Breeding Operations and Phenotyping

Gustavo Teixeira
EiB Module lead

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Thinking….

How would you like to have your seed stored?

Same CGIAR station

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Thinking….

How would you like to identify your plot?

Same CGIAR station

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Thinking….

How would you prefer to register your data?

Same CGIAR station

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Thinking….

Which agronomic practice would you prefer?

Same CGIAR center

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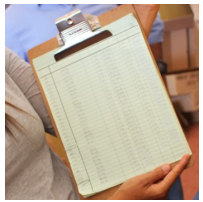
Thinking….

Which is the safest workplace?

Same CGIAR station

Why am I showing these pictures ???



Staff morale


Errors

Sustainability

Heritability

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… We will be more effective

… We will deliver better products

“… The technical aspect is not the biggest challenge….

“The solution is known…. It is a matter of prioritization and cultural change….”

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Excellence in Breeding PLATFORM

EiB – Module update
Breeding Operations and Phenotyping

What has been achieved?
Challenges and next steps

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Gustavo Teixeira

Breeding Operation and phenotyping Module leader at Excellence in Breeding Platform

I have over 15 years' experience in the private sector including Syngenta, John Deere and other companies.

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What do we want to achieve?

"...breeding programs have the most effective and cost efficient phenotypic process, from field preparation to data collection. With a strong culture of delivery of quality data through continuous improvement. Providing respect and safety for all employees".

https://excellenceinbreeding.org/eib-annual-meeting/day-1

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What does it mean?

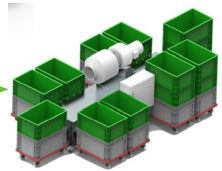
What does it mean?

Good field (plotmanship)

Good agronomic practices (field prep., pest control, etc..)

Effective and cost efficient process

Mechanization, Automation, Data collection, Access to service…



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What does it mean?

Continuous Improvement → Everybody everyday →

before

after

Health, Safety and environment → Staff morale, Leading by example, Sustainability →

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Background...

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Background

Early 2017 EiB Launch

Drone Imaging Workshop Nov, 2017

ICRISAT

Quality Analysis Workshop Aug, 2018

Q2 / 2019 Improvement Plan

Q3 2019 CtEH

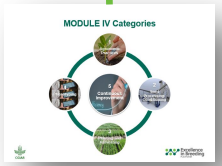
2nd Continuous Improvement Workshop June 2020 (IRRI)

Phenotyping

Breeding Operations and Phenotyping

Vincent Vadez Module IV Leader Part time

July '18 Gustavo Teixeira / Steve Corak



Oct '18 Assessment

Aug'19 Cassava and Yam Breeders visit Brazil

1st Continuous Improvement Workshop Nov'19

Q1 / Q2 2020 Engineering support Hiphen project Support for phenotyping

Irrigation / Soil Management July/2020

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What is the current status?

- Technical aspect

- Organizational aspect

Technical aspect
What needs to be done?

Current status – technical aspect

- Breeding operations assessment

Breeding operations assessment

1. **Agronomic practices**
2. **Seed processing**
3. **Planting and harvesting**
4. **Phenotyping**
5. **Continuous improvement**

25 research stations

National Programs

CGIAR

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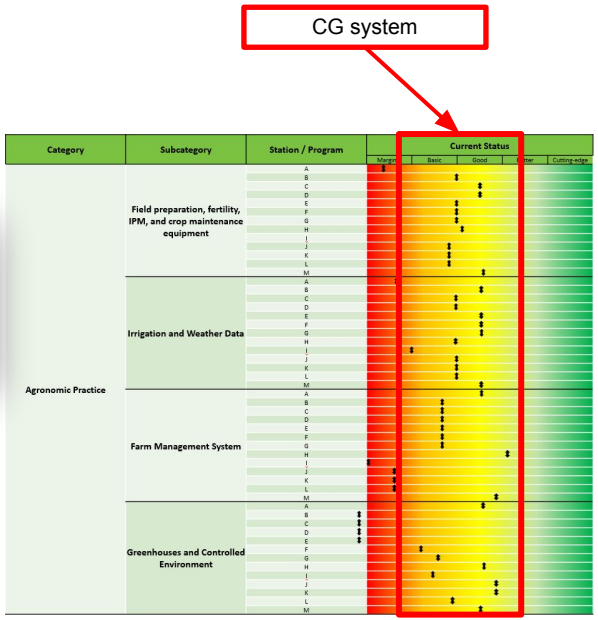
Ranking

Stations visited received a report ranking the current status of each sub-category ranging from Marginal to Cutting-edge.

