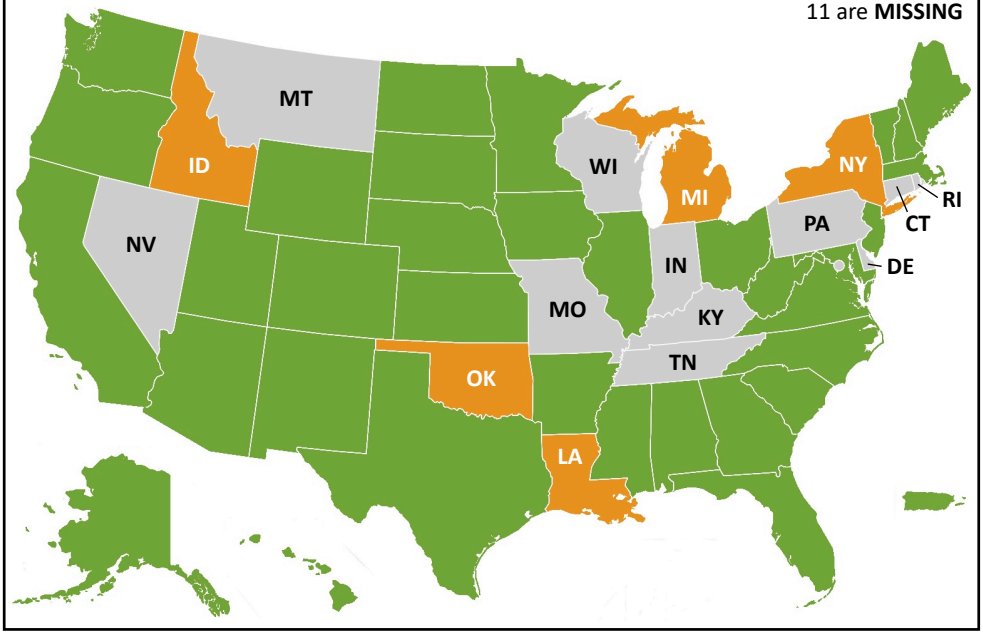
Incoming Secretary: Marta Pudzianowska

Executive Committee members:
Martin Bohn, Kate Evans, Ksenija Gasic, Michael Kantar, Barbara Liedl, Rich Pratt Wayne Smith

State representatives

40 states and territories participate

5 lack an official representative
11 are **MISSING**



PBCC's four Objectives (2020-2025)

1 - Resource Analysis

Collect, analyze, and disseminate data about U.S. public and private plant breeding efforts, including human capacity and access to enabling knowledge, technologies, germplasm, and infrastructure.

2 - Genetic Resources Conservation and Utilization

Promote the conservation, characterization, and utilization of PGR and access to those resources for plant breeding purposes.

3 - Education

Explore the U.S. plant breeding education capacity across universities and identify potential gaps and ways of achieving more uniform teaching capacity.

4 - Communication

Improve communication [1] **among public plant breeders and federal-state-local agencies** on plant breeding policy issues, including alerts to existing and emerging threats to agricultural security that are relevant to plant breeding; [2] **among public plant breeding programs and university administrators** through enhancing the mission and impact of PBCC state representatives; and [3] **between the plant breeding community and public audiences**.

Update on 2023-24 Initiatives

1. Germplasm Transitions
2. Plant Breeding Capacity Survey
3. Plant Breeding Success Stories
4. Plant Breeding Core Concepts

1. Germplasm Transitions [Objs 2, 3, 4]

Plant genetic resources (PGR) are high-investment and high-value public goods

Plant breeding is a multi-generational process

Periods of transition pose significant threats to PGR through lack of program continuity

Successful transfer of a program's germplasm and embodied knowledge is essential

No guiding framework or set of best practices exists

1. Germplasm Transitions [Objs 2, 3, 4]

GOAL: Identify and communicate a coherent set of best practices to ensure the successful continuity of public plant breeding programs

1. Germplasm Transitions [Objs 2, 3, 4]

PBCC Germplasm Transitions Conference

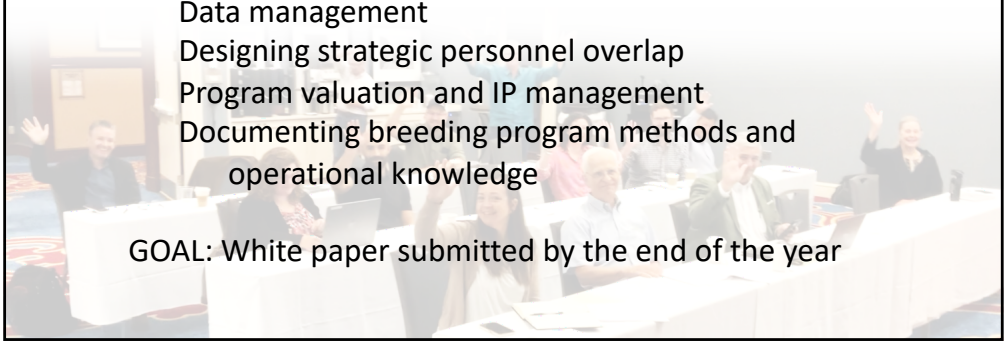
Funded by a USDA Conference Grant

36 participants (public, private, non-profit, government)

