

Takeaways and Comments from the Fall 2020 USDA Plant Breeding Stakeholder Meeting

Key Takeaways

- Focus on broad, more basic questions of biology and method development related to plant breeding
- Develop speed breeding protocols for different germplasm and crops
- Develop sabbatical opportunities and training for plant breeders with exchanges between universities, the seed industry, and the USDA
- Breeding to enhance resilience - develop crops that farmers can include in their rotations and for intercropping
- Foster the creation of crop specific collaborations analogous to GEM (Germplasm Enhancement of Maize) and Genomes to Fields for other species

Breakout Questions and Summarized Comments

1. *USDA investment in plant breeding occurs primarily through intramural breeding programs in the Agricultural Research Service (ARS), Natural Resources Conservation Service (NRCS), and Forest Service, and from extramural competitive and capacity funding to universities and ARS through National Institute of Food and Agriculture (NIFA) . Considering that public sector research is under-funded, are there ways that the private sector and commodity organizations might partner with USDA during the next 5-10 years to maximize efficiency and breeding impact from the available public sector plant breeding investments?*

Q1 - Summary of comments from the website and the live session:

- ✓ Public sector should focus on long-term objectives & fundamental principles that complement private sector
- ✓ Develop mechanism where industry can co-sponsor public breeding research
- ✓ Facilitate workshops and enhance communication on breeding
- ✓ Foundation for Food and Agriculture Research (FFAR) provides a good model where industry can partner with public programs
- ✓ Well-structured agreements and communication are key
- ✓ Can USDA play a role in getting research over the 'implementation hump'
- ✓ For forest tree resistance breeding public-private partnerships rarely exist – enhanced public funding is key
- ✓ Increase visibility and genetic characterization of the NPGS
- ✓ identify cover crop systems that fit into the growing season of the more northern latitudes that struggle to have a cover crop established prior to a freeze.
- ✓ Initiating additional crop specific collaborations analogous to GEM (Germplasm Enhancement of Maize) for other species, where the private sector enables the collaboration with germplasm as well as in-kind support and the public sector leads the “pre-breeding” efforts to diversify the species and create commercial opportunities
- ✓ Increasing the number of employees that shift from the public sector to the private sector and vice versa through revised sabbatical systems or planned employment shifts, including private sector sabbaticals where scientists visit universities and USDA facilities
- ✓ Collaborating on methodology to leverage diverse germplasm collections (such as NPGS accessions), to enable the utilization of beneficial genetic diversity without the negative consequences of breeding in non-adapted/non-improved germplasm. A technology enabling effort with genome editing might be a potential example.

2. *Considering that plant breeding is a shared responsibility between the public and private sectors, how should plant breeding responsibilities and obligations be divided between public and private sectors, and what should be the obligations and responsibilities of USDA in this partnership during the next 5-10 years?*

Q2 - Summary of comments from the website and the live session:

- ✓ The USDA needs to maintain and expand its germplasm collection since that is lacking in the private sector
- ✓ USDA should develop speed breeding protocols using existing protocols and expand for different germplasm and crops
- ✓ USDA focus should be on the public good and sustainability
- ✓ Increasing collaboration on the front end to improve further collaboration throughout the process
- ✓ For forest trees USDA should assure sustainable funding and support for permanent research facilities that conduct tree resistance research and development
- ✓ Public research should focus on broad, more basic questions of biology and method development related to plant breeding
- ✓ Develop USDA-ARS positions in underserved areas and regions to help offset the loss of plant breeders at universities
- ✓ USDA breeding should focus on pest and disease mitigation as well as agronomic efficiency
- ✓ USDA focus should be on innovative work “upstream” of private-sector breeders, who could incorporate and “leverage” key breeding advances in their own work

3. *Are the plant breeding synergies between the public and private sectors and allied agencies, such as commodity organizations, effective, and how can they be improved?*

Q3 - Summary of comments from the website and the live session:

- ✓ Separating pre-breeding from cultivar development is problematic
- ✓ USDA's support of the public germplasm data bank is effective
- ✓ Building consortia for breeders to discuss goals in a variety of crop production strategies, such as Controlled Environment Agriculture, would be impactful
- ✓ The Genomes To Fields is a good example of a synergy which is facilitated and partially funded by commodity groups
- ✓ Have USDA forest geneticists based at universities with forest genetics faculty to offer synergy between university-industry cooperatives
- ✓ Have communication across the three sectors during the onset of new initiatives and specific projects, as well as an ongoing cadence of communications across the sectors
- ✓ Germplasm maintenance and enhancement. The USDA Germplasm Collections are national treasures

4. *Comment on USDA's role in plant breeding education and mentorship. Does it produce value, and is it adequately balanced with the main activities of the various USDA agencies that practice or facilitate plant breeding? Also, how can USDA education and mentorship be improved during the next 5-10 years?*

Q4 - Summary of comments from the website and the live session:

- ✓ USDA scientists should be incentivized to mentor or contribute to university courses
- ✓ Partnering with the National Association of Plant Breeders (NAPB) and Plant Breeding Coordinating Committee (PBCC)
- ✓ Arboretum summer camps with plant breeding education is a great way to reach youth
- ✓ USDA provides a unique training opportunity for the next generation of breeders, especially in crops which are not largely privatized
- ✓ Allow USDA plant breeders to have a more direct relationship with graduate training in plant breeding

5. *What specific short, medium, or long-term plant breeding goals should USDA pursue during the next 5-6 years, and how should USDA deliver plant breeding products regarding intellectual property, technology transfer, and partnerships with public and private sectors?*

Q5 - Summary of comments from the website and the live session:

- ✓ Genetic characterization / knowledge of breeding material is key
- ✓ Breeding to enhance resilience to develop crops that farmers can include in their rotation (intercropping)
- ✓ Assessment and updating of crop vulnerability statements
- ✓ Functional genomics so we know what genes are important, the biotech tools to manipulate them, and a germplasm repository to place them in for distribution
- ✓ Breeding for quality and resilient cropping systems
- ✓ Pull together germplasm information and restrictions into a centralized database to make the information more actionable to breeders
- ✓ Understanding of the function of plant genes and genomes
- ✓ Develop genomic-based methods for plant breeding to take the advantage of high throughput genome sequencing technology and computing power
- ✓ Engaging the private sector on plant breeding and related plant sciences early in the discovery process to fully realize potential applications of new discoveries to create value for farmers and consumers through public private partnerships