The table on the right illustrates the current status of agronomic practices in Breeding Operations across CGIAR centers.



Current status of agronomic practices across CGIAR centers

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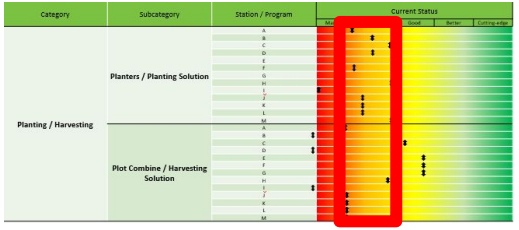
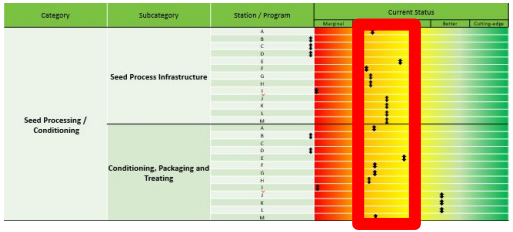
Agronomic Practices



Planting and harvesting

Phenotyping



Seed Processing

Continuous Improvement

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It helped us to define what needs to be done…

Our High-level Roadmap

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2020 | 2021 | 2022 | 2023 | 2024 | 2025

IRRIGATION
Projects – key station

IRRIGATION
Infrast + Staff Develop.

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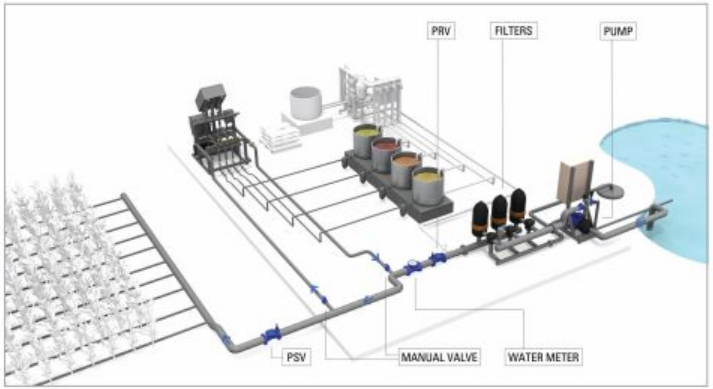
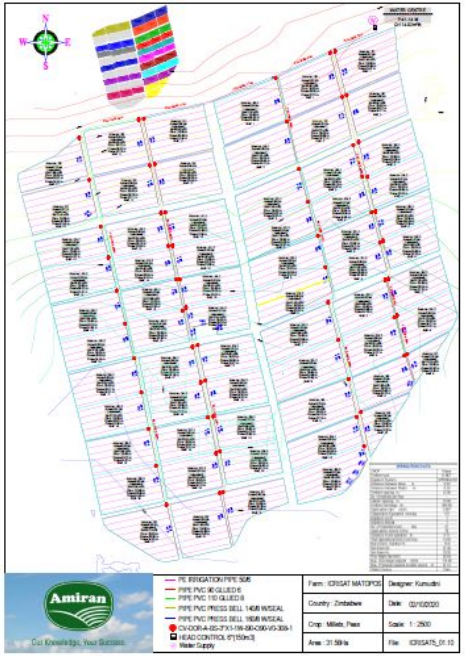
Irrigation project

- 7 CGIAR stations in Africa
  - Infrastructure upgrade
  - Weather station
  - Soil moisture probes