8 Case Studies/Perspectives

- Data management
- Designing strategic personnel overlap
- Program valuation and IP management
- Documenting breeding program methods and operational knowledge

GOAL: White paper submitted by the end of the year



2. Plant Breeding Capacity Survey [Objs 1, 2, 3, 4]

ORIGINAL RESEARCH ARTICLE
Crop Breeding & Genetics

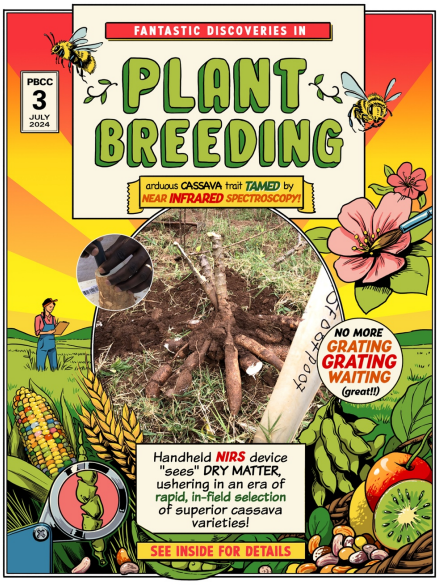
Crop Science

Plant breeding capacity in U.S. public institutions

Michael T. Coe[1] | Katherine M. Evans[2] | Ksenija Gasic[3] | Dorrie Main[4]

Surveys completed:	mid-March
Total survey responses:	285
After initial curation:	244 (vs. 278)
Data collection:	Dorrie Main
2023 survey analysis:	Michael Coe
2023 vs. 2018 analysis:	Soon Li Teh

3. Success Stories [Objs 2, 4]



4. Plant Breeding Core Concepts [Obj 3]

Finalized comprehensive **List of Core Concepts** essential for plant breeding graduate education (https://www.nrsp10.org/core_concepts)

Finished writing **white paper** "Core Concepts: Roles in Graduate Plant Breeding Education, Curriculum Development, and Monitoring"

Actively **sought funds** for the following activities:

Stakeholder Input Surveying university educators and industry breeding experts to validate and refine the concepts

Gap Analysis Identify missing elements in existing plant breeding graduate programs

Future plans

Development of Dynamic Web-Tool

- Develop a functional prototype of a dynamic web-tool (multimedia content and interactive quizzes) for communicating PB Core Concepts
- Conduct initial user testing with plant breeding students and faculty to gather feedback on the web-tool's usability and effectiveness

Expansion of Core Concept Framework

- Design a self-evaluation framework allowing students to assess their competencies against the Core Concepts
- Develop and launch web-based learning modules covering key areas of plant breeding education
- Initiate a pilot program with select graduate programs to implement and evaluate the expanded Core Concept framework and online learning materials

PBCC Renewal

2025-2030

One of the greatest successes of the PBCC has been the NAPB.

As the scope and reach of the NAPB has grown,
its overlap with the work of the PBCC has increased.

The release of NAPB's recent 5-year Strategic Plan
is a perfect opportunity to reflect on the future role of the PBCC.

Purpose To strengthen plant breeding to promote food security, quality of life, and a sustainable future

Members Primarily professionals (public and private) but also students aspiring to professional domain of PB.

Domain USA-based and internationally oriented.

Aspirations, relative to public plant breeding:

1. Create public-private bridges and partnerships
2. Vocally support public PB education and associated programs
3. Create networks, professional development opportunities, and professional community

Specific **mentions** of the PBCC:

"will collaborate with PBCC...to support the development of core curriculum for PB courses across USA"

"working with PBCC to communicate the impact that PB has on our food system"

ADVOCATE FOR POLICY
DEVELOP THE WORKFORCE
ISSUE POSITION PAPERS
BRING VALUE TO MEMBERS

EDUCATE LGU/SAES ADMIN
IDENTIFY GAPS AND NEEDS
GATHER AND INTERPRET DATA
SERVE THE PUBLIC SECTOR

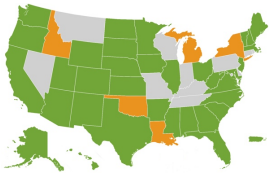
National Association of Plant Breeders
NAPB
Improving Plants to Improve Lives

coordination

information exchange

PBCC

public breeders
private breeders
students
associations



Distinct strengths of the PBCC

No formal affiliation with the private sector – a more objective voice for the public good

A USDA-authorized and -sanctioned platform to interact with and represent the position of public plant breeders

Small and focused = nimble

No membership costs = broader representation within the public sector

A low-barrier way for public breeders to engage in issues of national concern

Proposed PBCC's Objectives (2025-2030) ... food for thought

1 - Resource Analysis

Collect, analyze, and disseminate information about the evolving capacity, scope, impact, and needs of US public plant breeding programs.

