



EAST-WEST SEED

# Use of Genetic Resources in Plant Breeding

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Board member East West Seed

Center for Genetic Resources event  
“Genetic diversity - key for transitions in agriculture and forestry”.  
15 March 2023

*Enhancing The Lives Of Smallholder Farmers*



# FARMERS

at the heart of everything we do



# Brief outline

1. Brief introduction EWS
2. Role of plant breeding in addressing challenges faced by agriculture
3. Genetic resources management function in EWS
4. Access and benefit sharing

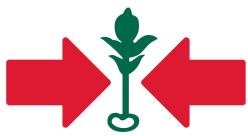
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# Our organization: East-West Seed

Purpose driven company and independent foundation

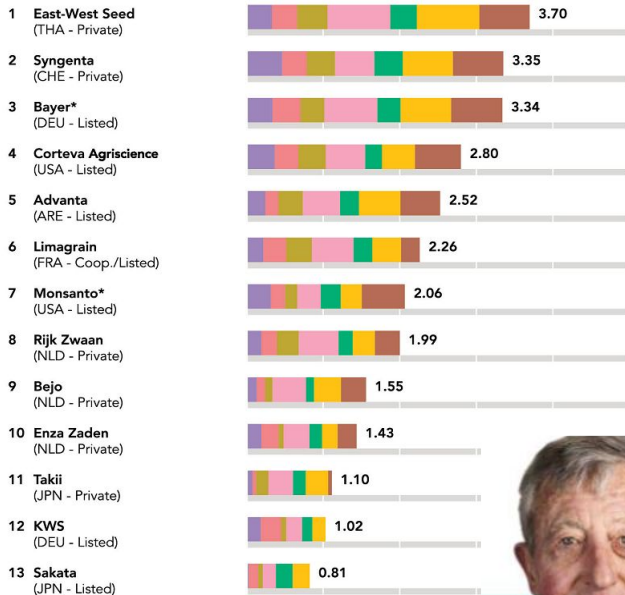




EAST-WEST SEED



## Access to Seeds Index 2019 Global Seed Companies



# EAST-WEST SEED

## BETTER SEEDS FOR BETTER YIELD

- Family-owned, for-profit company
  - 40 years in tropical vegetables seeds
  - 23 million farmers served in 60 countries in Asia, Africa and Latam
  - 80 crops and 740 varieties
  - Mission: to provide innovative seeds & services that help improve the livelihoods of tropical vegetable farmers
- Focus on local markets & local needs
- Higher yields
  - High germination, strong disease resistance
  - Adaptable to climate change

**“A good seed can change the lives of millions”**

**Simon N. Groot**



**KNOWLEDGE  
TRANSFER**

**BETTER SKILLS FOR  
BETTER YIELD**

- **Knowledge Transfer** is EWS' non-profit foundation
- Operating in areas where farmers struggle with poor-quality yields & with potential for future agricultural-input markets to develop
- Funded through fixed percentage of seed sales & external donor funds
- Mission : to improve the livelihoods of smallholder farmers by sharing knowledge on profitable and sustainable production practices
- In 2021 we trained 120k farmers direct & reached over 5 million people online
- Goal to train 1 million farmers between 2021 and 2025

# Role of plant breeding

Addressing challenges faced by agriculture





## What do high quality seed bring to farmers?

- High germination rate
- Disease resistance (i.e bacterial wilt)
- Tolerance to abiotic stress in changing climates (i.e heat stress during flowering, drought stress)
- Increased vigour and uniformity
- Higher yields
- Marketable traits (improving farmers competitive position)





## Plant breeding contributes to UN Sustainable Development Goals

- **SDG 2** - end hunger, achieve food security and improved nutrition and promote sustainable agriculture; improved seeds boost crop yields and make available nutritious food
- **SDG 8** - promote sustained, inclusive and sustainable growth; new and improved varieties of crops contribute to improving the livelihoods of farmers
- **SDG 13** - plant breeding help farmers adapt to climate change
- **SDG 15** - life on land - biodiversity conservation



# Plant Breeding Process

## Germplasm Collection



- Includes wild relatives, genebank accessions, commercial materials

## Characterization of new germplasm



- Morphological characterization
- Identify resistances and other useful traits
- Require 1-2 years of evaluation.

