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A TATA Enterprise

Novel Genetic Technologies for Enhancing Drought Resilience in Corn

Dr. Dror Shalitin
Founder and CEO, PlantArcBio

Dr. Vairamani Ramanathan
Chief - Technology & Innovation, Rallis

World Agri-Tech Innovation Summit
March 14, 2023

Disclaimer

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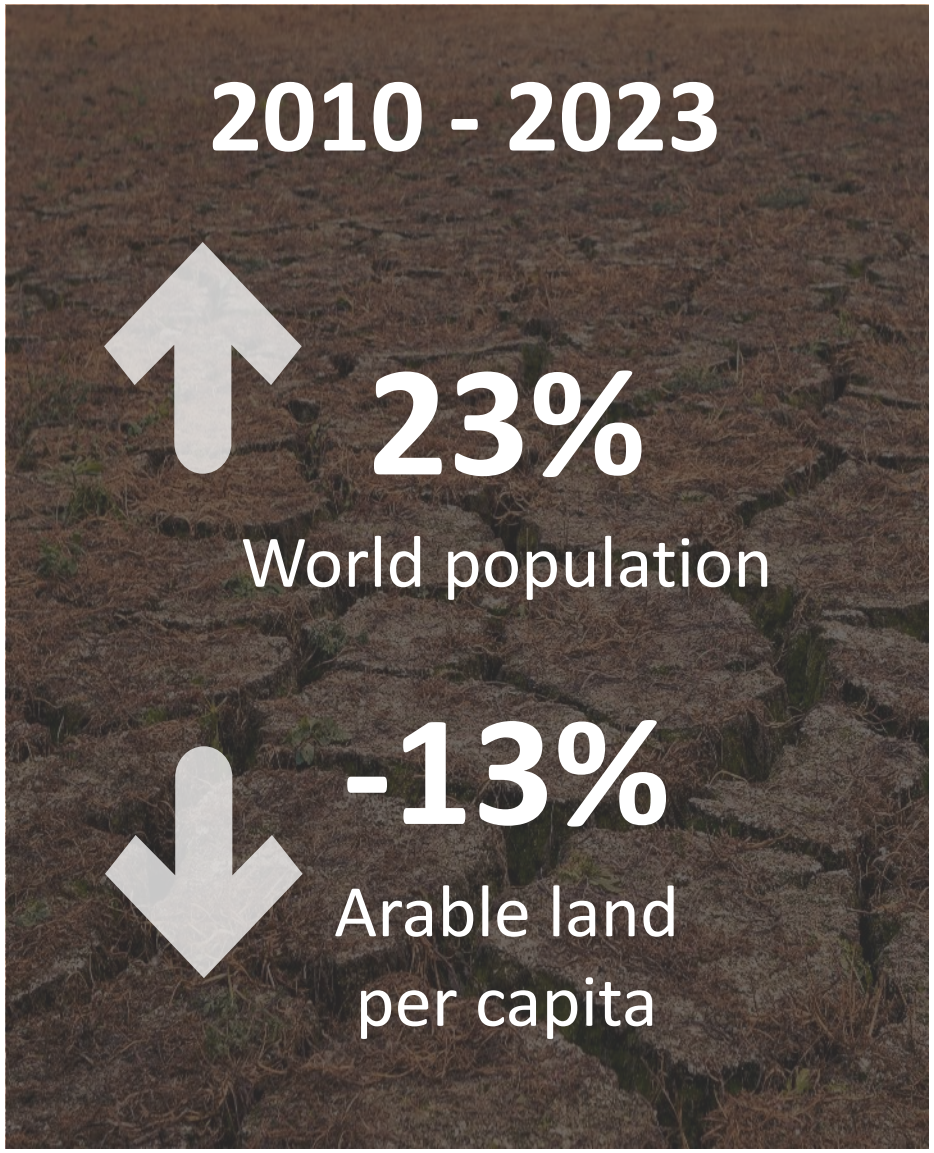

Global Food Security Challenges

- Climate changes, desertification
- Increasing population
- Less available arable land

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Source: FAO

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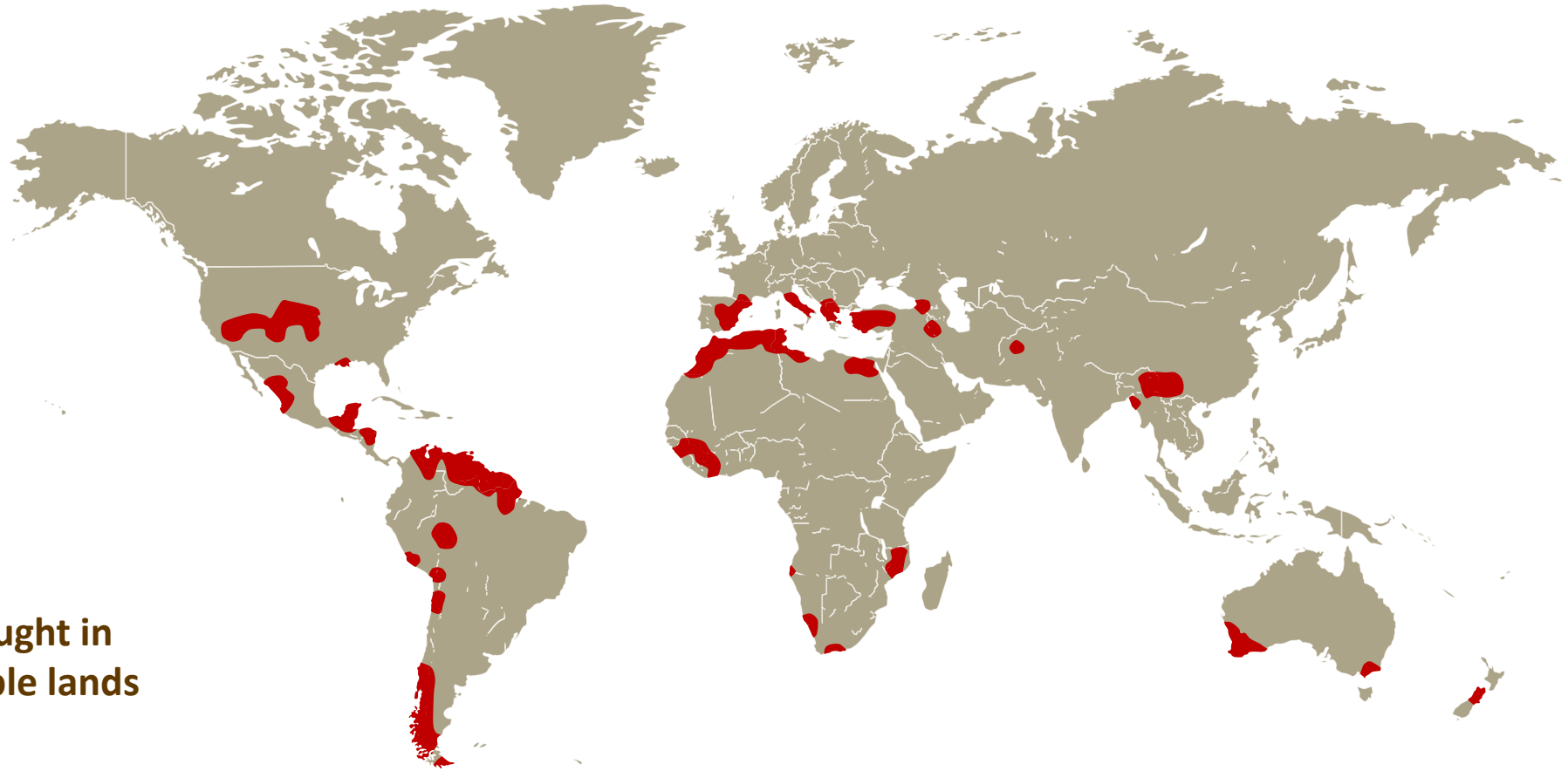
Drought Prevalence is Increasing

2011 status



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https://wwwfdp.2010SERIW_thguord-iaD/srepap/iada/sac/ude.racu.dgc2

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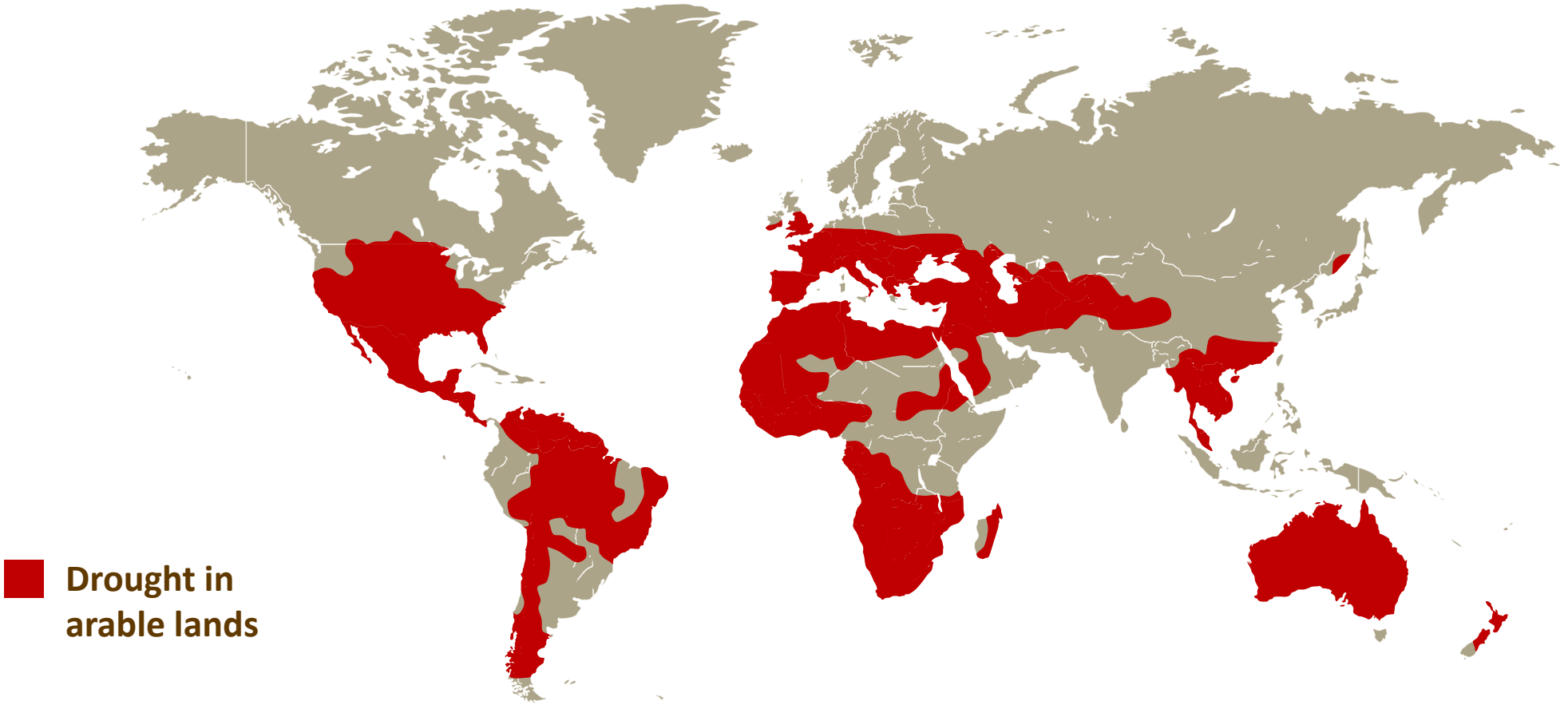
2050 prediction