2 - Best Practices

Develop and promote individual, programmatic, and institutional best practices (data, personnel, IP, methods, etc.) to prevent loss of invested value and ensure ongoing impact of plant breeding in the public sector.

3 - Education

Track US plant breeding graduate education capacity across public universities, identify gaps, and develop strategies for achieving relevant and more uniform teaching capacity.

4 - Communication

To ensure needed ongoing support of public plant breeding capacity, facilitate effective communication of public plant breeding impacts and needs to **federal-state-local agencies, LGU/SAES administrators, and the broader public**.

A modest proposed shift in PBCC operational structure

Participants as *members of sub-committees*

↓

Participants as *contributors to discrete initiatives*

Historically, PBCC members have worked in sub-committees aligned with each of the four broad objectives

Such committees often have unclear remits

Much important work does not fit within an Objective-aligned committee structure

People who don't feel aligned to a broad objective may be keen to engage in specific topics/projects/initiatives

1 - Resource Analysis
2 - Best Practices
3 - Education
4 - Communication

Ongoing initiatives

1. Breeding program transitions [2, 4]
2. Plant Breeding Capacity Survey [1, 3, 4]
3. Success stories [3, 4]
4. Core concepts [1, 3, 4]

Future initiatives

1. Public PB royalty structure [2, 4]
2. ???
3. ???

APPENDIX D

Full program for the Germplasm Transitions in Plant Breeding Conference, held on July 20, 2024, in St. Louis, MO.

Germplasm Transitions in Plant Breeding Conference Program

July 20, 2024
St. Louis, Missouri
New York/Illinois Central Room
St. Louis Union Station Hotel

Plant Breeding Coordinating Committee (PBCC)
National Association of Plant Breeders (NAPB)
USDA-AFRI award number 2024-03382

Overview

Plant breeding is one of the world's oldest technologies, from farmers selecting plants during domestication to large scale modern commercial breeding programs using genomics and phenomics. Plant breeding is a multi-generational process, in the sense that the breeding lines developed by one generation of breeders serve as the raw materials for subsequent generations. As plant breeding positions turnover (e.g. retirement) or restructure (e.g. movement to different roles within institutions), periods of transition pose significant threats to the conservation and utilization of germplasm through lack of program continuity. Given the investment in public cultivar development and breeding, the successful transfer of a breeding program's germplasm and embodied knowledge is essential. Despite the frequency and critical nature of such transitions across the nation's numerous public breeding programs, no guiding framework or set of best practices exists. The purpose of this convening is to identify and articulate the elements of such a framework.

Table of Contents

List of Delegates

Group 1 - Data management

Martin Bohn - UIUC - mbohn@illinois.edu
Timothy Burke - Industry - timothy.burke@bayer.com
Mitchell Feldmann - UC Davis - Speaker - mjfeldmann@ucdavis.edu
Michael Kantar - UH/PBCC EC - group facilitator - mbkantar@hawaii.edu
Jim Luby - UMN - Speaker - lubyx001@umn.edu
Jeff Neyhart - USDA - jeffrey.neyhart@usda.gov
Duke Pauli - U Arizona - dukepauli@arizona.edu
Margaret Smith - Cornell - mes25@cornell.edu
Dorrie Main - WSU - dorrie@wsu.edu

Group 2 - Personnel overlap

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Ilene Jones - Industry - ilene.jones@syngenta.com
Paul Johnson - Utah State - paul.johnson@usu.edu
Jenny Koebernick - Auburn/PBCC EC - group facilitator - jenny.koebernick@auburn.edu
Addie Thompson - MSU - thom1718@msu.edu
Christian Tobias - USDA - christian.tobias@usda.gov
Bill Tracy - U Wisconsin - wftracy@wisc.edu
Peggy Ozias- UGA - pozias@uga.edu

Group 3 - Program valuation and IP management

Anton Bekkerman - UNH - Speaker - Anton.Bekkerman@unh.edu
Kate Evans - WSU - kate_evans@wsu.edu
Loren Fisher - NC State -lrfishe1@ncsu.edu
Nathan Fumia - Research non-profit (HARC) - nfumia@harc-hspa.com
Iago Hale - UNH/PBCC EC - group facilitator = izv2@unh.edu
Amanda Hulse-Kemp - USDA - Speaker - amanda.hulse-kemp@usda.gov
Rishi Masalia - Industry - rishimasalia@gmail.com
Richard A. Vierling - TAMU - Richard.Vierling@ag.tamu.edu
Margaret Worthington - U Arkansas - Speaker - mlworthi@uark.edu
Steve Hague - Auburn - ssh0035@auburn.edu