## Recombination and Breeding Line Development



- Introgression of target traits from donor parent to breeding lines.
- Requires at least 4 years cycles of selection process

# Plant Breeding Process

Hybridization



Variety Evaluation



Seed Production



Commercialization



- Production of 50-100 test hybrids (which may vary between crops and programs)

- Evaluation of new test hybrids conducted In- house and farmers' field.
- Requires at least 3 years of evaluation and testing.

- Production of commercial amounts of hybrid seeds or OP varieties

- Introduction and commercialization of new varieties in the market
- Variety registration



## New breeding objectives: disease resistance, climate change adaptation

- require access, screening and characterization of new starting materials
- new access is a continuous requirement

# Genetic Resource Management



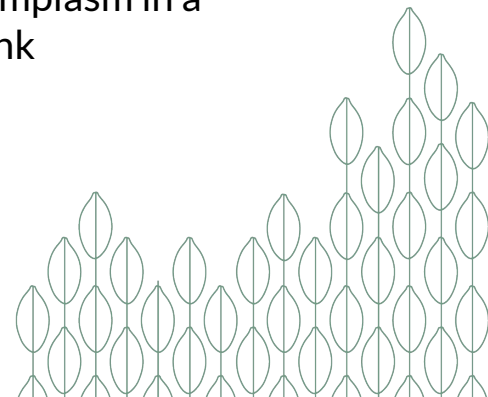


# Using Genetic Resources in Plant Breeding

- Genetic diversity is the basis of plant breeding
- Most plant varieties used in breeding crosses are varieties that are already cultivated and have been collected, transferred, combined, sold, and traded internationally for a long time

## Genetic Resource Management (GRM) at EWS

- GRM Function was established as part of the East West Seed strategic initiatives to secure its IP
- The GRM Function is responsible for safely securing EWS valuable germplasm in a centrally managed genebank



# Scope of GRM Function

## Conservation

- \*Seed preservation of breeding lines, local varieties & crop wild relatives through a centrally-managed genebank.
- \*Supporting both local & international policies on germplasm conservation

## Trait Discovery

- \*Supporting breeding & research programs through the discovery of high impact traits needed in developing improved varieties and climate-resilient crops.

## Acquisition

- \*Germplasm acquisition through formal correspondence using an MTA or sMTA.
- \* Germplasm exchange with research partners supported by project contract or MOA.

## Partnerships

- \*Supporting local & international genebanks through monetary & in-kind contributions for germplasm conservation.
- \*Support Crop Trust initiatives & projects through research partnerships.

*Contributing to Genetic Resource Conservation*

*Supporting the East West Seed Mission*

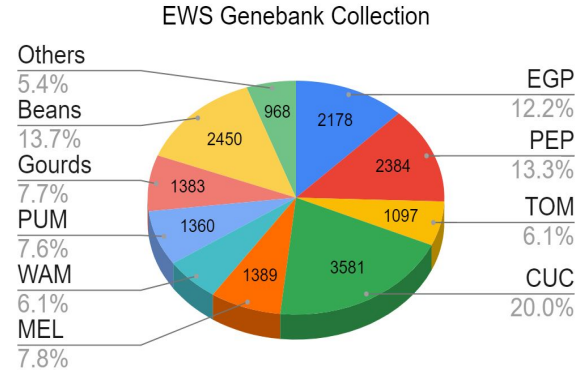
# GRM Highlights

## Genebank stats

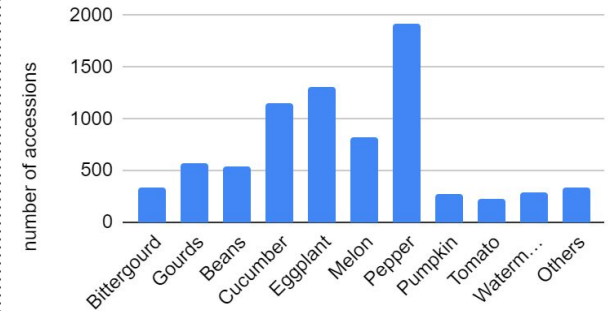
- 17,000 accessions/20 crops
- 18 genera/159 species including crop wild relatives
- 7,540 accessions preserved or ~100,000 seed packets stored