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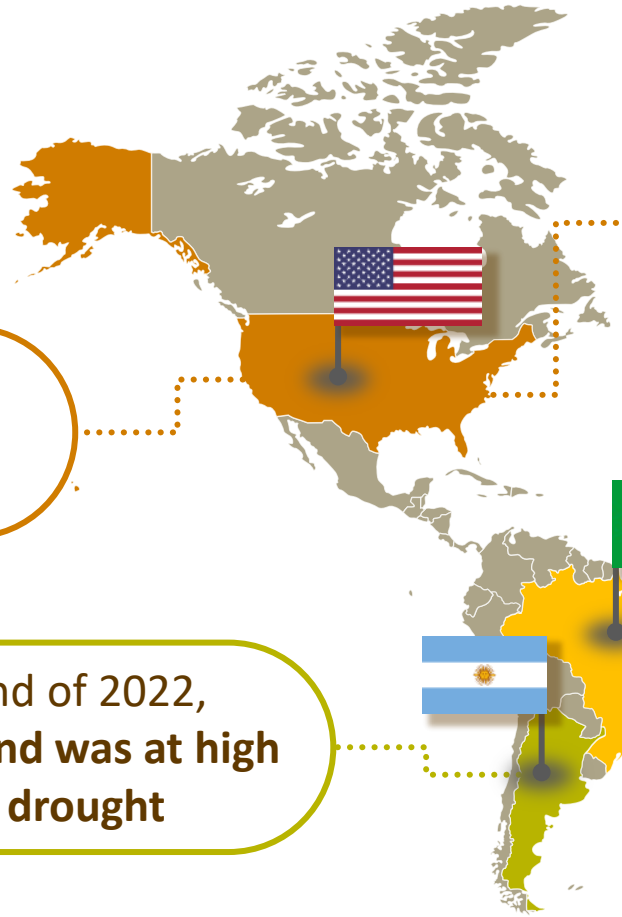
Up to 14% of Rain-fed Cropland WW has Suffered From Drought in 2022



2022: **Drought** and wildfires accounted for over **$20.4 billion in total crop losses**

In 2012, **severe drought impacted 80 % of agricultural land**

47% of corn and 59 % of soybean were at high risk of drought

At the end of 2022, **most cropland was at high risk of drought**

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AFBF - American Farm Bureau Federation, 2023 McKinsey, 2022 drought.gov

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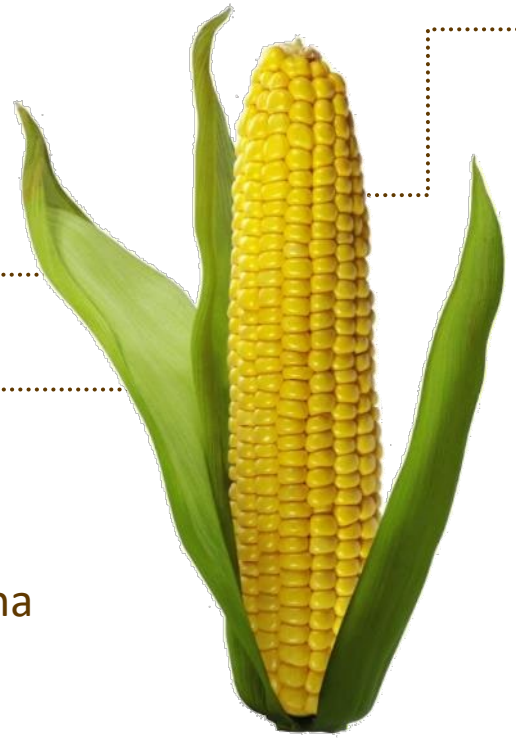
Global Corn Market

Global corn seed market

US$25 billion

in 2021



Corn is expected to become

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201 million hectares

Estimated growing area

1 billion tons

Estimated production **per year**

45%

of corn grow in
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90% of it is genetically modified

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Source: USDA

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- Corn is particularly sensitive to drought
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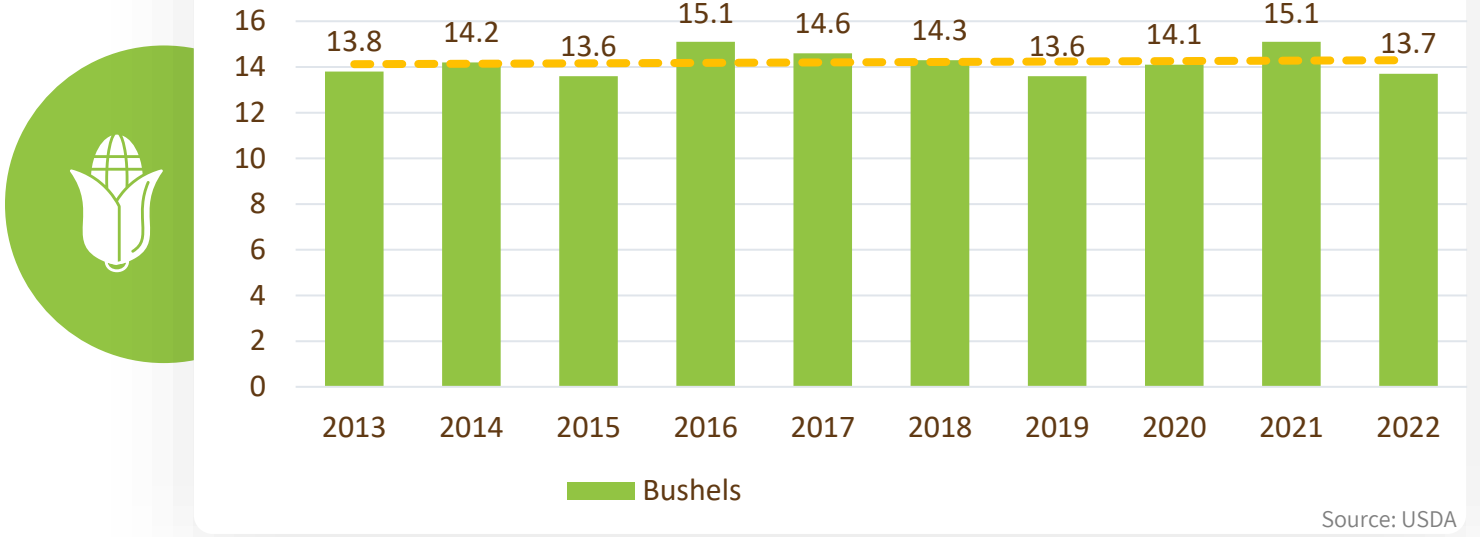

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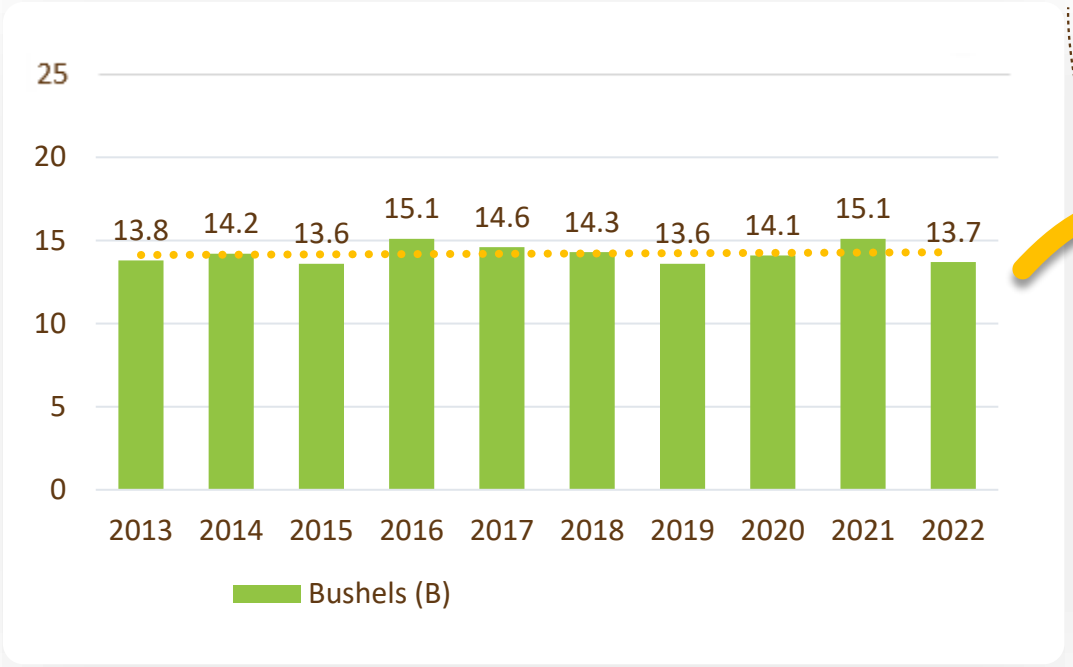
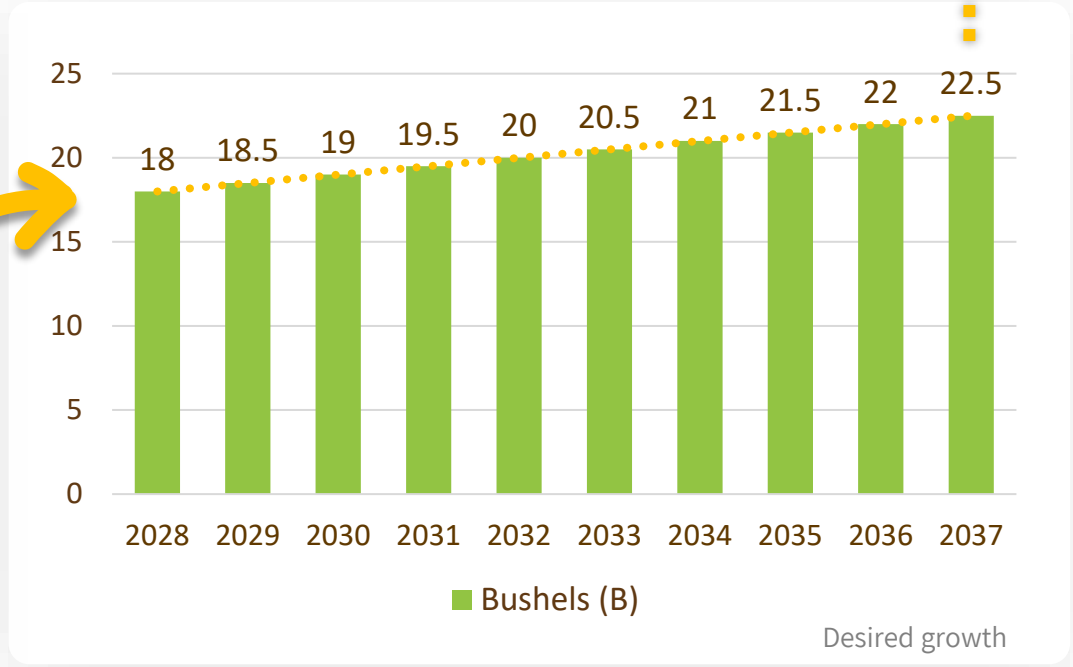
Novel Approach for Drought Resistance is Required

Genetic approach: Increasing yield through drought resistance



Desired 20% - 40% yield increase



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We Made it Possible!