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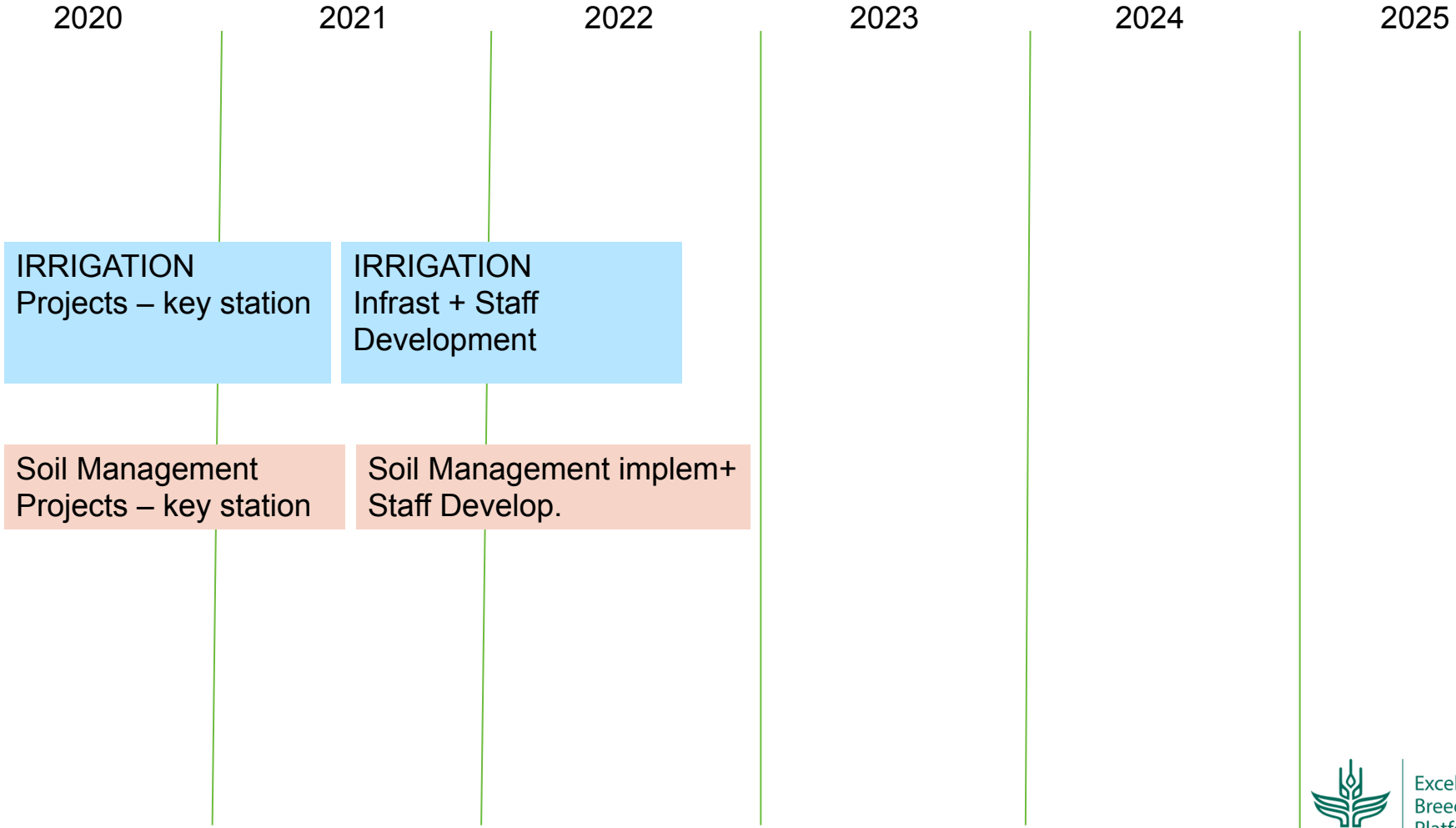
Irrigation project

- Challenges
  - Internal processes (procurement / legal)
  - Communication / scope definition

- How to mitigate
  - We'll involve procurement and legal team earlier in the process
  - We got the commitment from CIMMYT team to improve the support
  - We'll be hiring the Breeding Operation/ Mechanization specialist