# Supporting the business



## Germplasm stored at -15C





# Conservation & Utilization of Crop Wild Relatives for Pre-breeding & Research

- Characterization to identify sources of **disease & insect pest resistance** and **drought & flooding tolerance** - traits impacting pre-breeding & rootstock breeding.
- Utilization in **genome sequencing & marker development** for various traits significant to variety development.
- Contributing to global efforts of **conserving** crop wild relatives through external partnerships.



## Access and Benefit Sharing (ABS)



*ABS refers to the way in which genetic resources may be accessed, and how the benefits that result from their use are shared between the people or countries using the resources (users) and the people or countries that provide them (providers).*

# ABS approaches

- **Nagoya Protocol**
  - Sharing the benefits arising from the utilization of genetic resources in a fair and equitable manner
- **International Treaty of Plant Genetic Resources for Food and Agriculture (ITPGRFA)**
  - Multilateral system of Access and Benefit Sharing
  - Standard Material Transfer Agreement (SMTA) benefit sharing provisions:
    - Monetary benefit sharing
    - Non-monetary benefit sharing
      - Information sharing
      - Capacity building
      - Technology transfer

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## ABS Challenges

- Not easy to produce prior informed consent (PIC) and mutually agreed terms (MAT) via bilateral agreement
- Every cross stacks the contractual ABS requirements of its parental lines
- Many of the ABS agreements are not adapted to “stacking in a breeding program”
- When buying commercial seeds, it is usually not possible to know the underlying ABS requirements - retroactive application in some countries



## ABS approaches that work

- ITPGRFA/MLS - preferred ABS mechanism by seed associations
- Standard access agreement
- Royalty payments only at commercialization
- Standard royalty rate that is not cumulative



## Collaboration with genebanks

# Evaluation of Pumpkin wild relative, *Cucurbita lundeliana* for disease resistance



GB-358 (PI 532357)  
Calabasa de Monte



GB\_356 (PI 438542)  
Peten Gourd



GB-359 (PI 540898)  
#95

Source: USDA-NPGS (acquired through formal correspondence)

# Regeneration & Evaluation of Genebank Collection



GB-CUC-046 CGN cucumber fruit diversity



GB-PUM-056 USDA pumpkin fruit diversity



GB-YLB-011A Evaluation of NPGRL materials by genebank & breeder



GB-EGP-030 BW screening



GB-CUC-046 BPI post-entry inspection



GB-Pum-063 Pumpkin wild relatives



Pumpkin fruit evaluation by genebank & breeding team



GB-Pum-062 Africa local pumpkin



## External Partnerships with Philippines genebank & NPPO

Partnering with Philippines genebank NPGRL by reviving their old seed collections at East West Seed Company Quarantine Facility, free of cost.



Collaborating with The Bureau of Plant Industry on phytosanitary plant inspection to ensure the safe conservation & distribution of germplasm.