60% to 250%

increase in total seed weight of genetically modified corn in drought conditions

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Gene Discovery for Improving Drought Resistance in Agricultural Crops

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Life in the Desert is Adapted to Drought Conditions

We went to the Dead Sea area to collect genetic samples…

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Novel Approach for Gene Discovery – DIP™

Millions of genes

Millions of genes in millions of plants

Building a gene pool from nature

Transforming to model plants

Applying abiotic stress - drought

1-20 leading genes

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Drought & Yield Increase in Corn –
Collaboration With Rallis

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Enabling Biotech Trait Delivery in Corn

Immature embryos
Day 0

Early Selection
Days 15-20

Late Selection
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Maturation
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Rooting
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Elongation
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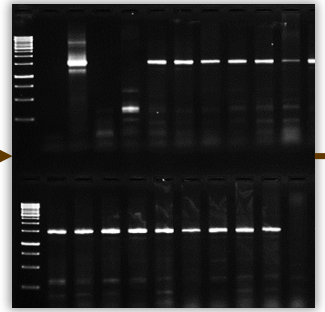
Drought Tolerance Bioassays

Lab based Assays



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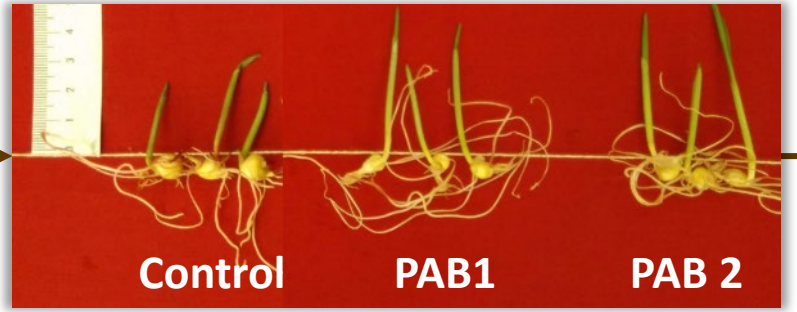

PEG Assays

Greenhouse based Assays

Seedling Pot Assays

Whole Plant Pot Assays

On-ground Assays

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*Depending on genotype

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Drought Results – Trials in Pots

PAB Target Genes	Days of water stress	Recovery rate (%)
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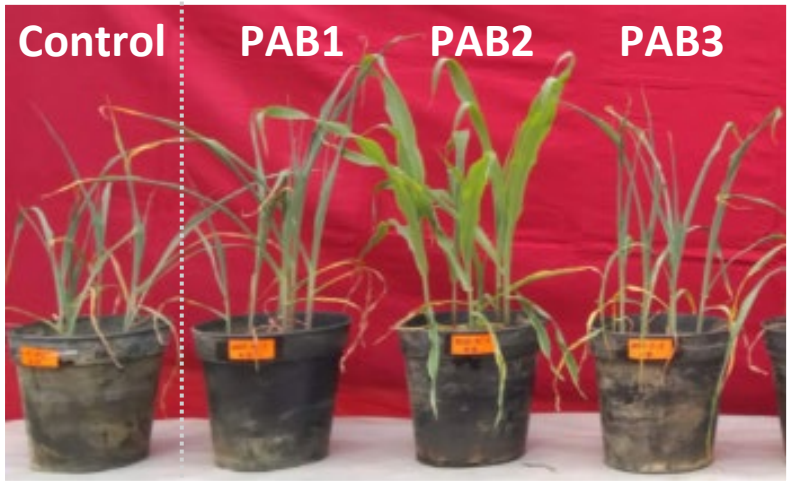
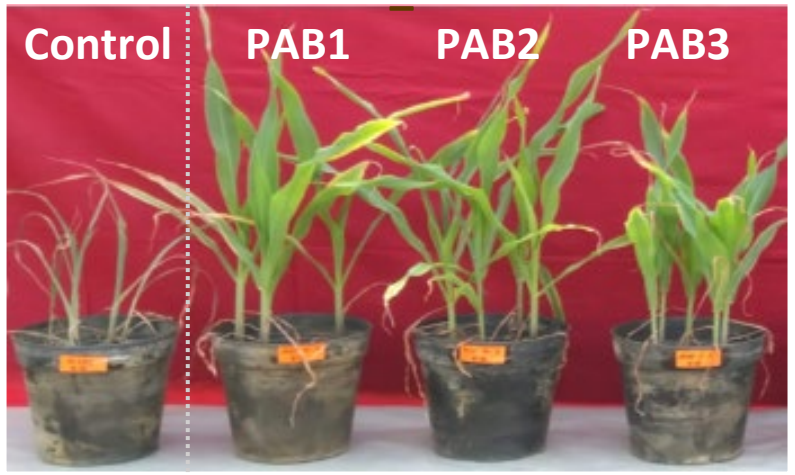


Severe drought



Recovery

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On Ground Results

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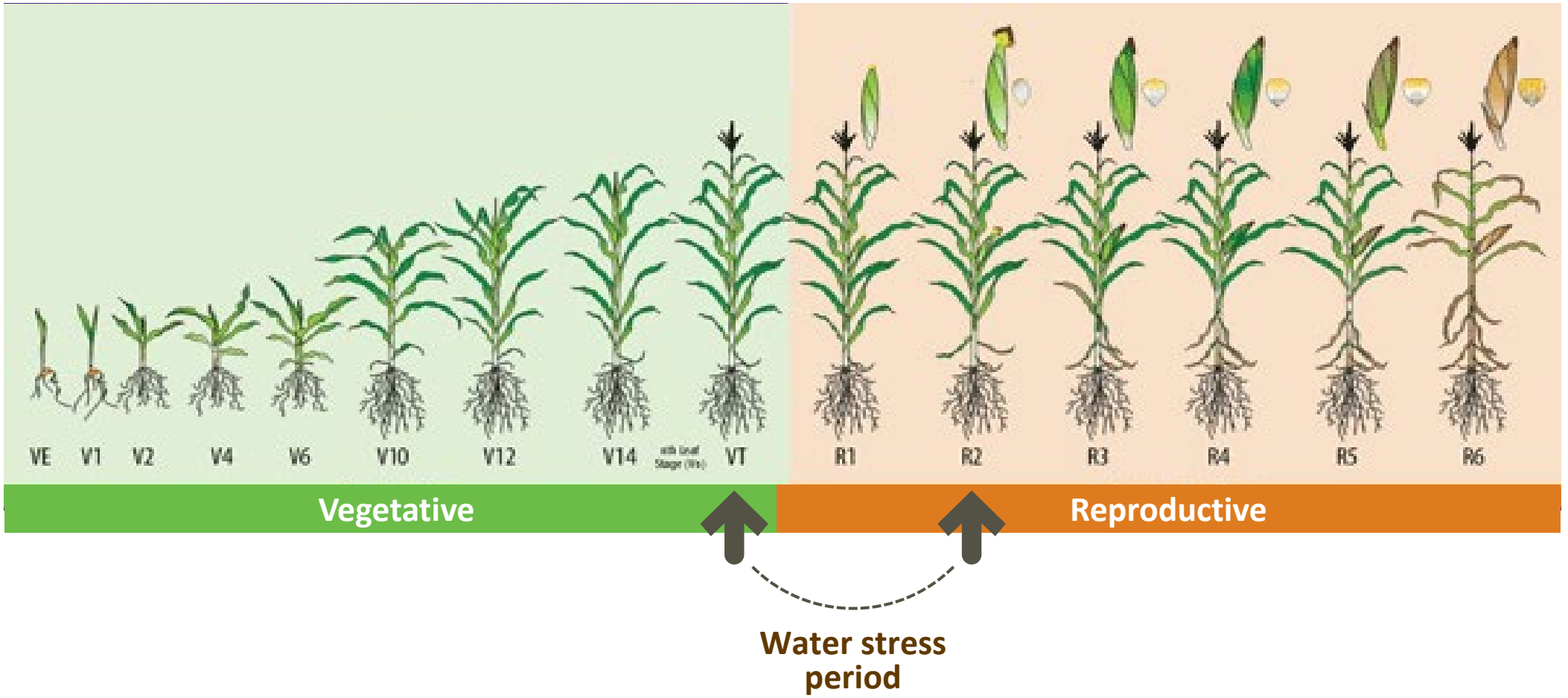
On Ground Assay – Water Stress Period

Corn Growth and Development



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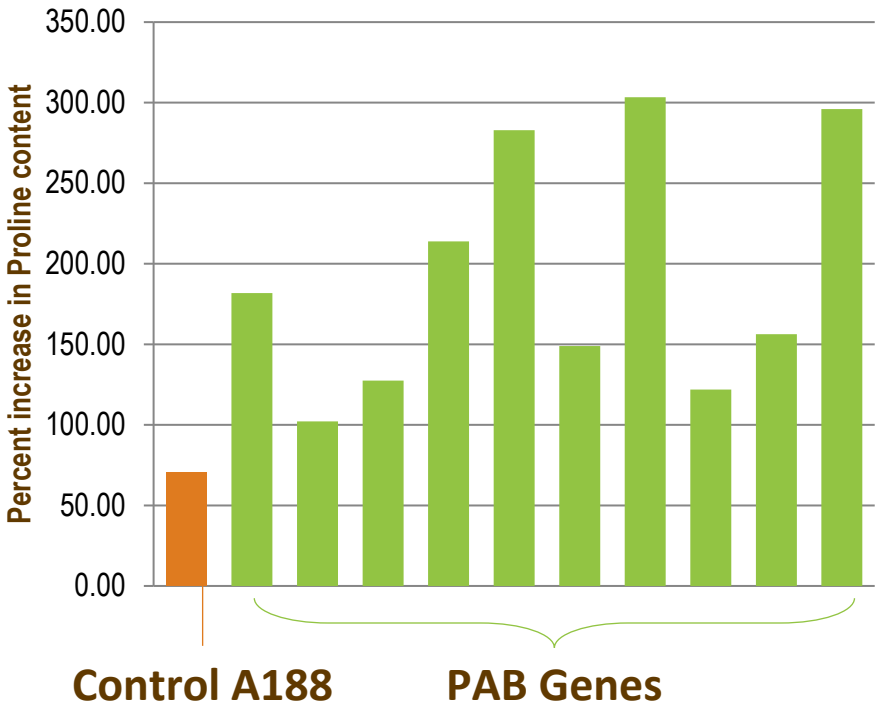
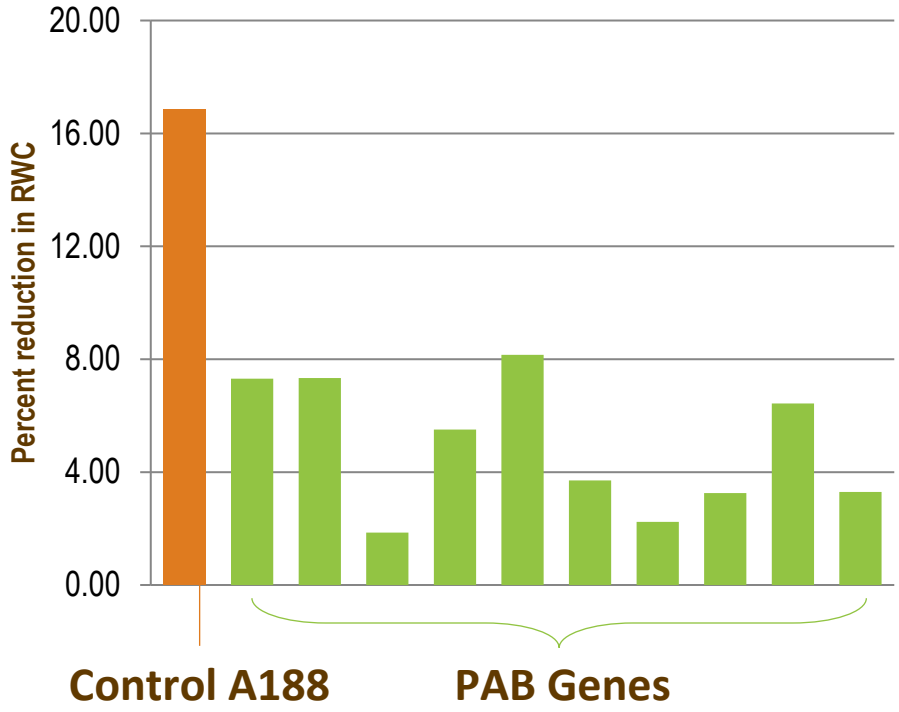
Yield Increase in Corn

