Why Seed Innovation?

SIPA™
Seed Innovation & Protection Alliance

Seed Innovation Provides More Abundant, Better Tasting Foods.

With the advancement of seed innovations we can make better food that is more sustainable and better for our environment.

The U.S. Seed Industry reinvests approximately **15%** of the estimated total annual seed value, **$20.8 billion**, into research and development.* So approximately **$3.1 billion** in annual research and development brings innovations such as the following:

Why Seed Innovation

YEILD

HEALTH

- Cancer fighting compounds
  - » High antioxidants
- Higher nutrition content
  - » High glucosinolate broccoli
  - » High lutein spinach
  - » High carotene carrot

ABUNDANCE

- More innovative types being developed
  - » Multi-leaf lettuce
- Increase yields
- More adaptable under stressful conditions
  - » Early maturity

ENVIRONMENT

- Pest resistance keeps millions of pounds of pesticides out of the environment
  - » Fungi
  - » Nematodes
  - » Virus
  - » Insects
  - » Bacteria

SUSTAINABLE

- Traits to improve shelf life
- Drought tolerant plants
- Diverse genetics
- Heat tolerance
- Water Use Efficiency

TASTE

- Sweet onions
- Super sweet corn
- Improved eating experience
  - » Tearless onions
  - » Seedless watermelon
- Mini snack products improve consumption
  - » Cucumber
  - » Carrots
  - » Tomato
  - » Peppers

* sigma™Seed, Kynetec (2016)

Breeders Efforts Improving % Contribution to Yield

Yield = Function

(genetic potential + environmental + cultural practices)

Improved genetic potential **now contributes 70%** to realized yield (up from 50%)

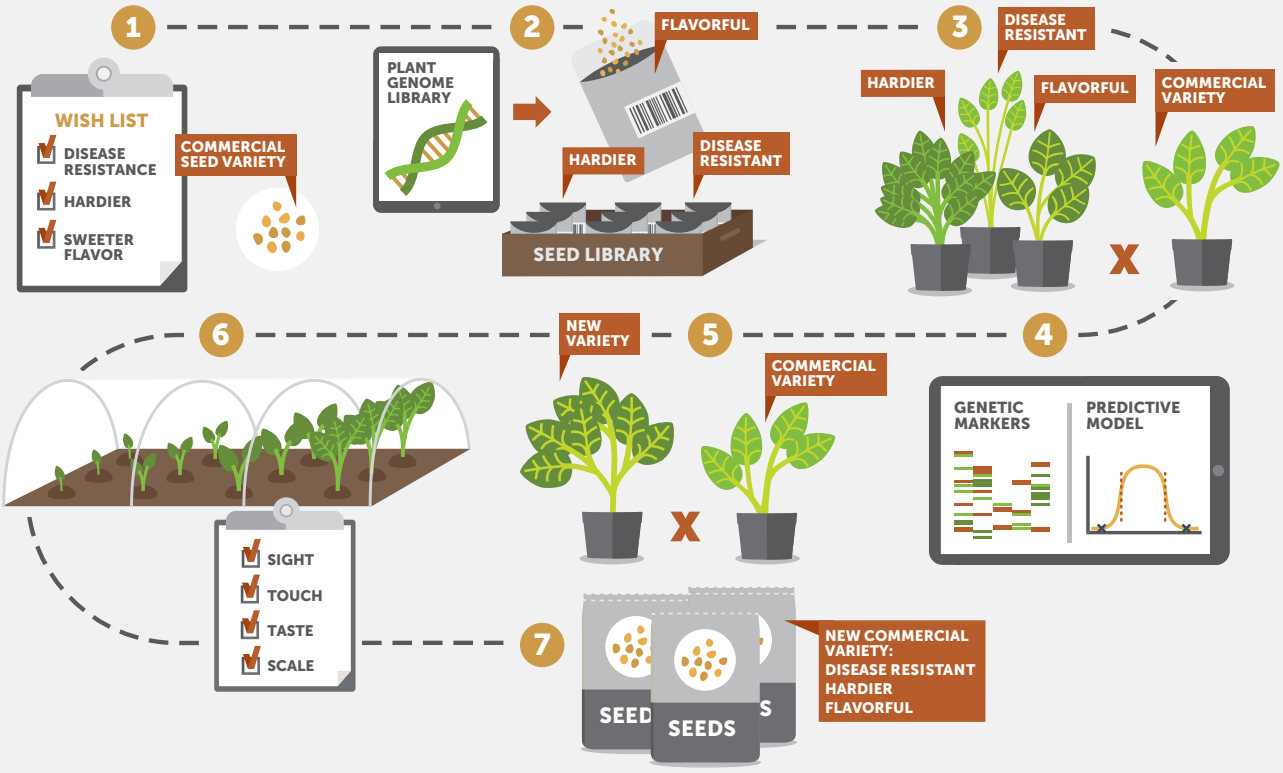
*Source: Steffen Noleppa (2016, March)The economic, social and environmental value of plant breeding in the EU, HFFA Research.
https://hffa-research.com/projects-publications/agriculture/plant-breeding/the-economic-social-and-environmental-value-of-plant-breeding-in-the-eu/

Innovation in Plant Breeding

Plant breeders strive to provide solutions for disease and pest resistance and increased tolerance to environmental stresses, while achieving higher yields and meeting consumer expectations for high quality crops.