# Public-Private Partnership

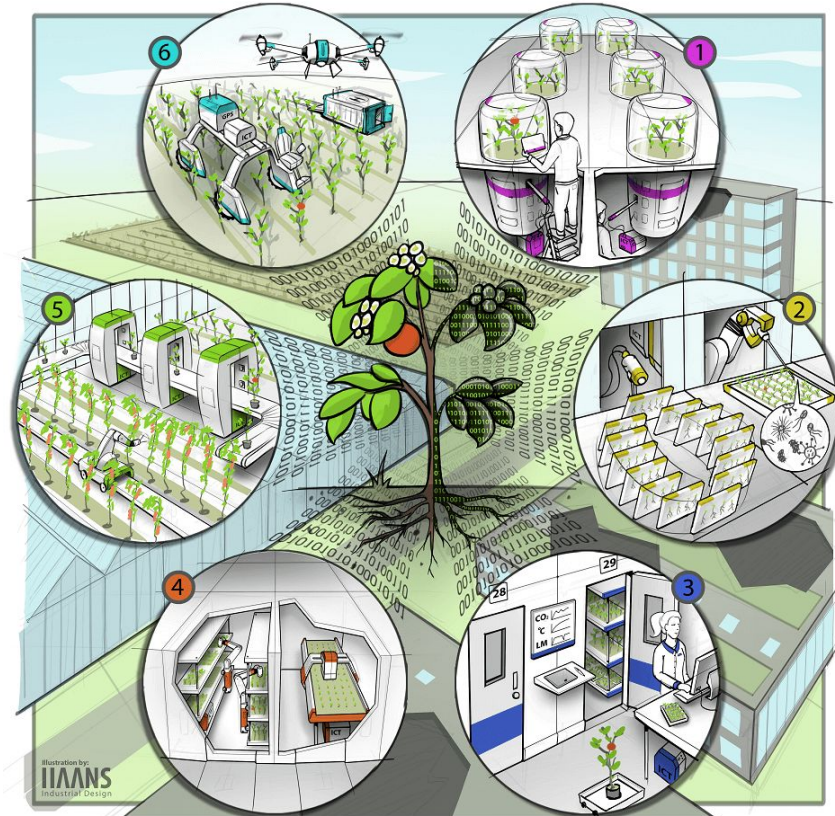
Collaborated with the Global Crop Diversity Trust and Universitat Politecnica de Valencia (Spain) for a project on development and preparation of eggplant pre-bred materials for adaptation to climate change

- Multiplication of germplasms
- Morphological characterization
- Evaluation for biotic stresses



# COLLABORATIVE PROJECTS ON HIGH THROUGHPUT PHENOTYPING

- High throughput phenotyping for disease resistance in plants  
*Project Proponents: Wageningen Plant Research, EWS + 15 other companies/partners*
- High throughput phenotyping for plant resistance to sucking pests  
*Project Proponents: Plant Research International, EWS + 5 other companies/partners*



# COLLABORATIVE PROJECTS

- APSA-Worldveg: Multi-environment testing of Ty genes in tomato and sequence analysis of begomovirus and its whitefly vector  
*Project Proponents: Worldveg, EWS + 22 other APSA member companies*
- APSA-NSTDA (Thailand): Screening protocol development for TNRV and CaCV (tomato)  
*Project Proponents: BIOTEC (Thailand), EWS + 9 other companies/partners*
- New APSA-Worldveg project: High throughput phenotyping for heat tolerance (tomato and pepper)  
*Project Proponents: Worldveg, EWS + 7 other companies/partners*



# Vegetable Gene Bank Universitas Gadjah Mada



- Established August 2018, assisted by East West Seed Indonesia for ex situ conservation of vegetable genetic resources.
- Is expected to be the center for research and development of vegetable in Indonesia.
- Gene bank development is one step to conserve and maintain Indonesia vegetable germplasm from genetic erosion.



# What would EWS like to request from genebanks?

- More evaluation of material, more reliable data,
  - Better accessibility of collection material,
  - Collecting more (and hence bigger) collections,
  - More attention for benefit sharing obligations,
  - Reduction of redundancy between collections,
  - More attention for phyto
- 
- But most of all : sharing germplasm with seed companies using the SMTA.





## Concluding Remarks

- Global nutrition security requires accelerated plant breeding.
- Plant breeding requires quick and easy access to genetic resources
- ABS legislation is a complex issue; makes it difficult for breeders to deal with it in their daily work
- The seed industry needs legal certainty to continue innovating



# Thank you!

For any questions or further clarifications.

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