Proline Content



Increase in proline content compared to well irrigated plants

Relative Water Content



Reduction of water content compared to well irrigated plants

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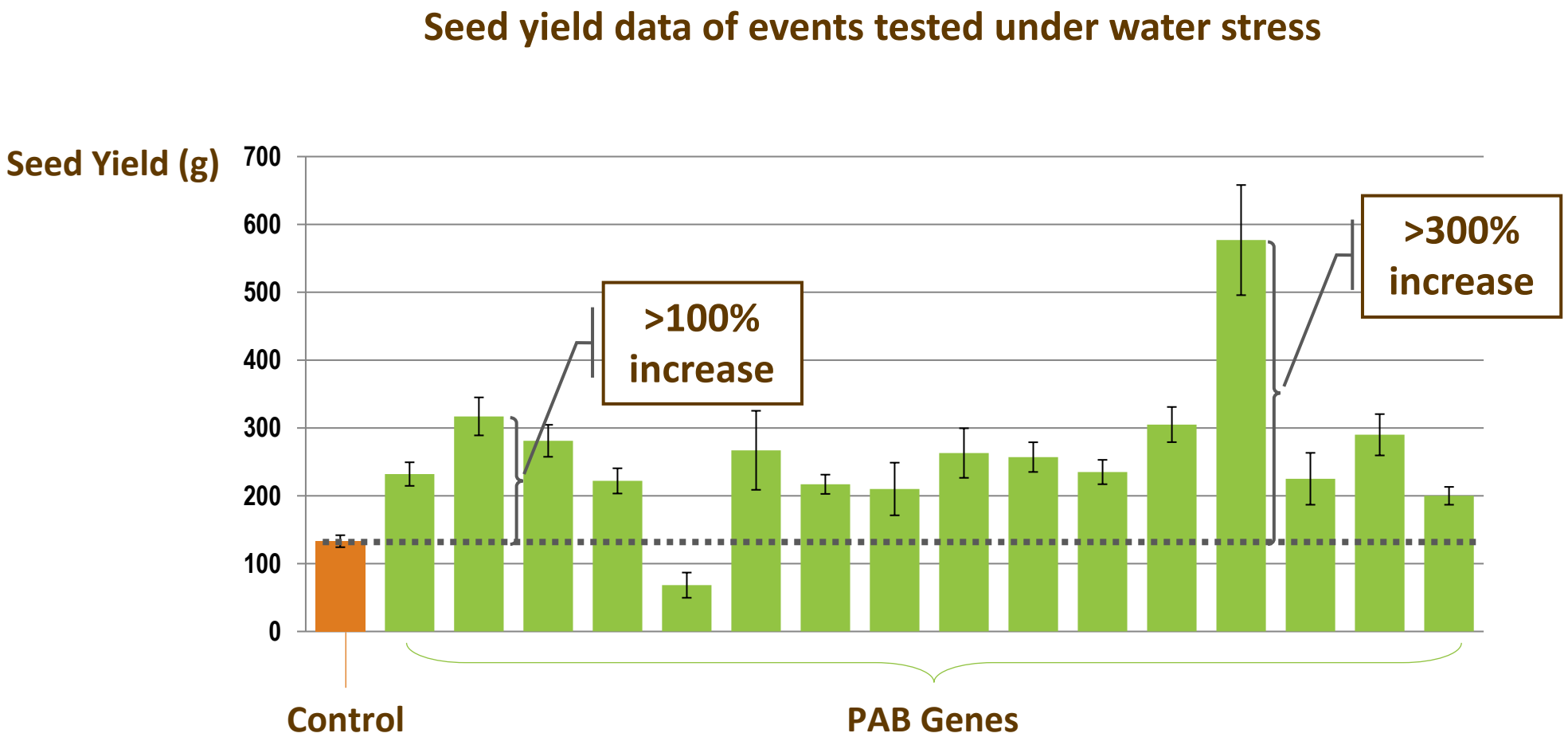
Exceptional Results – Seed Yield



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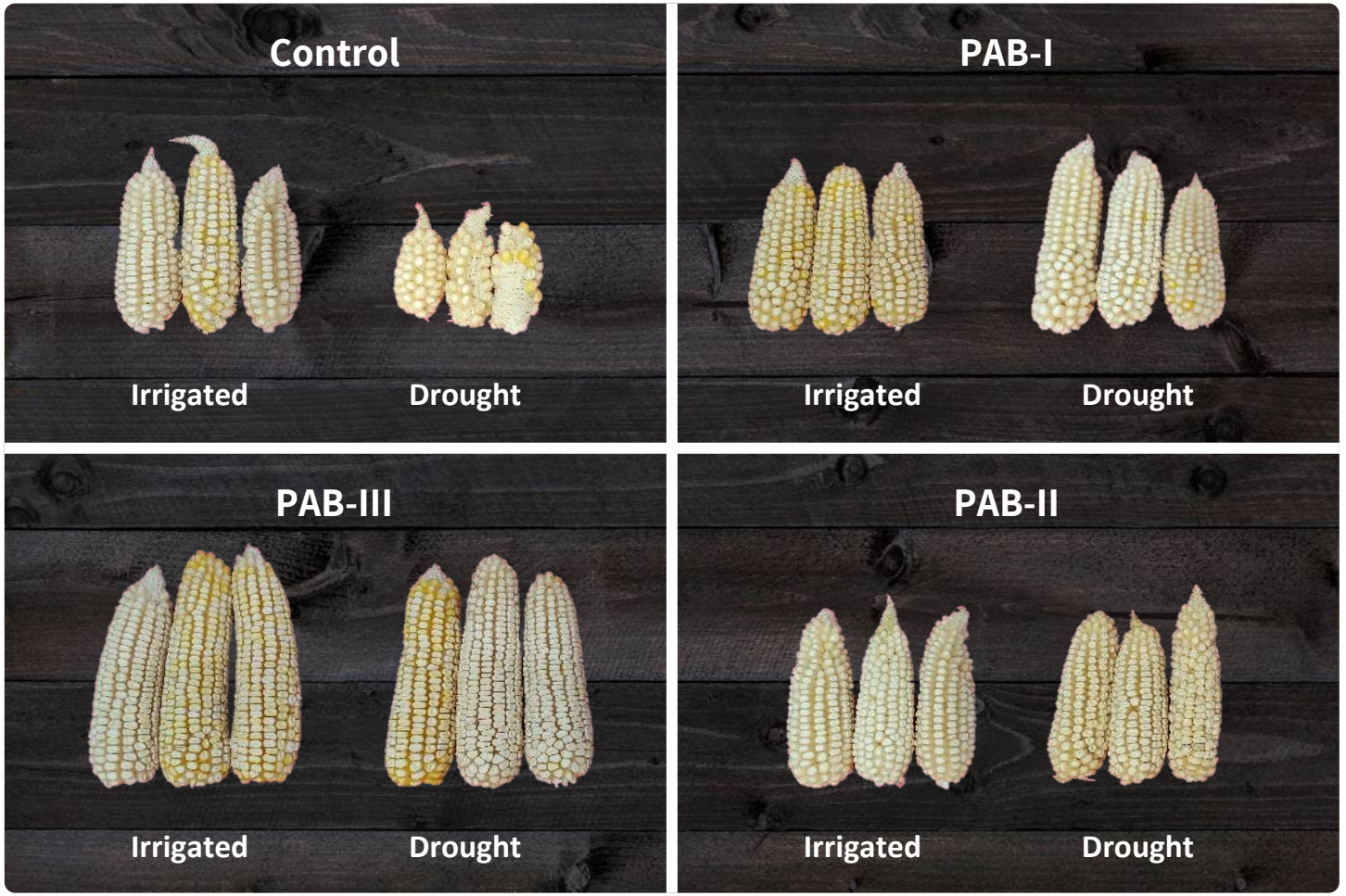
Yield Increase in Corn – Wishes come true

60-250%

Increase in the total seed weight of corn plants, containing best PAB drought resistance gene!



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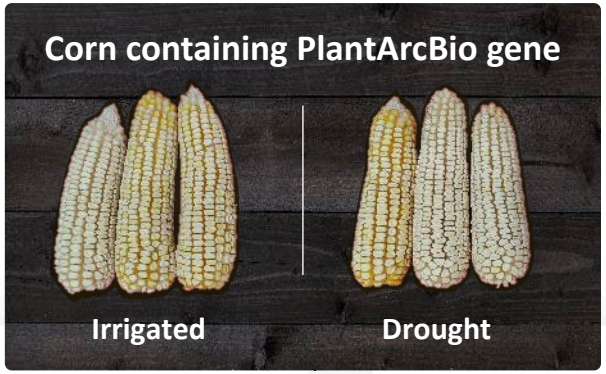
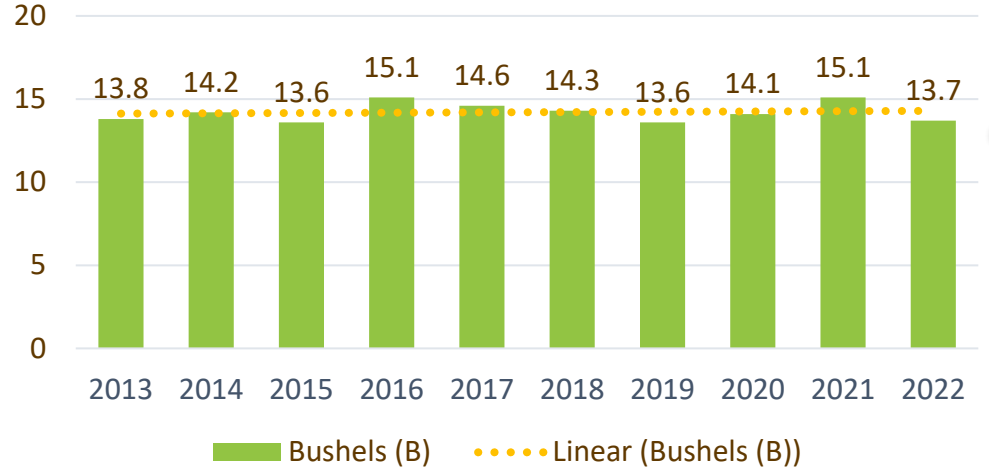
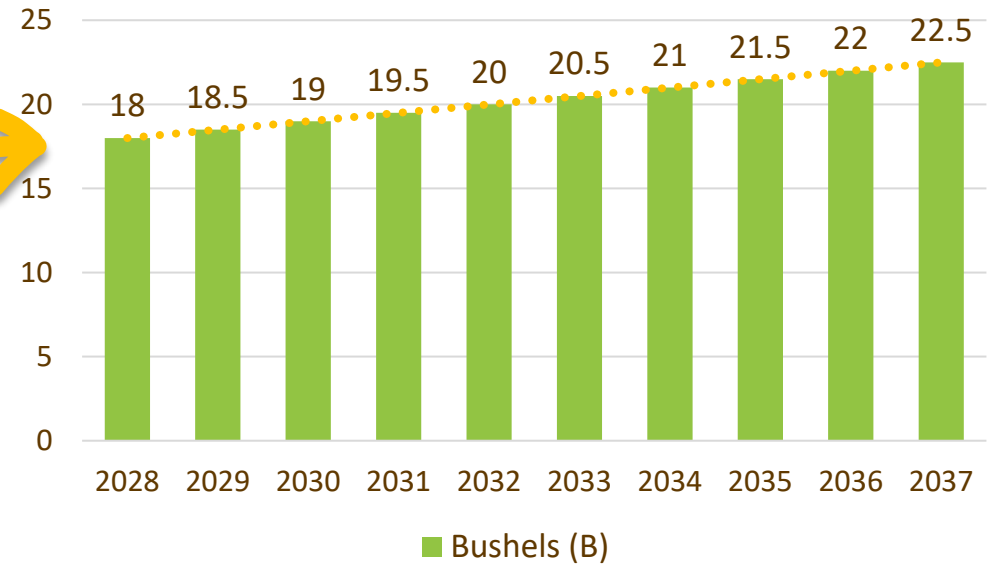
20% increase in corn yield in the US may increase production by 70 million tones







Corn is Just the Beginning...