- Commitment to developing a new variety: **$1 M and approximately 7-18 years** (crop dependent)
- Commitment to developing a new trait (GM): **$140 M and 14 years**
- Commitment to developing new parental inbreds: **$20 M+**
- Commitment to developing a new hybrid: **$5M a and 8+ years** (less 1% success)

JOURNEY TO BETTER SEED | Some vegetables take up to 18 years to commercialize.



1. Evaluate farmer/consumer needs to establish breeding goals
2. Identify variety combinations with desired characteristics
3. Cross pollinate plants
4. Predict outcomes
5. Create a new variety
6. Scale quantities, test for desired flavor, hardiness and disease resistance
7. Harvest seed, condition, package and deliver

Better Life, Better Seed™

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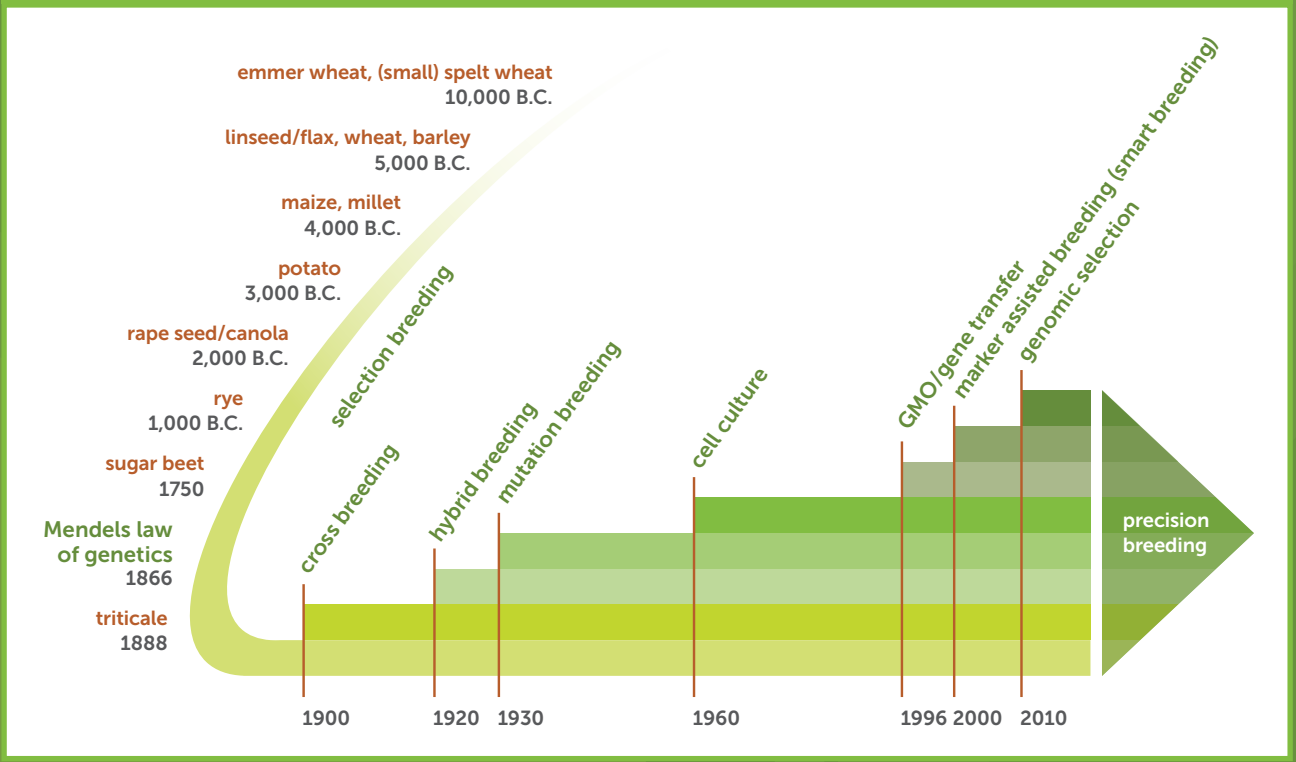
PLANT BREEDING INNOVATIONS

- Reverse breeding
- Synthetic genomics
- Grafting (on GM rootstock)
- RNA-dependent DNA methylation (RdDM)
- Oligonucleotide directed mutagenesis (ODM)
- Agro-infiltration (agro-infiltration "senu-stricto", agro-inoculation, floral dip)
- Gene or genome editing (incl. Zinc Finger nuclease (ZFN), Site Directed Necleases (SDN), Meganucleases, TALEN's & CRISPR

MILESTONES IN PLANT BREEDING



SIPA
1-844-SEED-TIP
Respect Seed Innovation

For more information contact Executive Director Eloy Corona at **EloyC@seedipalliance.com**.

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