

# PLANT BREEDING INNOVATION: PERSPECTIVE FROM THE SEED SECTOR

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The Goals of Plant Breeders Remain the Same

# MILESTONES IN PLANT BREEDING

## CROP DOMESTICATION

Farmers select the best wild species to create crops

10,000  
BC

Domestication  
of wheat



1940



Blast-resistant  
rice

## MUTAGENESIS

Developing new genetic diversity by exposing crop plants to chemical agents or radiation

1926



More vigorous  
hybrid corn

## HYBRID BREEDING

Crossing two genetically different individuals to develop better performing hybrid

## PLANT BREEDING BASED ON CROSS BREEDING

Development of improved varieties by combining good characteristics from two parents



Insect-resistant  
cotton

## GMO

Introducing foreign genes into the DNA of a plant

1994



Barley resistant to yellow dwarf virus

## MARKER-ASSISTED SELECTION

Locating desirable traits in a plant for efficient selection and breeding

2000



Waxy corn

## TARGETED BREEDING

Using modern tools such as genome editing for more targeted breeding

## PLANT BREEDING BASED ON GENETIC INFORMATION

Development of improved varieties by working directly with the DNA



now

future

# Important to Plant Breeders

- Gene editing methods can be used across all agriculturally important crops
- Efficient and precise
  - Can reduce R&D and breeding time
  - Important for plants with long generation times
  - Important for crops with complex genomes

# Why We Care: Some Examples

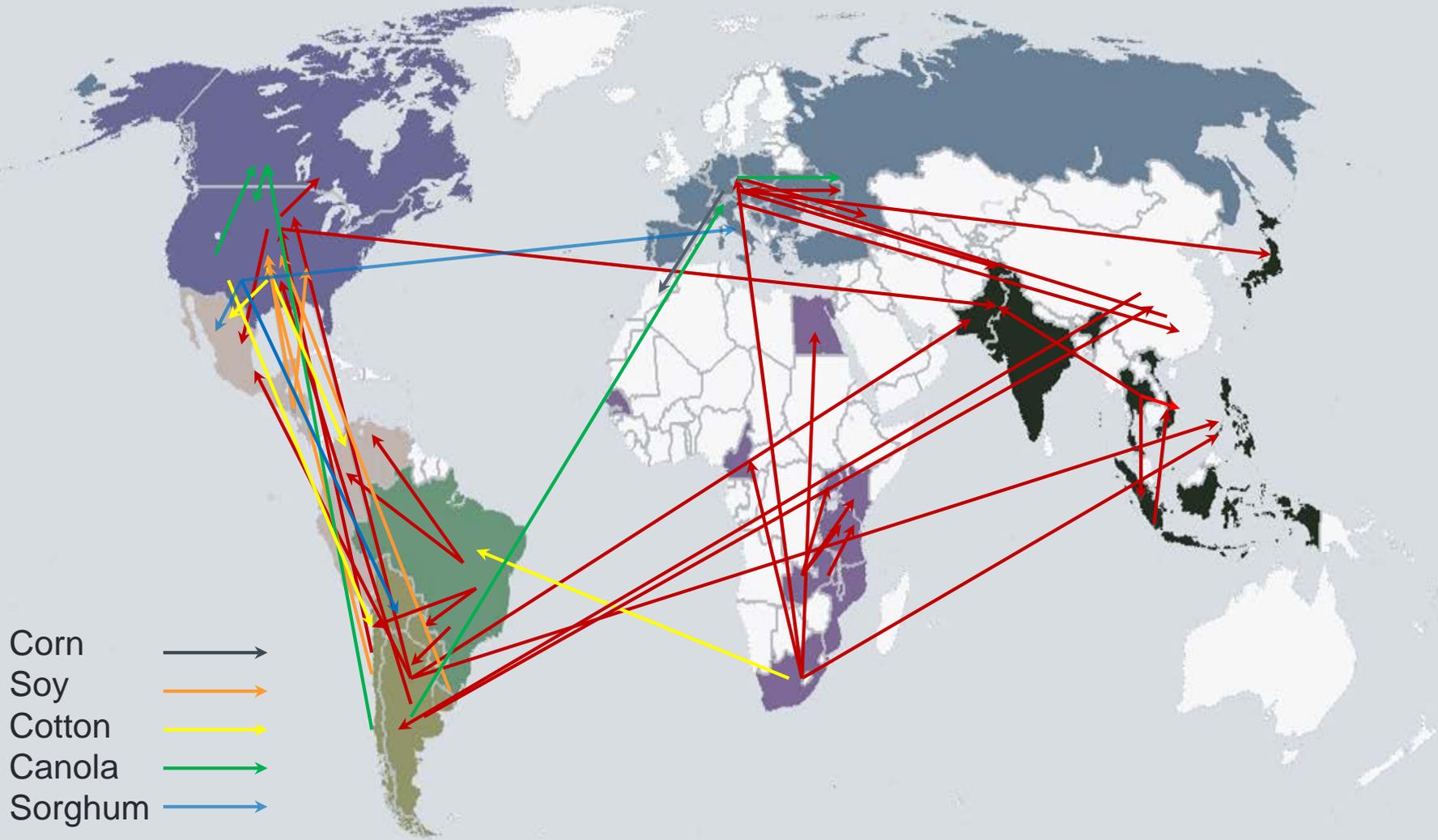
- Crops with high disease pressure
- Genetically complex, consumer focused characteristics
- Water Use efficiency
- Nitrogen, phosphorous, potassium use efficiency
- Improved photosynthetic capacity (higher yields in less space)