Potato

Rice

Canola

Wheat

Soy

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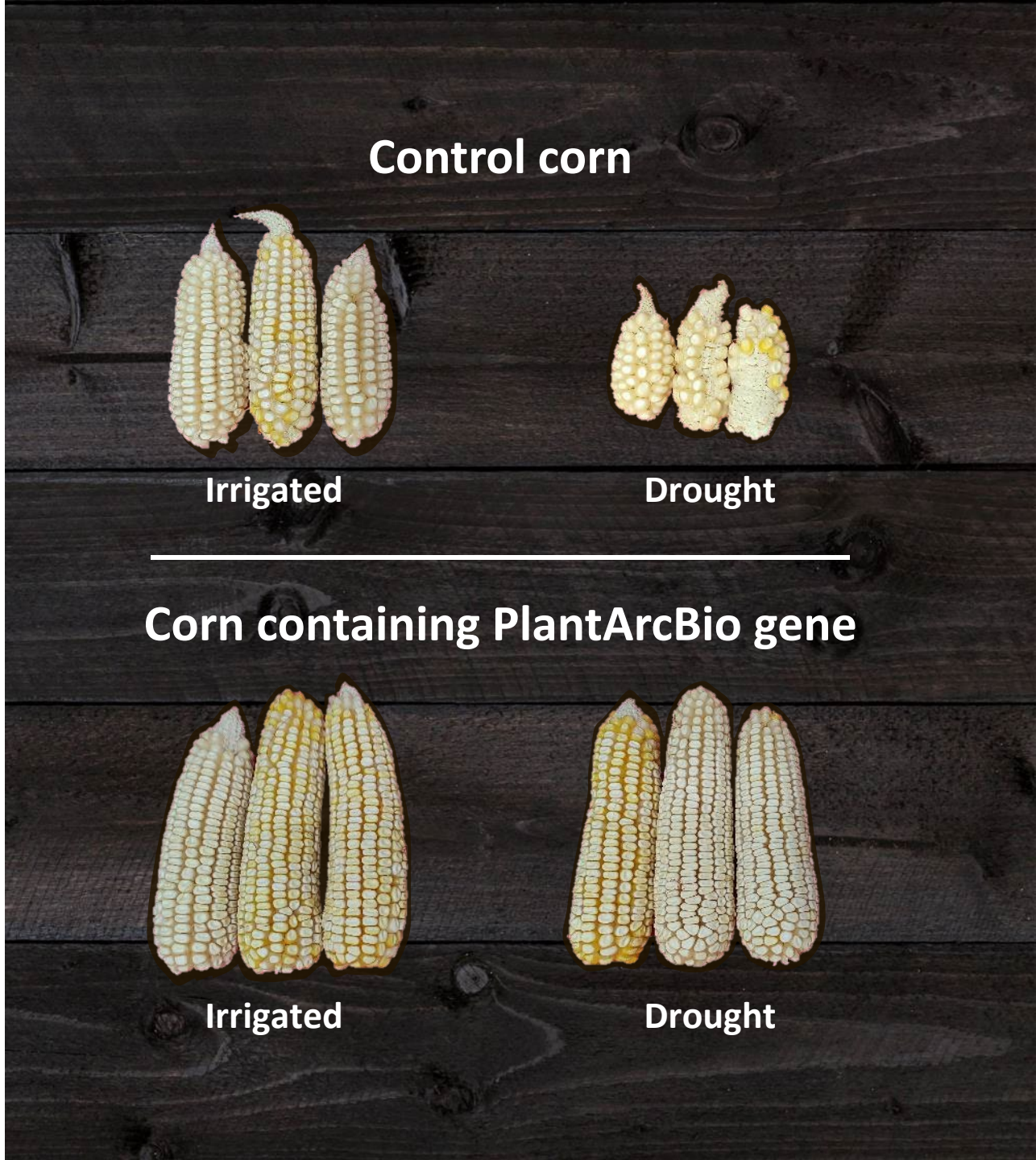
Let's Plant the Seeds of Change Together!

Dror Shalitin, PHD
CEO and Founder
PlantArcBio
dror@plantarcbio.com

Vairamani Ramanathan, PHD
Chief - Technology & Innovation
Rallis India Limited
vai.ramanathan@rallis.com



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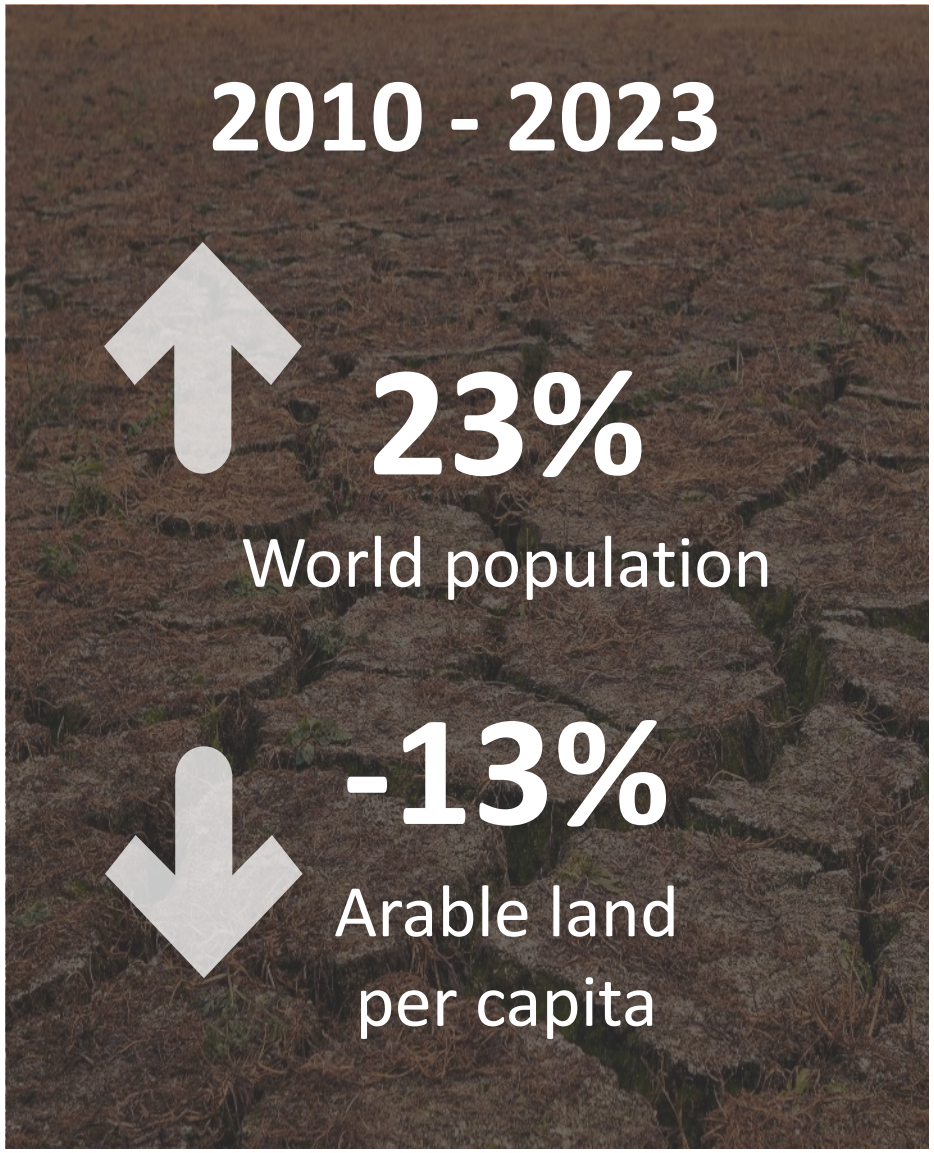

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Drought Prevalence is Increasing

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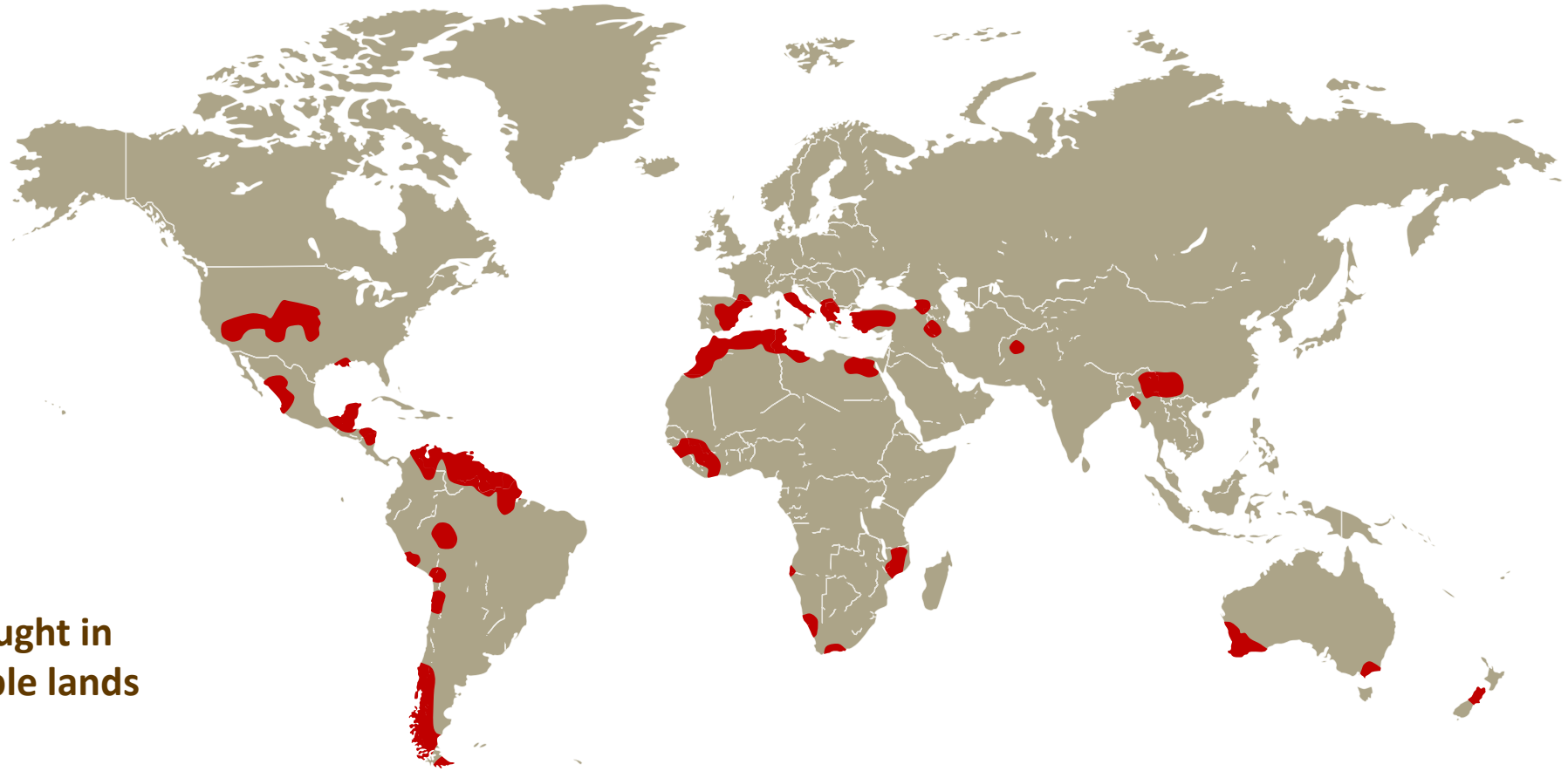