Group 4 - Program methods and operational knowledge documentation

Juan Arbelaez - UIUC/PBCC EC - group facilitator - arbelaez@illinois.edu
Fred Bourland - U Arkansas - Speaker - fbourland@uada.edu
Ksenija Gasic - Clemson - kgasic@clemson.edu
Carlos Iglesias - NC State - caiglesi@ncsu.edu
Jim McFerson - WSU - jim.mcferson@gmail.com
Lukas A. Mueller - Cornell - Speaker - lam87@cornell.edu
Gayle Volk - USDA - gayle.volk@usda.gov
Marnin Wolfe - Auburn - Speaker - mdw0092@auburn.edu

Some potential causes of breeding program transitions

Personnel change

Breeder retires or transitions to administration
Breeder moves to another public institution
Breeder moves to the private sector

Tragedy

Natural disaster (hurricane, earthquake, fire, etc.)
Sudden death/illness

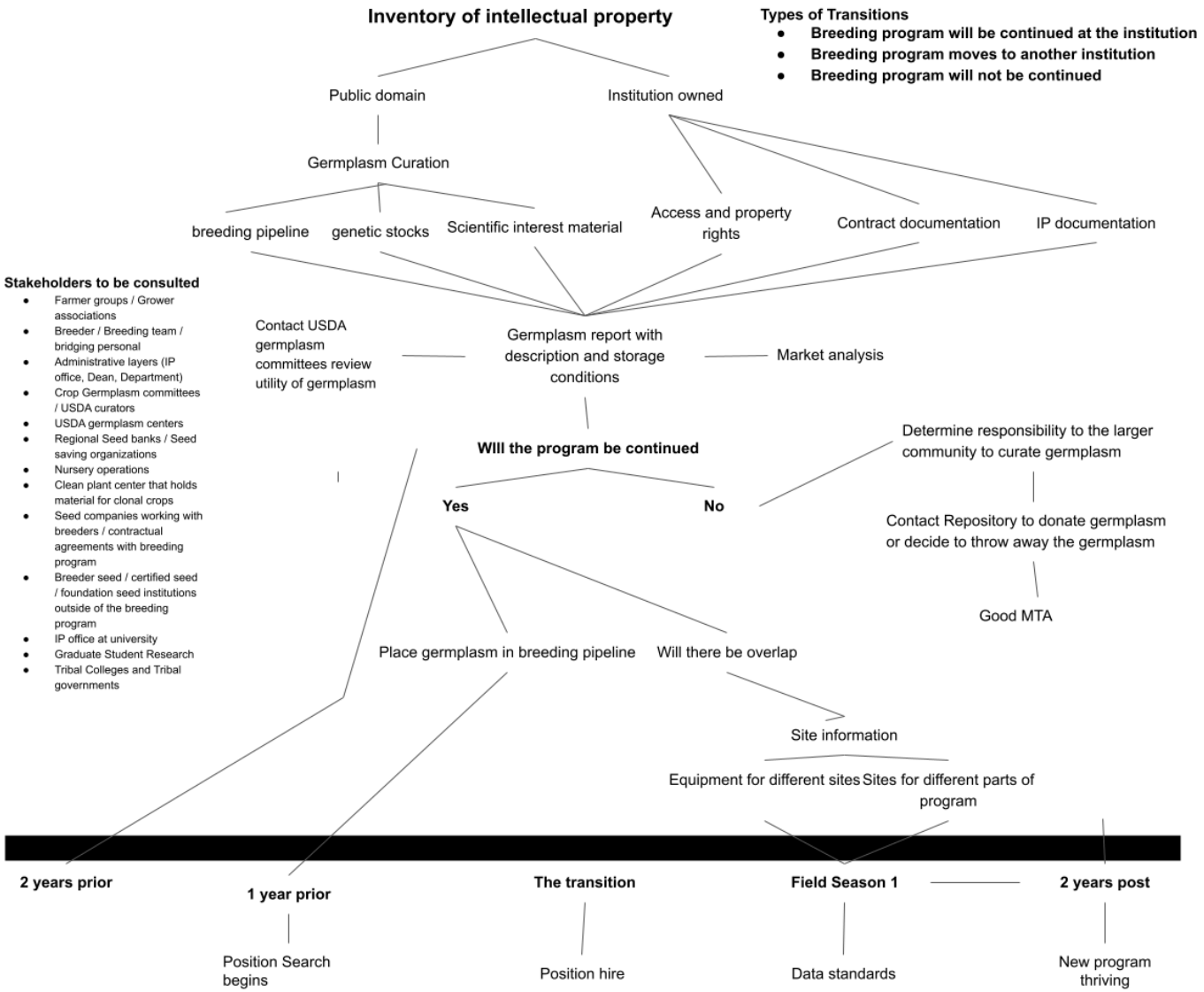
Resource reallocation

Loss of funding
Institutional re-prioritization

Some key questions relevant to program transitions

- Who are the stakeholders?
- What is the value of the program, and should it continue?
- Are the breeding program's goals and methods well documented?
- Are the program's data (genetic, genomic, phenotypic) accessible and understandable?
- Who understands the value of the germplasm?
- Who controls IP, and how does it affect future work?
- Are the program's methods (field trials, germplasm curation, etc.) documented?
- What other resources (funding, equipment) does the program have?
- What is the royalty structure for the program?