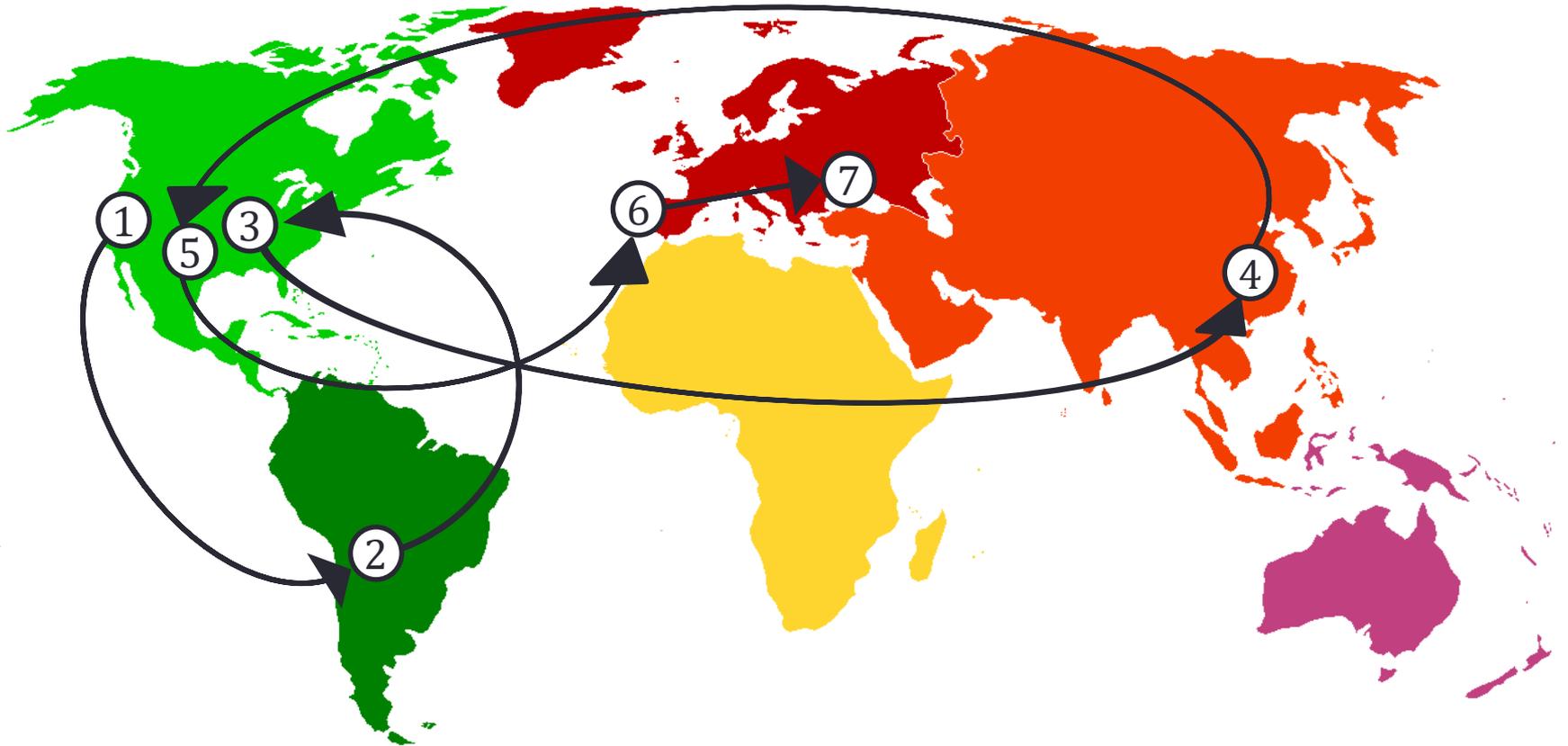
# Impact of Public Policy

- Regulatory policy will determine utilization of methods across companies and across crops
- Unnecessarily high regulatory burden
  - Limit utilization to largest companies
  - Limit utilization to highest value crops (e.g., corn, soybeans) and to limited number of traits (e.g., herbicide tolerance)

# Global Seed Flows



# Tomato Example



# Plant Breeding Innovation: Goals of Global Seed Sector

- The seed sector and agriculture are global—what is needed?
  - Clear government policy
  - Facilitation of innovation, collaboration and trade
  - Consistent, risk-based policies across countries

# International Goals

- Question is not whether plant varieties are regulated
  - Real question is: Should there be a pre-market review & approval?
- It is key that governments and international organizations work together to avoid creating new trade barriers or disruptions due to inconsistent policies and practices.