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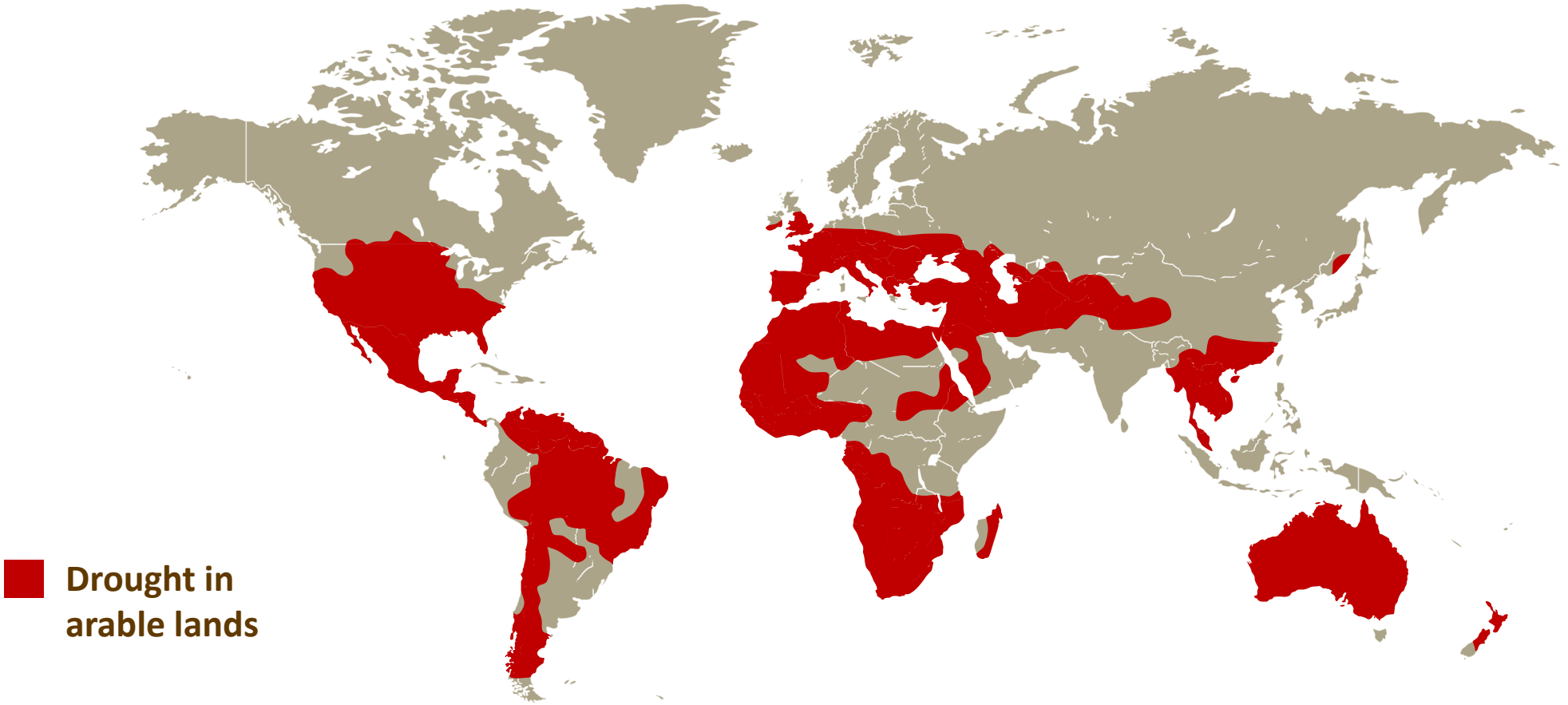

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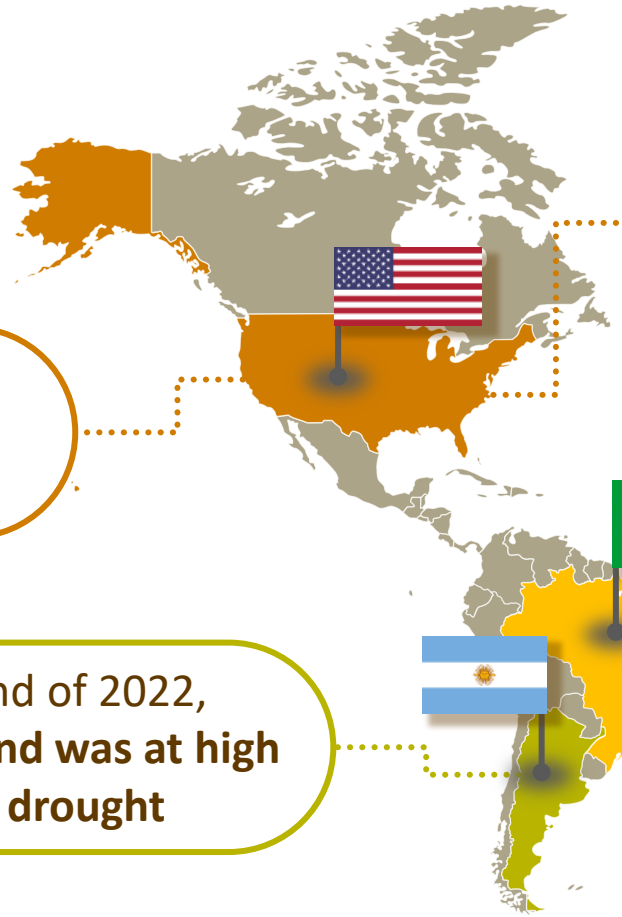
Up to 14% of Rain-fed Cropland WW has Suffered From Drought in 2022



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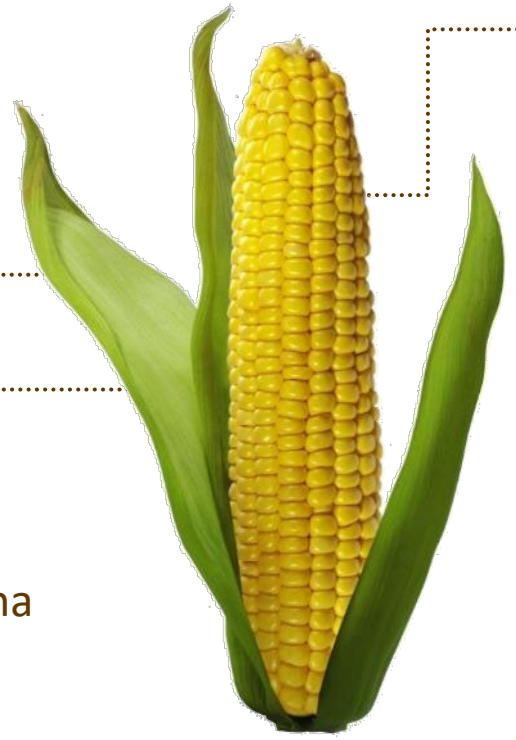

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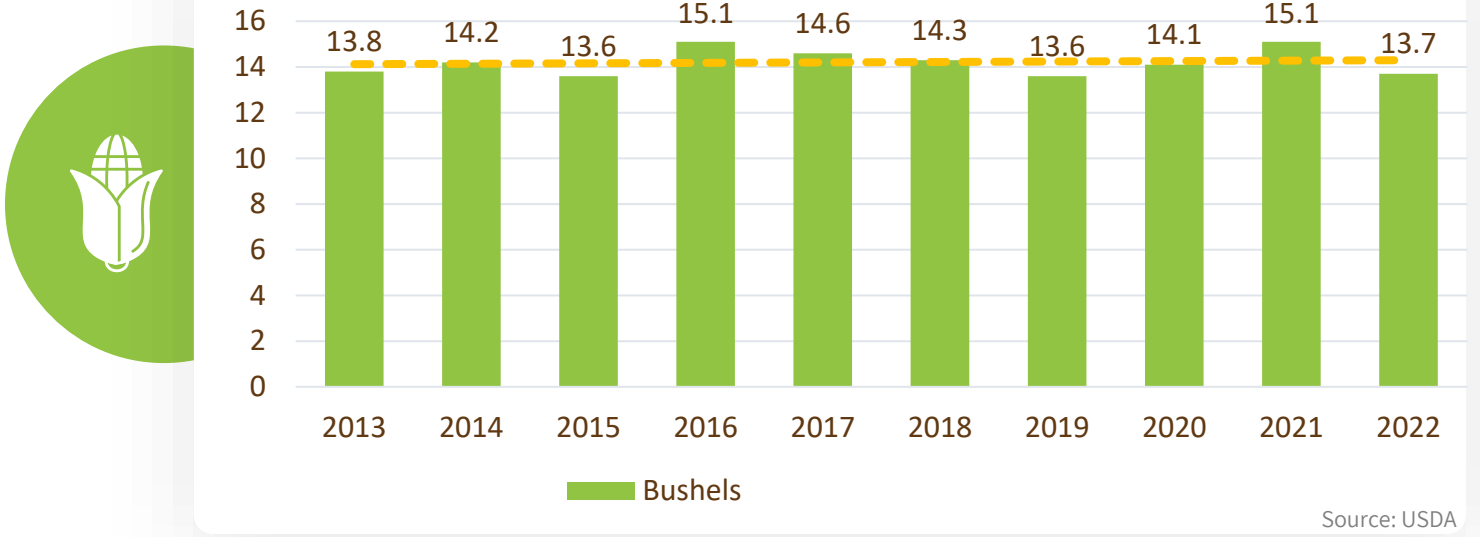

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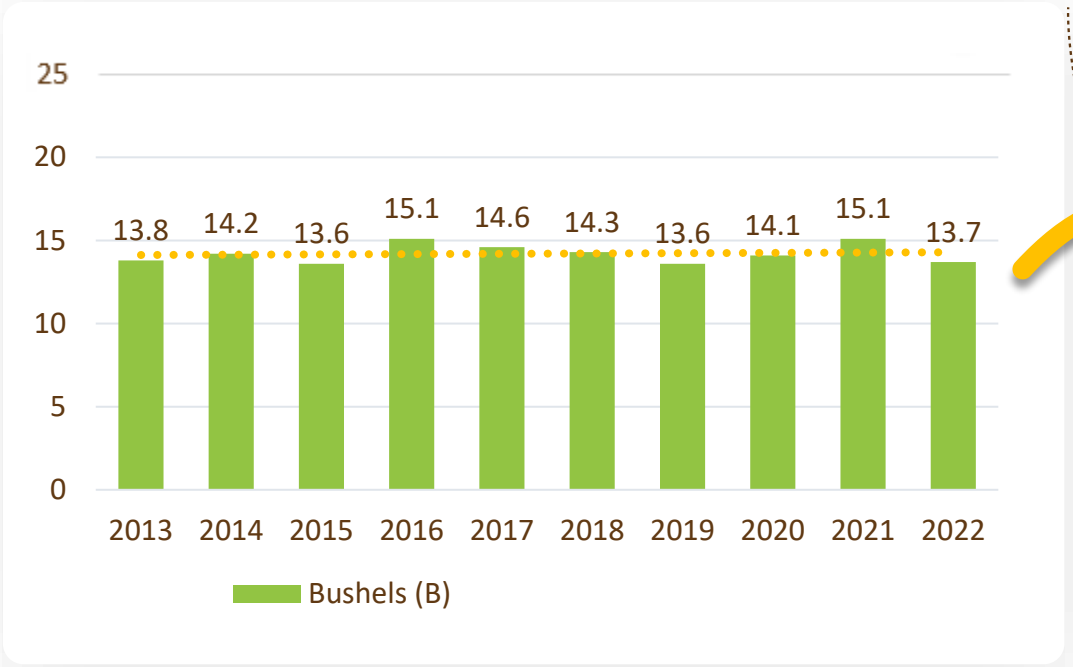
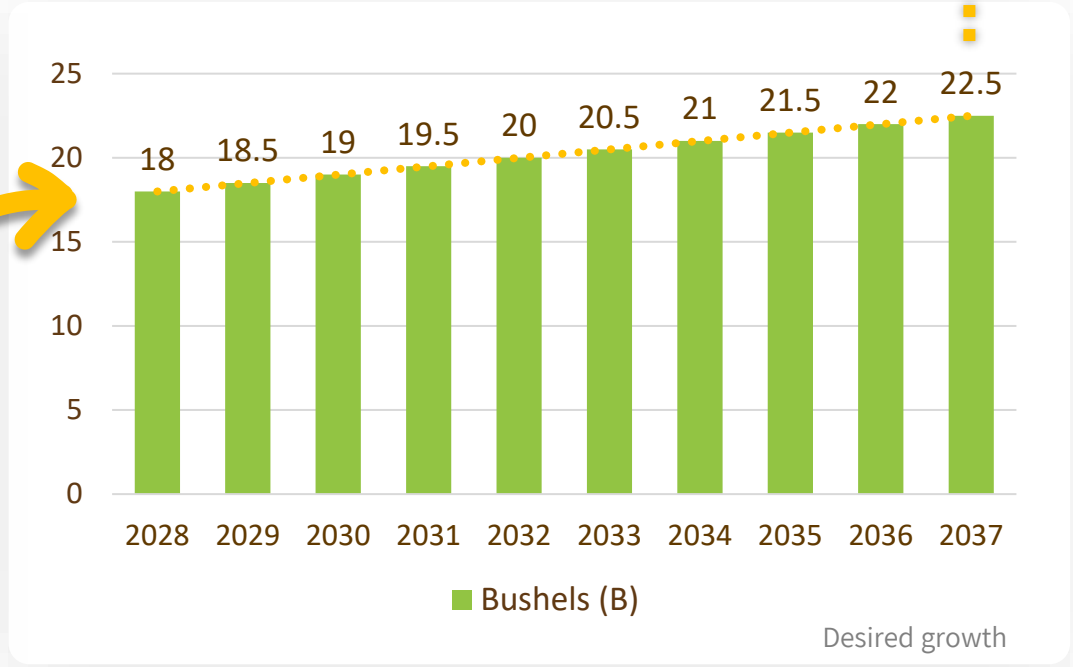