Initial Diagram/Mind-map of a Transition, with Essential Decision Points



Meeting Structure and Agenda

MORNING PROGRAM 9:00 – 12:00

- **Welcome and Introduction** 9:00-9:15
    - The Germplasm Transition Problem
    - Objectives and structure of today's meeting

- **Case Study 1 – A transition history at University of Minnesota,** 9:15-9:35
    - Neil Anderson and James Luby
- **Case Study 2 – Transitioning a cotton breeding program in Arkansas**, 9:35-9:55
    - Fred Bourland 9:35-9:55

Coffee Break! 9:55-10:10

- **Case Study 3 - Transitioning multiple breeding programs at the same time**, 10:10-10:30
    - Margaret Worthington
- **Case Study 4 - Transitioning the UC Davis strawberry breeding program**, 10:30-10:50
    - Mitchell Feldmann
- **Case Study 5 - Restarting a program**, 10:50-11:10
    - Marnin Wolfe

Coffee Break! 11:10-11:25

- **Case Study 6 - Understanding Data During a Breeding Program Transition,** 11:25-11:45
    - Amanda Hulse-Kemp
- **Case Study 7 - Systems to manage data during transitions,** 11:45-12:05
    - Lukas A. Mueller
- **Case Study 8 - Transitioning a Breeding Program: The Experiment Station director position,** 12:05-12:20
    - Anton Bekkerman

Networking Lunch 12:20 pm - 1:20pm

AFTERNOON PROGRAM 1:20 pm – 4:00 pm

- **Facilitated Discussions within small groups (see page 3)**

- **Divide into groups and discuss the case studies and synthesize lessons learned relevant to your group's focus area** 1:20 pm - 2:50 pm

    - Group 1 - **Data management during a transition** (*case studies AHK and LM)*
        - Plant breeders often have idiosyncratic methods of data storage (e.g. 50 years of field notebooks in a personal shorthand). The goal of this group is to discuss possible methods of developing and enforcing translatable data standards within individual programs, regarding:
            - Physical germplasm
            - Trial data
            - Genetic data
            - Other data

    - Group 2- **Designing strategic personnel overlap during a breeding program transition** (*case studies MW, NA, JL, FB and MF*)
        - Plant breeding programs often have idiosyncratic standard operating procedures (SOPs). For an incoming breeder to understand why certain procedures were done often requires an overlap with the previous breeder/staff. The goal of this group is to discuss how best to structure such personnel overlap:
            - Job descriptions
            - Start, end, and overlap dates
            - Needed funding mechanisms (hard/soft lines)

    - Group 3 - **Program valuation and managing intellectual property during a transition** (c*ase studies NA, JL, and AB)*
        - Plant breeding programs often have idiosyncratic IP structures and royalty standards, something further complicated by generational IP. Such questions also directly relate to a program's perceived value and need for continuation in the eyes of its host University/AES. The goal of this group is to discuss the following in service of program continuity:
            - Determining and communicating program value
            - How to facilitate IP transition
            - How to structure royalty distributions

- Group 4 - **Documenting breeding program methods and operational knowledge** (c*ase studies FB and MW*)
    - To be successful, incoming breeders need access to the details of and rationale behind the program's methods. The goal of this group is to discuss how best to develop and structure SOPs regarding breeding program history, including:
        - Breeding plan
        - Resources (facilities, equipment, etc.)
        - Testing site selection and management
        - Timelines

- Prompts for all groups:

    - *Regarding your assigned focus areas, what are*
        - *Necessary elements for a successful transition?*
        - *Desired elements for a successful transition?*

    - *On a transition timeline, what and where are the decision points for your focus areas?*
        - *What information and/or resources are needed to make rational decisions at each decision point?*

    - *For your focus area, what are the controversies?*

    - *What are the unknowns?*

Coffee Break! 2:50-3:05

- **Small group presentations - reporting out,** 3:05-4:05 pm

- **Discuss needed modifications to the draft mind-map, and outline the structure of the white paper,** 4:05 - 4:35 pm

    - *Regarding the draft mind-map:*
        - *What have we missed? Where are the major gaps?*
        - *Are there opportunities for an improved overall structure?*
        - *Can we prioritize the elements?*

    -

Timeline for developing the white paper:

- PBCC will do an initial synthesis of the discussion
- PBCC will create an initial draft to be circulated by Sept 1
- Comment period: Sept 1 - October 31
- Revise in November
- Send to AES Directors/NPGCC by Dec 1 for comment
- Submit to journal by Dec 31
    - Crop Science?
    - Other potential journals?

