



NOTES TO THE
FRUIT AND VEGETABLE INDUSTRY
ADVISORY COMMITTEE FVIAC

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*USDA Office of the Chief
Scientist*

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Plant Health, Production, and Plant Products



United States Department of Agriculture
Office of the Chief Scientist

Background:

Office of the Chief Scientist, OCS



**2008 'farm bill': USDA Chief Scientist,
Under Secr'y for Research, Education, & Economics (REE)
presently Dr. Catherine Woteki**

**OCS supports and advises Chief Scientist and Secretary;
Fosters collaboration and coordination among
USDA science agencies**



**OCS has a Director; staff incl. Sr. Advisors in 6 areas:
Plant Health, Production & Products // Animal Health,
Production & Products // Natural Resources & Environment incl.
Bioenergy // Food Safety & Nutrition // Agricultural Systems incl.
Climate Change // Agricultural Economics & Rural Communities**



Five USDA Agencies *Conduct or Support* Plant Breeding

Plant breeding, genetic resources, and related biological research:

- Agricultural Research Service (ARS)
- Forest Service (FS)
- Natural Resource Conservation Service (NRCS)

Economic and policy analyses

- Economic Research Service (ERS)

Capacity and competitive funds for Research, Education, and Extension (i.e. *extramural* plant breeding)

- National Institute for Food and Agriculture (NIFA)





What is Plant Breeding?

**“Human-aided development of plant cultivars
with needed characteristics”**



The *organizing principle* of breeding is the genetic gain equation:

$$\Delta G = h^2 S$$

Gain in a desired trait (ΔG , or “delta-G”) is a function of

- the *heritability* of *that trait* (h^2)
- the *intensity of selection* (S)

Plant breeding “puts it all together”, using many different resources, tools, and methods to maximize gain, ΔG .





Role of USDA Plant Breeding

To provide plant breeding outcomes *that are needed to achieve USDA's Strategic Goals,*

...When these have the nature of "public goods":

E.g.,

- Breeding for long-term horizons -- too distant for private investment
- Important goals but probability of success is low or unknown
- Market size is small





An Increase in Stakeholder Attention to USDA's Plant Breeding

Examples include:

- Land-grant U's: Plant Breeding Coordinating Committee 2007
- National Assoc. of Plant Breeders (NAPB) (*publ+priv*) 2009
- American Seed Research Summit (*private-sector organized*) 2008
- Seeds & Breeds for 21st Century Ag. (*organic/sustainable*) 2014

Since ~2010,
Increasing number of stakeholders, across sectors,
engaging w/USDA officials
to present plant breeding needs & priorities





USDA Response:

- Plant Breeding Working Group (PBWG) 2012
 - *Support to USDA Chief Scientist (REE UnderSecr.)*
 - *Interagency coordination; advise re issues & priorities*
- Public Plant Breeding Listening Session 2013
- USDA Plant Breeding Roadmap 2014/15

Both documents posted at:

[http://www.usda.gov/
wps/portal/usda/usdahome?navid=OCS](http://www.usda.gov/wps/portal/usda/usdahome?navid=OCS)





What We've Learned

What stakeholders—*both public and private*—
see as USDA's core contributions to plant breeding:

- **The National Plant Germplasm System collections** (NPGS) incl.
 - Collection, curation, rejuvenation, characterization, and pre-breeding
 - Genetic Resources Information Network (GRIN):
GRIN is an *Information management system*
for genetic resources:
Inventory, images, rejuvenation status, IPR status, requests/order status





What We've Learned, con't.

Additional core contributions -- as seen by stakeholders:

USDA's breadth of geographic coverage, through partnerships including:

- USDA sites (e.g. ARS, FS, and NRCS)
- State Agricultural Experiment Station (SAES):
 - Agric. research units of the **state land-grant univ's.**
 - Co-funded through USDA since in 1887
- Others, e.g.
- Long Term Agricultural Research sites (LTAR) (multi-partner)





What We've Learned, cont'd.

Deliverables “by and for” public plant breeding
cited by stakeholders as *needed from USDA*:

Intramural

- **Cultivars** (varieties) for “public-goods situations”
- **New tools & methods**, publically available for any breeder to help maximize gain, ΔG .
 - E.g. new tools / methods to :
 - Incorporate new genetic & biological understanding
 - Reduce breeding cycle time (from cross-to-variety release)

Extramural

- Adequate and appropriate funding mechanisms,
 - for the long-term nature of plant breeding;
 - for education





What We've Learned, cont'd.

Heard from stakeholders: concerns about...

External funding thru' USDA

- Low total funding + many proposals leads to low success rates in compet. programs (<10%, sometimes <5%)
- Short-duration (2-4 yrs); non-renewable

Education

- Few funding opportunities for student stipends
- Even fewer for faculty to develop contemporary plant breeding curricula
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Challenges for USDA's response

- Not enough competitive funding to respond to stakeholder concerns
- Plant breeding needs longer-term funding cycles

Solution?

- Rely on intramural USDA plant breeding?
... leads to more questions:
- Loss of university plant breeding?
- Loss of closeness to needs and opportunities of local farming?
- Whence opportunities for educating future breeders
-- *within active breeding context?*



United States Department of Agriculture
Office of the Chief Scientist

National Institute of Food & Agriculture, NIFA
is USDA's extramural funding agency.

NIFA funding programs that can include plant breeding :

Capacity programs (source of \pm 40% of NIFA plant breeding funding 2008-13)

Hatch	1862 state land-grant univ's.
Evans-Allen	1890 land-grant univ's.
McIntire-Stennis	State forestry schools

Competitive programs (\pm 50% of NIFA funding to plant breeding 2008-13)

- AFRI** (Agriculture & Food Research Initiative); *including:*
AFRI Fellowships (2010) / Challenge Areas (2010) / Foundational (2013)
- OREI** Organic Agriculture Research & Extension Initiative (started 2005)
- SCRI** Specialty Crops Research Initiative (2008)
- BRDI** Biomass Research & Development Initiative (2009)
- SBIR** Small Business Innovation Research

Other programs including special grants (*less than 10%*)



Also from the Roadmap process: Issues broader than USDA

Recruit / Educate

- Encourage more young people to be interested in plant breeding
- Education: K-12, CC's, undergrad.; grad.

IPR

- Optimal understanding and use of intellectual property rights (IPR) and tech transfer mechanisms?

Public / Private

- Most favorable balance of investment in plant breeding?

Funding the model

- A joint endeavor: intra/extramural; capacity/competitive; public/private
- Funding the training pipeline

What are ways that USDA can respond?