Desired 20% - 40% yield increase



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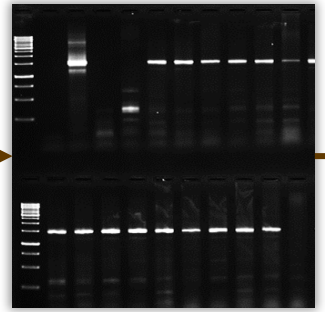

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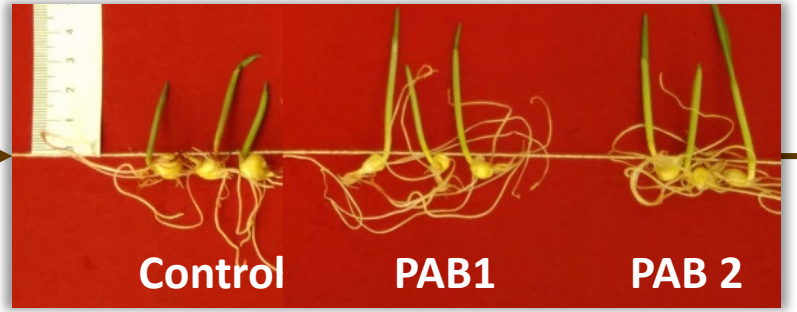

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On-ground Assays

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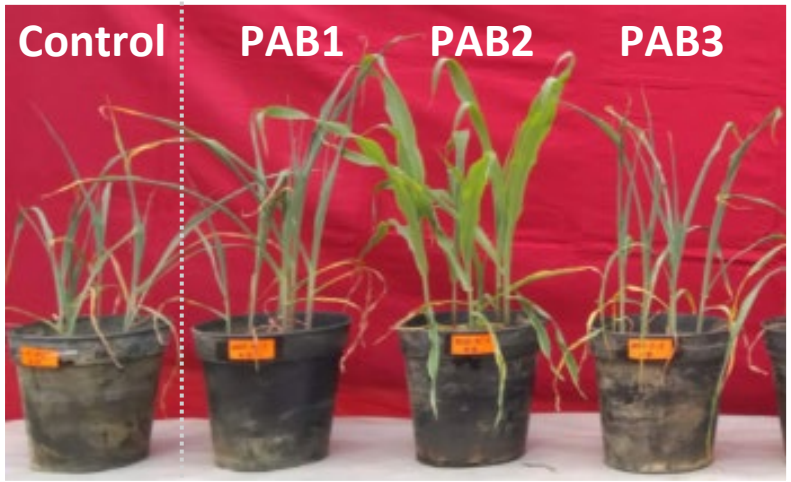
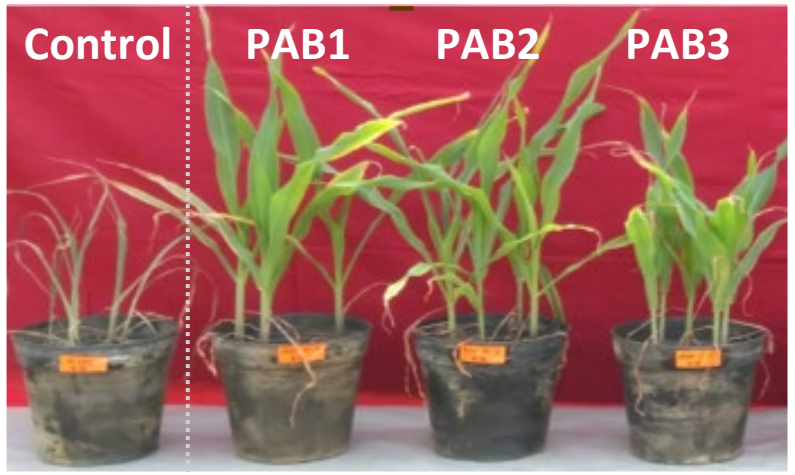


Severe drought



Recovery

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On Ground Results

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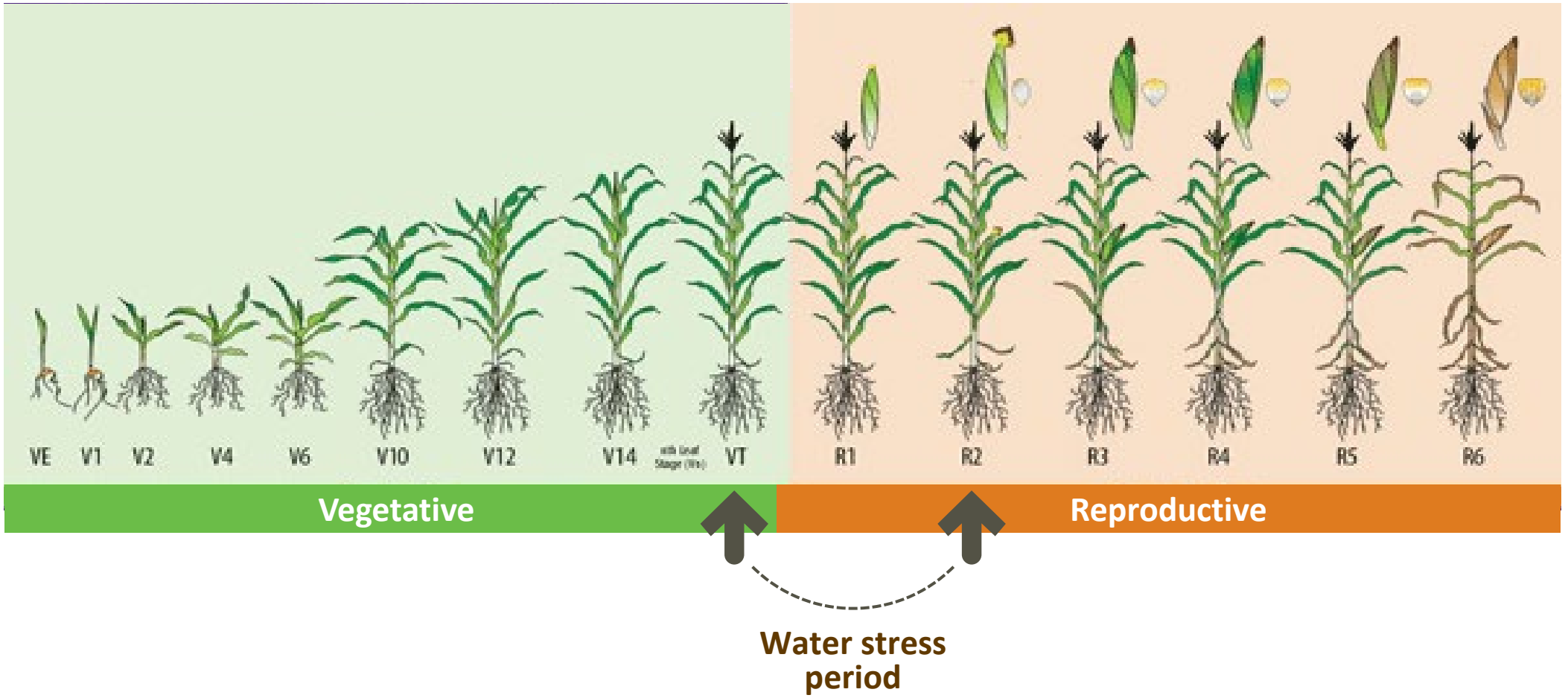
On Ground Assay – Water Stress Period

Corn Growth and Development



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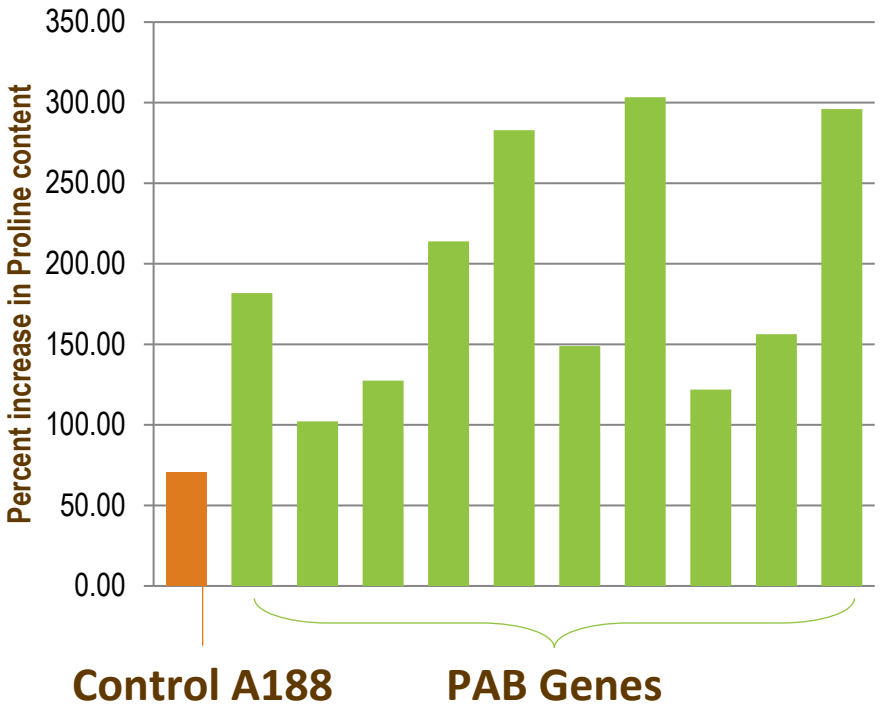
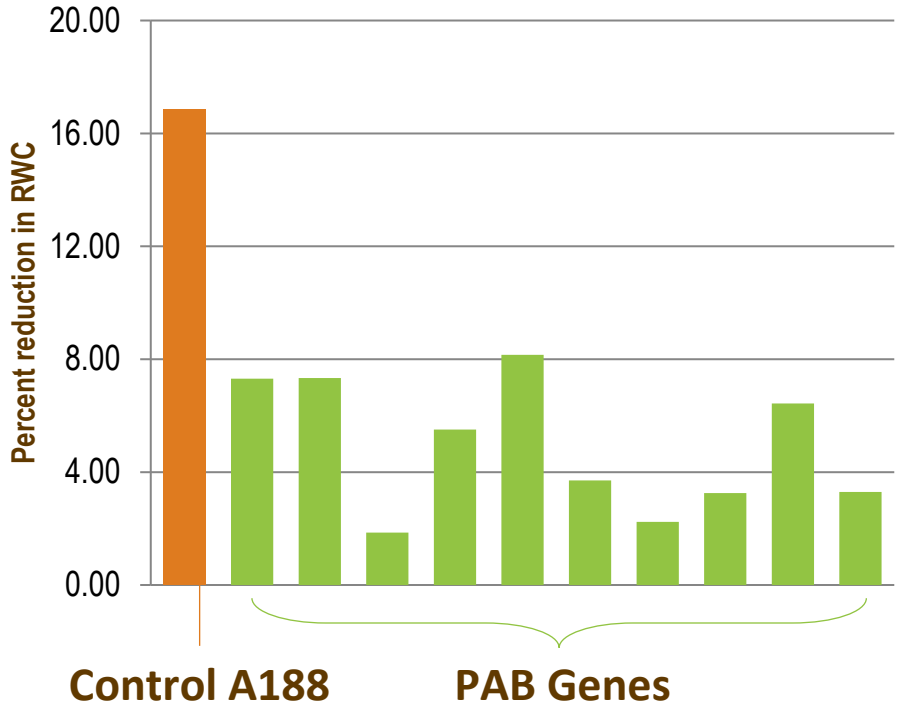
Yield Increase in Corn