Case Study 1 – A transition history at University of Minnesota

Neil Anderson and James Luby, Department of Horticultural Science, University of Minnesota, 1970 Folwell Avenue, St. Paul, MN 55108 U.S.A.

Abstract

The seven public-sector plant breeding programs within the Department of Horticultural Science' 136 year history are well-known for their pioneering work with cold hardiness for woody/herbaceous perennials and accelerated production of annual vegetable crops in reduced growing periods of northern latitudes. Historically, plant breeding program transitions were smoothly transferred to the next generation plant breeder. More recent budget cuts have imposed changes to the presumed transition of plant breeding programs which may/may not ensure that breeding for each commodity continues. Two examples are provided of vegetable (David Davis) and potato (Florian Lauer, Christian Thill) breeding programs with no transition, discontinuation or limitation thereof which were precipitated by unanticipated faculty retirements or death. Massive germplasm losses occurred in both cases as well as all breeding records. In contrast, the current fruit (mainly apple and grape) breeding program transition was an intentional multi-year effort. The grape breeding program was initially transitioned from Jim Luby to Matt Clark in 2015. Clark introduced new technology and product targets to the grape breeding program and in 2022 was PD for the $10M VitisGen 3 SCRI grant. Coordination was facilitated by the Luby and Clark lab groups meeting weekly and Luby and Clark often served together on graduate student committees. As Luby retires in 2024, Clark, now a tenured Associate Professor, has assumed leadership of the apple breeding program which has a demanding global technology commercialization aspect. Soon Li Teh was hired in 2023 to assume leadership of the grape breeding and enology program with transition support from Clark and key staff.

Key Take home messages / Recommendations

- Critical prior consultation with leadership in the college, experiment station, Technology Commercialization, and commercial partners.
- Germplasm transferred almost seamlessly in a multi-year double leadership transition that featured overlap of faculty project leaders.
- New support staff were also hired to incorporate new technology and build key knowledge-redundancy of critical processes and germplasm to assist new project leaders.

Case Study 2 - Transitioning a cotton breeding program in Arkansas

Fred Bourland, Professor of Plant Breeding and Genetics, Crop, Soil, and Environmental Sciences, 115 Plant Sciences Building, University of Arkansas, Fayetteville, AR 72701

Abstract

Seven cotton breeding programs associated with Agricultural Experiment Stations (AES) were active in the Mississippi River Delta in 1970 – now there is only one. Obviously, transitioning within these programs *has seldom been successful*. Roles of AES cotton breeding programs have included providing stock for other breeders, encouraging the direct and indirect release of improved varieties/germplasm, enhancing breeding approaches, and training future breeders. Successful transitions often have three factors in common. First, minimum time between successive breeders reduces germplasm losses, avoids delays in progress, and lessens startup costs by maintaining trained assistants and essential equipment and facilities. Secondly, maintaining similar breeding objectives enhances attainment of breeding goals, may augment early career of new breeders and preserves/completes career of previous breeders. Thirdly, the program is strongly supported by commodity groups/clientele, as well as their AES administrators and other departmental scientists. This support is engendered by breeding success and appropriate communication of those achievements. Even if my position is terminated at my retirement, my work should be preserved by aggressive release of developed lines, cooperative agreements sharing early generation materials, and publishing of findings.

Key Take home messages / Recommendations

- Transitions need to occur quickly
- Agreement on Breeding objectives
- Have strong regional connections with growers

Case Study 3 - Transitioning multiple breeding programs at the same time

Margaret Worthington, Associate Professor of Fruit Breeding and Genetics, Department of Horticulture, 316 Plant Sciences Building (PTSC), University of Arkansas, Fayetteville, Arkansas 72701

Abstract

The University of Arkansas System Division of Agriculture (UADA) Fruit Breeding Program was established in 1964 by Dr. Jim Moore, who developed blackberry, grape, peach, nectarine, strawberry, and blueberry varieties. In 1997, program leadership transitioned to Dr. John Clark, who previously worked as Dr. Moore's graduate student and program technician and as resident director of the UADA Fruit Research Station. Over the following 19 years, Dr. Clark developed impactful public-private breeding and testing partnerships and generated new intellectual property revenue to sustain the program. Dr. Clark also ended blueberry and strawberry breeding programs, while establishing a new muscadine grape improvement program. Dr. Clark proposed hiring a new fruit breeder several years prior to his retirement, understanding that any new assistant professor would struggle to establish a record of scholarly achievement, become familiar with the program germplasm, and manage complex commercial relationships without a substantial period of overlap. Dr. Worthington was hired as the new fruit breeder in 2016 and worked closely with Dr. Clark until his retirement in January 2023. This extremely long period of transition worked smoothly because a detailed but flexible plan was proposed prior to her hiring outlining a timeline for transfer of program responsibilities. Dr. Worthington was initially given responsibility for peach and nectarine breeding and all molecular breeding and graduate student training. She then assumed leadership of the muscadine grape breeding program in 2019 and the compact/reduced internode blackberry breeding program in 2020. Finally, she became the director of all fruit breeding program activities in 2023, after seven years of mentorship with Dr. Clark. Frequent communication between outgoing and new breeders, clearly delineated responsibilities, and early opportunities for leadership and decision making were all keys to making this transition a very successful and enriching experience for Dr. Worthington, Dr. Clark, and all stakeholders of the Arkansas Fruit Breeding Program.