Irrigation project

- Next steps
  - Implementing infrastructure (some with CtEH funds)
  - Filling additional gaps / other projects
  - Training staff
    - Breeding operation exchange program
    - Publishing material in EiB toolbox



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Breeding
Platform

Soil Management

- Baseline for key CGIAR stations in Africa
  - Project delayed due to COVID-19
  - Report for one station delivered

Lydiah Gatere ·

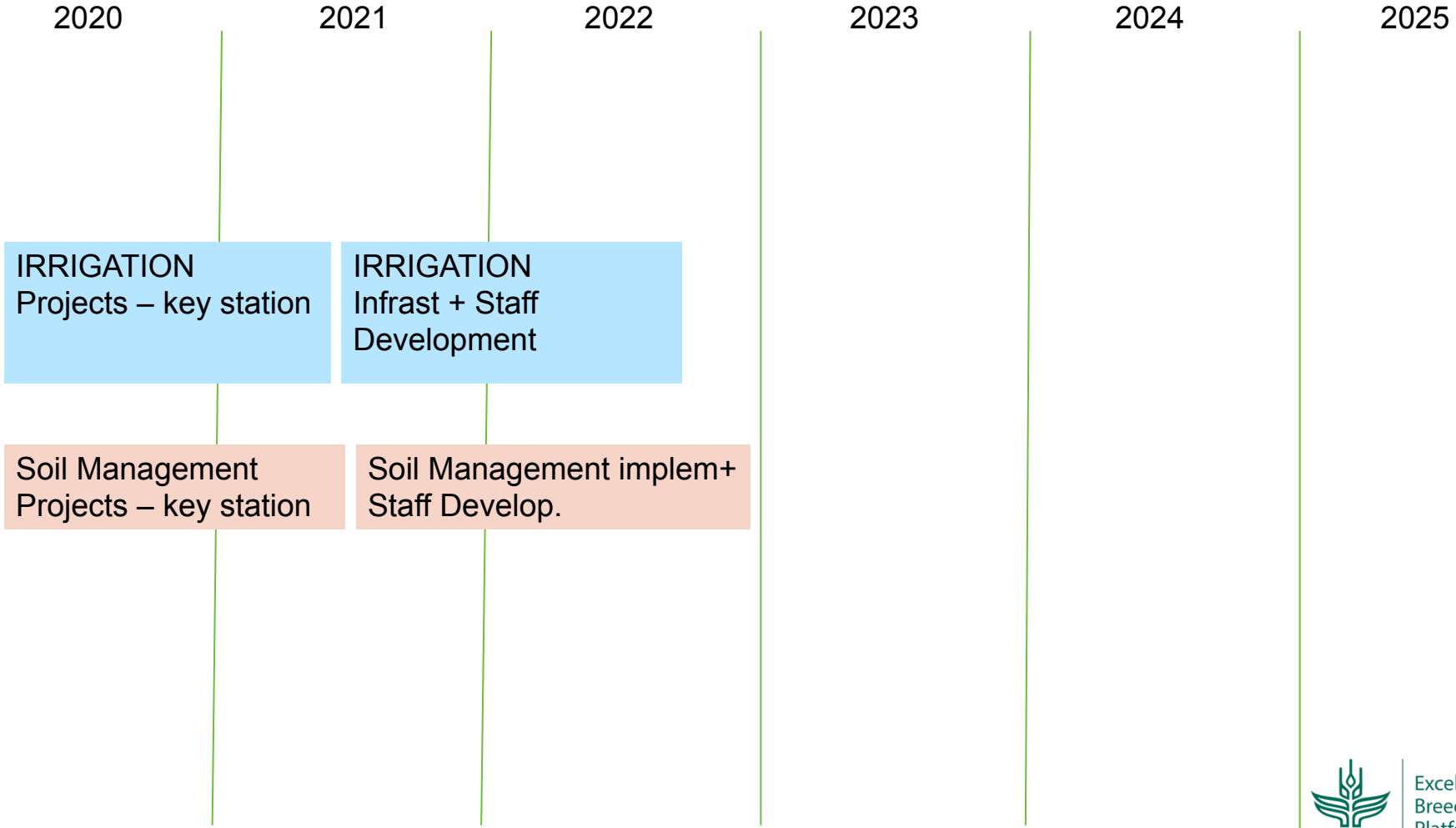
Ray R. Weil

Soil Management

- Challenges
  - Internal processes (procurement / legal)
  - Communication / scope definition