Proline Content



Increase in proline content compared to well irrigated plants

Relative Water Content



Reduction of water content compared to well irrigated plants

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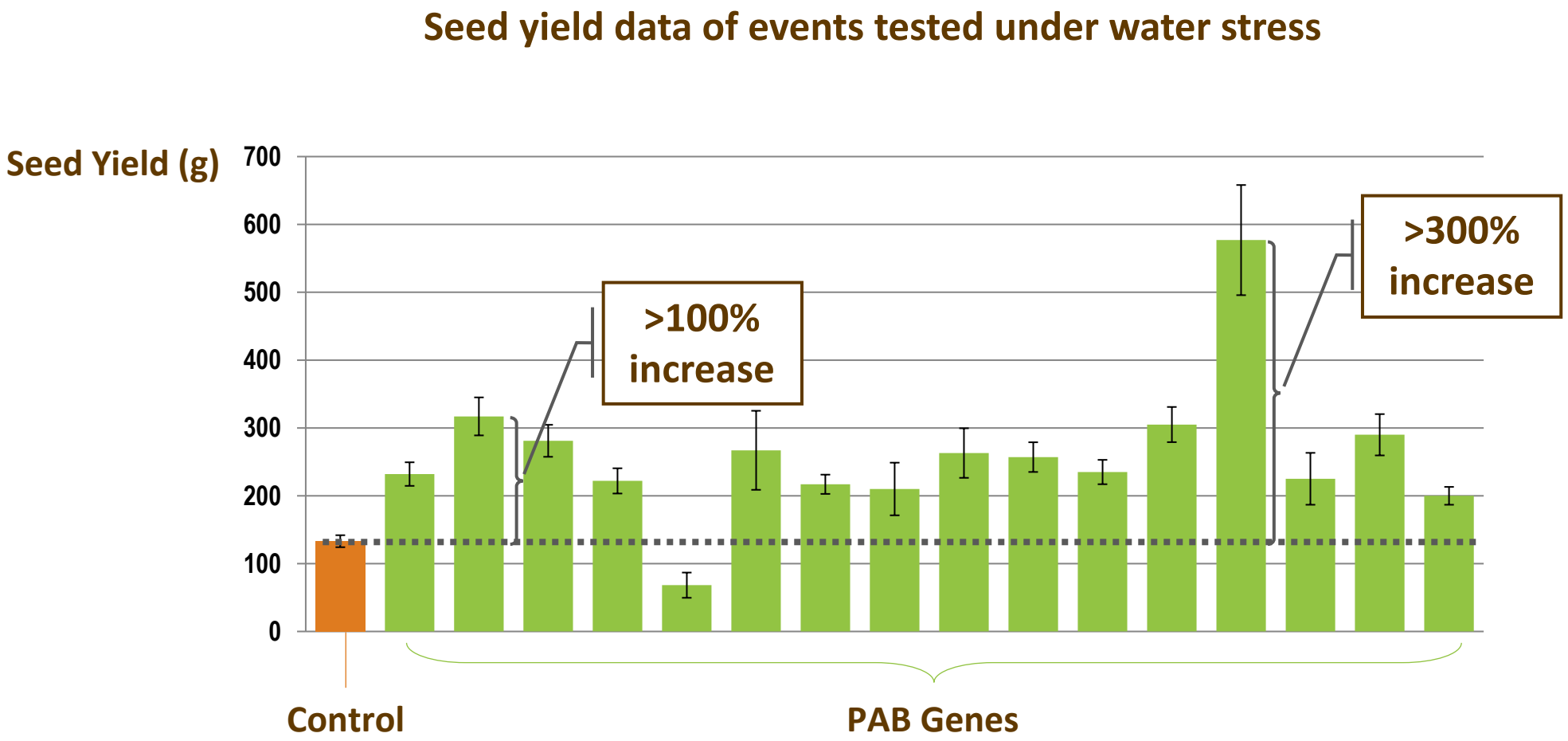
Exceptional Results – Seed Yield



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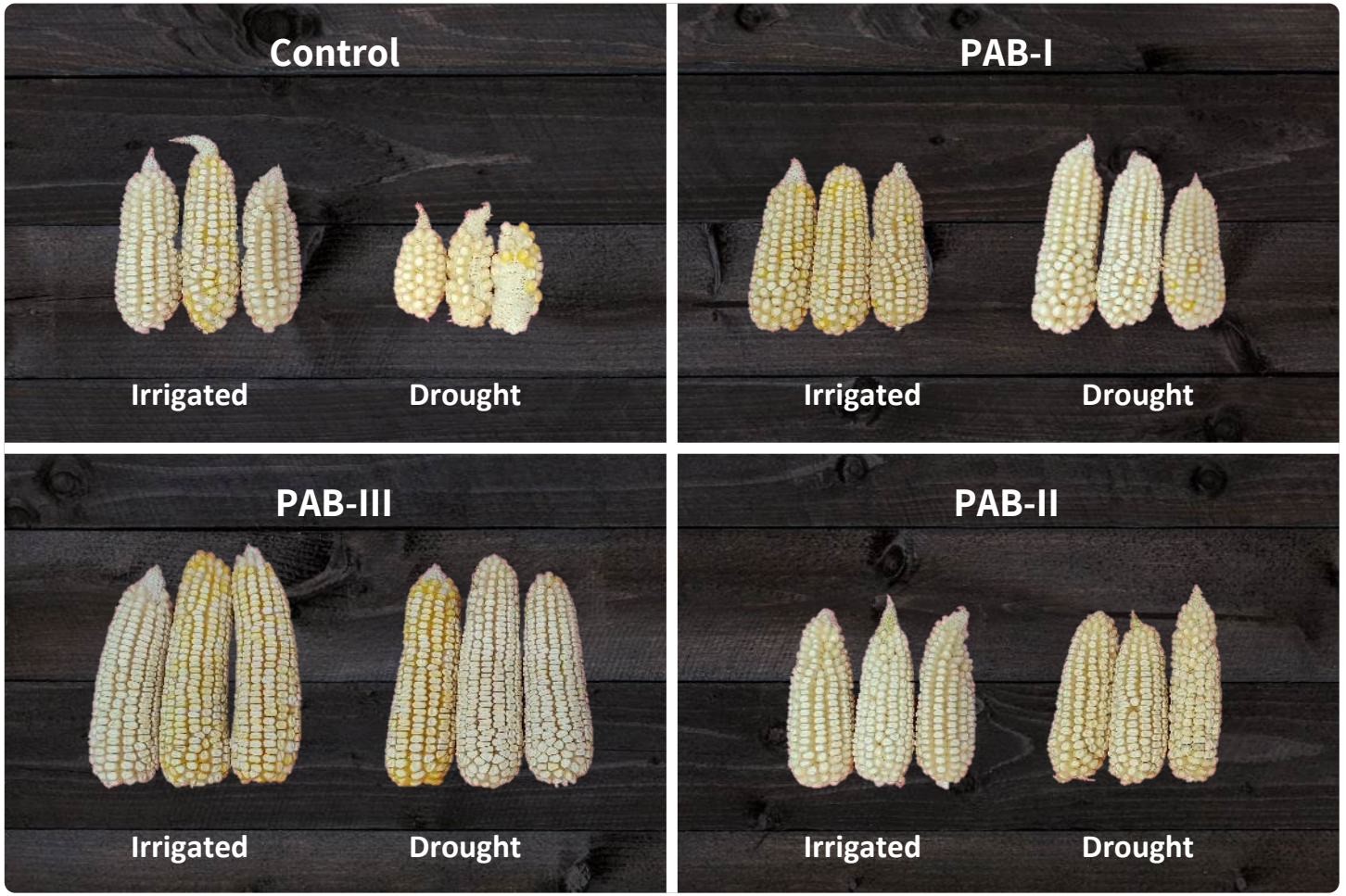
Yield Increase in Corn – Wishes come true

60-250%

Increase in the total seed weight of corn plants, containing best PAB drought resistance gene!



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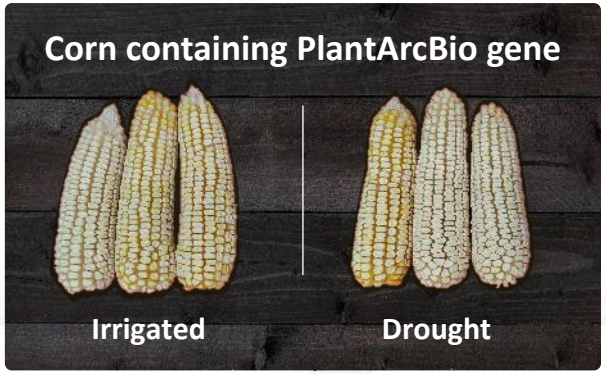
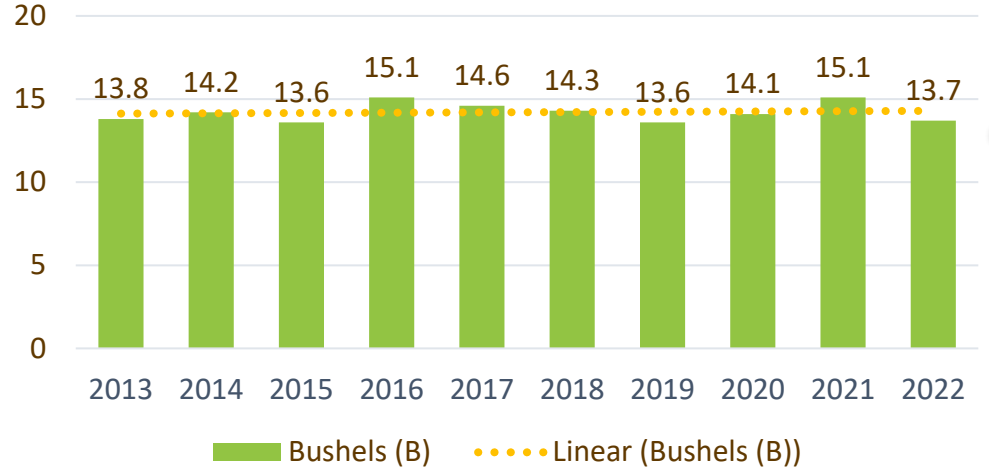
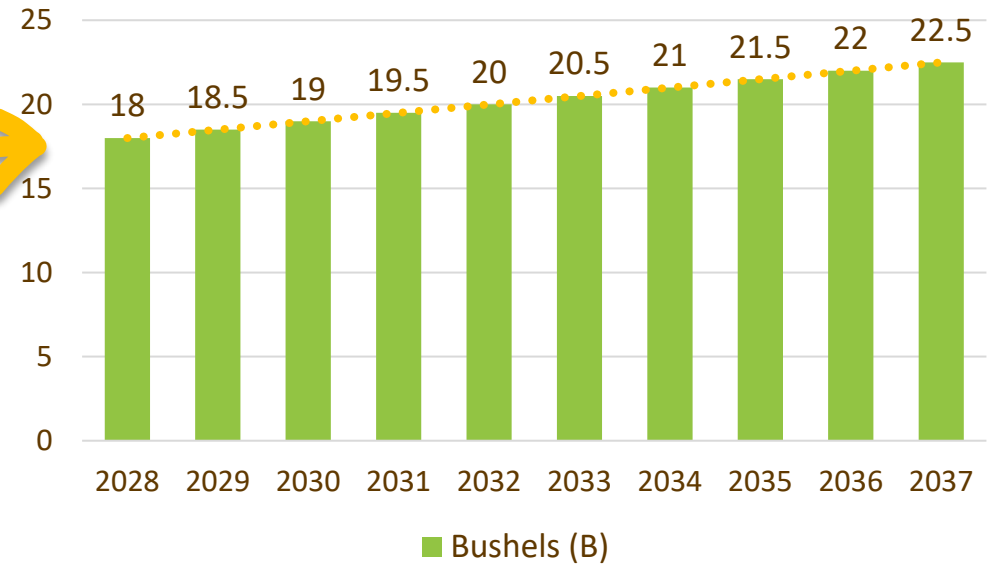
20% increase in corn yield in the US may increase production by 70 million tones







Corn is Just the Beginning...

Potato

Rice

Canola

Wheat

Soy

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Let's Plant the Seeds of Change Together!

Dror Shalitin, PHD
CEO and Founder
PlantArcBio
dror@plantarcbio.com

Vairamani Ramanathan, PHD
Chief - Technology & Innovation
Rallis India Limited
vai.ramanathan@rallis.com