Key Take home messages / Recommendations

- Good transition planning is especially important for perennial crops and those with major intellectual property management and commercialization responsibilities.
- Clear delineation of responsibilities and freedom to work independently of outgoing breeders in certain crops or focus areas can help new breeders to feel ownership and build confidence during the transition period.
- Both outgoing and new breeders need to approach the transition with open minds and positive intentions! Hiring managers should think about how personalities will interact when interviewing candidates.
- Carefully planned transitions can allow programs to hire promising young breeders who may have worked in other crops in the past rather than choosing someone who has worked in a similar cropping system. This diversity of experience can bring new ideas and approaches to an established breeding program

Case Study 4 - Transitioning the UC Davis strawberry breeding program

Mitchell Feldmann, Assistant Professor and Director Elect, University of California, Davis, One Shields Avenue, Davis, CA 95616 | 530-752-1011

Abstract

The University of California Davis Strawberry Breeding Program has undergone four formative transitions in its century-long life span. Two of these transitions can be seen as “healthy” with FTE faculty members co-existing in their roles, and two of them could be described as “unhealthy” with limited institutional oversight, no preparation, and little to no shared information. In the early 1950s, Dr. Royce Bringhurst and Dr. Victor Voth were hired to restart the program following its temporary closure during World War 2. In the early 1990s, UC Davis hired Dr. Douglas Shaw and Dr. Kirk Larson before the retirement of Drs. Bringhurst and Voth. There was a gap in activities from 2012-2015 while Drs Shaw and Larson separated from UC Davis. In 2015, the breeding program came under the directorship of Dr. Steven Knapp and Mr. Glenn Cole. In 2023, before the retirement of Dr. Knapp and Mr. Cole, UC Davis hired Dr. Mitchell Feldmann to overlap with the previous directors for 2 years. Without primary experience with the previous transitions, except as a graduate student, I am willing to argue that we are currently experiencing the best way that a breeding program can transition: (i) there is a strong sense of mutual respect for ownership, legacy, and purpose; (ii) the program is well staffed and those scientists understand that, for the time being, they are a part of this transition; (iii) the germplasm collection is well curated and available; (iv) change in directorship and retirement time tables are established and clear; (v) grants and continuing funding have been transitions; and (vi) critical relationships between incoming and key industry members have been made.

Key Take home messages / Recommendations

- Germplasm must be protected, available, and useful. Protection and quality assurance should be taken very seriously and reviewed critically by independent 3rd parties and consultants, faculty members from universities with similar programs, members of the department/college, or all three. Who is responsible/accountable?
- The outgoing director needs to have clear timelines for, at a minimum, a title change.
- Staff members need to be made aware and ideally participate in the hiring process. The incoming director should be able to rehire staff positions based on a critical review process.
- The incoming director needs to respect the timelines and there needs to be a clear plan for shared inventorship, which may need to involve tech transfer, Department chair/head, and/or college Deans.
- Ideally, industry grants and funding should be transferred to the incoming director within 1-2 years to (i) signal the change to industry research directors and (ii) provide an opportunity for the outgoing director to educate the incoming director on the logistics and politics surrounding such agencies.
- The outgoing director should use their foot to initiate and participate in industry meetings in the first year to introduce the incoming director to key industry stakeholders, collaborators, and decision-makers.

Case Study 5 - Restarting a Breeding Program

Marnin Wolfe, Assistant Professor, Crop, Soil and Environmental Sciences, 383 CASIC Building, Auburn Univ, AL 36832

Abstract

In 2016, Dr. Edzard Van Santen retired from Auburn University without a successor in place, ending a long tradition of forage breeding and genetics research dating back at least to the 1950's. Several attempts to obtain approval for a new breeding hire by faculty in the Dept. of Crop, Soil and Environmental Science were unsuccessful. However, faculty recognition of the value of the germplasm remained and research in cover crop and forage systems continues to be a priority. The key opportunity to revive the germplasm came in 2022, when discussions with Dr. Marnin Wolfe, a prospective faculty hire in quantitative genetics, found strong common interest around cover crop and forages. Even though we were not able to overlap during an active transition, Dr. Van Santen has actively provided advice and support to the program. Enthusiastic and continued support and collaboration from other cover crop and forage breeders has also been vital. This case study therefore involves an unplanned retirement, followed by a nearly 7 year gap and an equally unplanned revival. Critical factors that have enabled this breeding program restart include: (1) At least some of the breeder's seed are still viable; USDA NPGS and collaborations have provided supplemental genetic diversity. (2) Institutional knowledge and interest remained along with at least some of the necessary facilities and equipment. (3) Market demand for AU varieties continues. (4) We have had initial success establishing (soft) funding streams through both federal and state (checkoff board) sources.