- How to mitigate
  - We'll involve procurement and legal team earlier in the process
  - We got the commitment from CIMMYT team to improve the support
  - We'll be hiring the Breeding Operation/ Mechanization specialist

- Next step
  - Finalizing pending station (visit / recommendation)
  - Implementing recommended plan
  - Training staff
    - Breeding Operation exchange program
    - Publishing material in EiB toolbox



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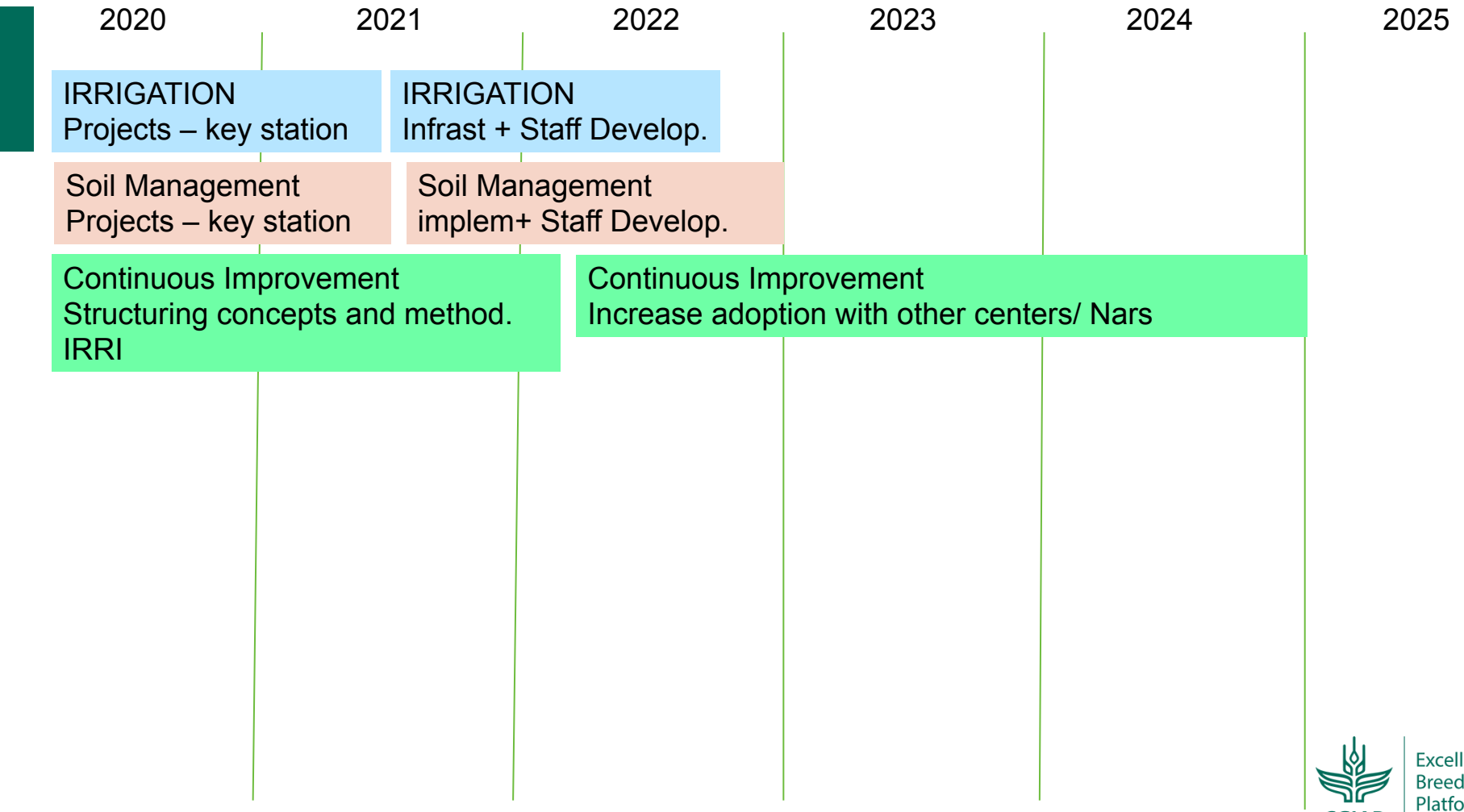
CGIAR