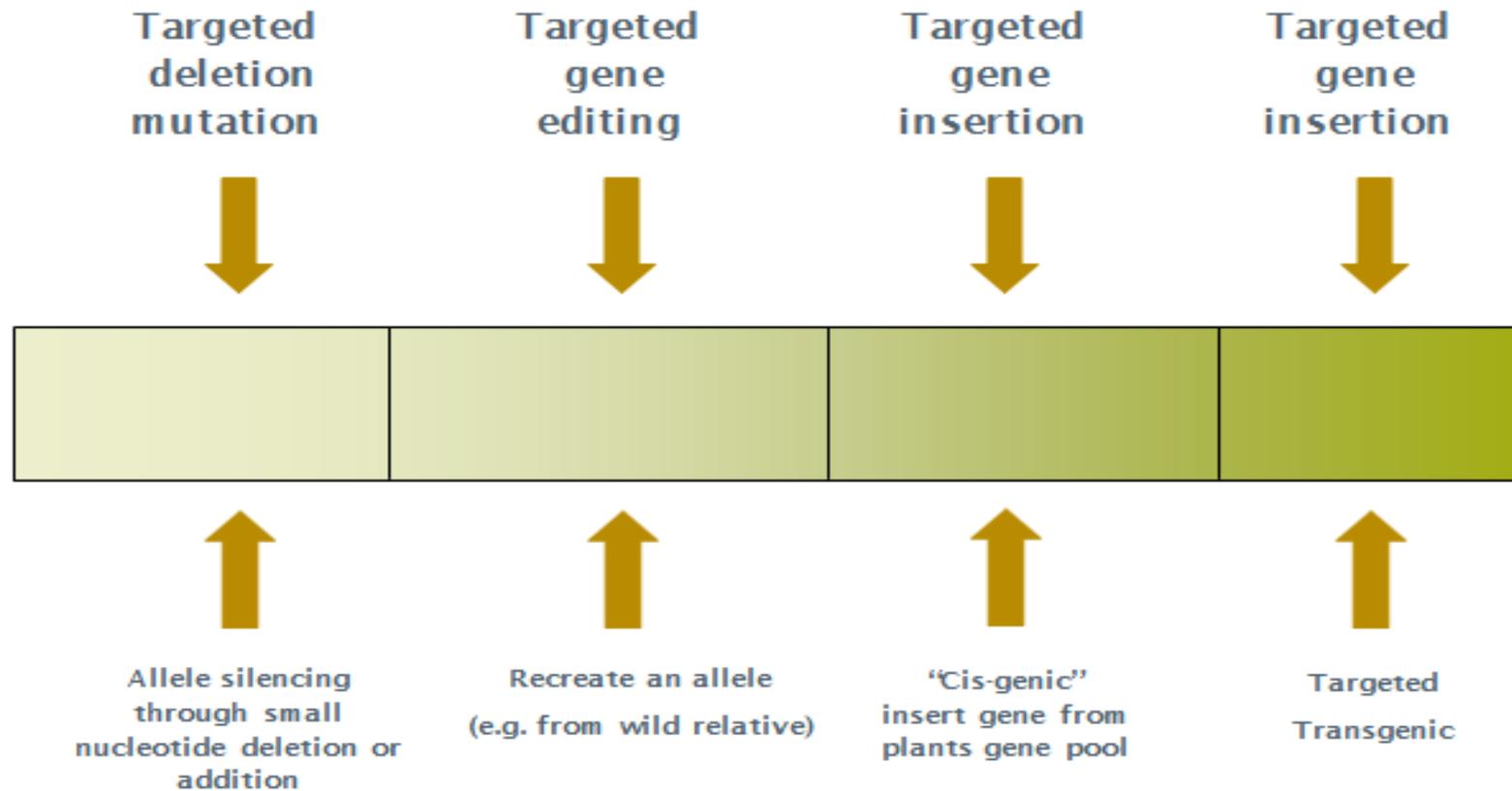
**Goal: Consistent approach to the scope of regulatory oversight for products of plant breeding innovation**



# Underlying Principle

*Plant varieties developed through the latest breeding methods should not be differentially regulated if they are similar or indistinguishable from varieties that could have been produced through earlier breeding methods.*

# Genome Editing: A Continuum



# Some Observations

- Not just about gene editing
  - Precedent for future innovation
- Impact on research
  - Research grants & public/private collaborations
- Plant breeding practices remain the same
  - Quality management practices fundamental to breeding
- Communication is key!
  - Public, value chain and policy makers

# Public-Facing Resources: Check out ASTA's microsite!

- FAQs
- Breeder profiles
- Blog
- Videos
- One-pagers
- News articles
- Infographics



**[www.SeedingInnovation.org](http://www.SeedingInnovation.org)**

# QUESTIONS & ANSWERS

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