Key Take home messages / Recommendations

- What is required to restart a program depends on the time since the program was halted as seed viability drops and markets move on. For several reasons, the longer a program has been halted, the more resources (money, time, equipment, space) will be needed to revive it. Restarting breeding with long dormant germplasm will resemble starting a program from scratch.
- Successfully reviving germplasm and restarting a breeding program, regardless of time-dormant or resources being invested, requires institutional and stakeholder support. It also requires sustainable funding streams, which will often need to be developed over time, esp. in the absence of royalties from the previous program.
- It is incumbent upon the new breeder, restarting the program, to get material growing before it is too late, to conduct necessary "forensics" and to preserve it for posterity.
- There are likely multiple (many) shuttered programs within a seed viability window. If possible, we should develop strategies to ensure their conservation. In addition, a contingency plan should be provided to retiring breeders not-yet-assured of their programs continuance.

Case Study 6 - Understanding Data During a Breeding Program Transition

Amanda Hulse-Kemp, USDA-ARS, Computational Biologist, Genomics and Bioinformatics Research Unit, 840 Oval Drive, Raleigh, NC 27606

Abstract

USDA-ARS uniquely has separate units targeted with germplasm maintenance and distribution and for breeding. There have been efforts to integrate informatician support for digital data transition, particularly under new P&P 630.1 directive mandating a higher stringency for making USDA-ARS research available to the public. As representatives of Breeding Insight OnRamp (BI OnRamp), a program aimed towards supporting translation of tools and technologies into breeding programs for a range of species, we will share what we have learned. BI OnRamp and Breeding Insight now support over 28 species across 59 programs, across the continental US and Hawaii with a target of supporting all species in the USDA-ARS portfolio.

Key Take home messages / Recommendations

- Target movement to digital data capture as quickly as possible, allow as much flexibility as possible
- Ensure capture of RAW data sets
- Spend time developing a content model and implementing that into the digital space to ensure relationship between datasets is not lost in institutional knowledge upon transition
- Long-term informaticians serve as a valuable interim knowledge base developed as integrate into breeding programs
- Develop an incoming and outgoing checklist for program leads

Case Study 7 - Platforms for Managing Data during Breeding Program Transitions

Lukas A. Mueller, Adjunct Professor, Section of Plant Breeding and Genetics, School of Integrative Plant Science, Cornell University

Abstract

Breeding databases such as Breedbase (https://breedbase.org/) play a key role in modern breeding programs for tracking field experiments, phenotypes, genotypic information, and other data, thereby enabling timely and more sophisticated data analysis resulting in better selections and more rapid improvement of lines. To run databases efficiently, information collection, description, sample collection and analysis, and data analysis need to be standardized and formalized, for example, by using standardized ontologies for describing and measuring traits, standardizing naming and curation of germplasm and pedigrees, as well as collection tools for capturing data, and define specific algorithms for data quality control and analysis. Web-based databases allow such standards and associated data to be disseminated and used by a user across large geographies, but an aspect that is often overlooked is that they can also play an important role in safeguarding information for future users and facilitate transitions in breeding programs, as all SOPs, traits, trials, and germplasm information is readily available in one place.

Key Take home messages / Recommendations

- Program SOPs need to be transferable to new breeders
- Standardization needs to be done for every aspect of the program

Case Study 8 - Transitioning a Breeding Program: The Experiment Station Director position

Anton Bekkerman, Associate Dean for Research and Director of the Agricultural Experiment Station, Professor, Dept. of Agriculture, Nutrition, and Food Systems, G15 RUDMAN HALL · 46 COLLEGE ROAD · DURHAM, NH 03824

Abstract

The national network of state Agricultural Experiment Stations (AESs) and partnering enterprises at HBCU colleges of agriculture continue to play an important role in enabling and supporting long-term agricultural research. This is done through units' capacity to provide consistent programmatic funding as well as through investments in research infrastructure and staff supporting those resources. When major changes to long-term breeding programs occur—especially transitions of lead scientists—the continuation of those programs is evaluated. The presentation offers an AES director's perspective about the types of mission-centered and resource availability-centered considerations that are made when making these assessments. In cases when there is uncertainty about the continuation of a long-term breeding program, scientists can be important resources and provide guidance for AES and College of Agriculture administrators by helping develop multifaceted rationales for preserving materials, continuing the research, or transitioning the work elsewhere. These include demonstrating alignment with mission areas, minimizing transition costs, focusing on regional collaborations, considering alternative futures, among others.

Key Take home messages / Recommendations

- AES directors and College of Agriculture administrators consider multiple mission areas when assessing programs.
- Scientists can be key participants in the decision-making process by helping evaluate the costs and benefits of program continuations.