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Continuous Improvement

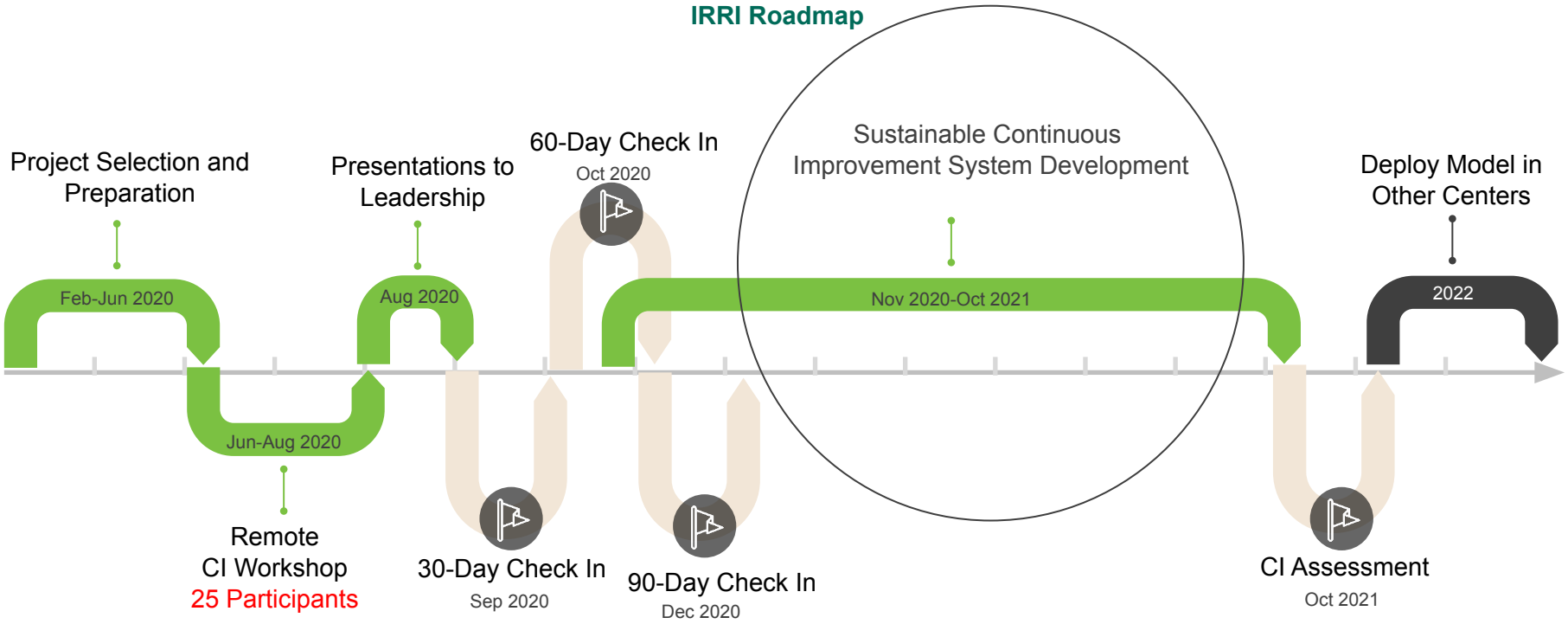
- Achievements
  - 75 CGIAR staff trained on lean methodologies (32 hour training)
  - 9 projects
  - Over 120 participants (from NARS) on CI webinar

Continuous Improvement

- Challenges
  - Virtual training
  - Follow up projects (Covid-19)

- How to mitigate
  - Reduce the group size
  - Key practitioners / leaders that will help drive it

- Next step
  - Working with IRRI to create the Continuous Improvement system (including e-learning)



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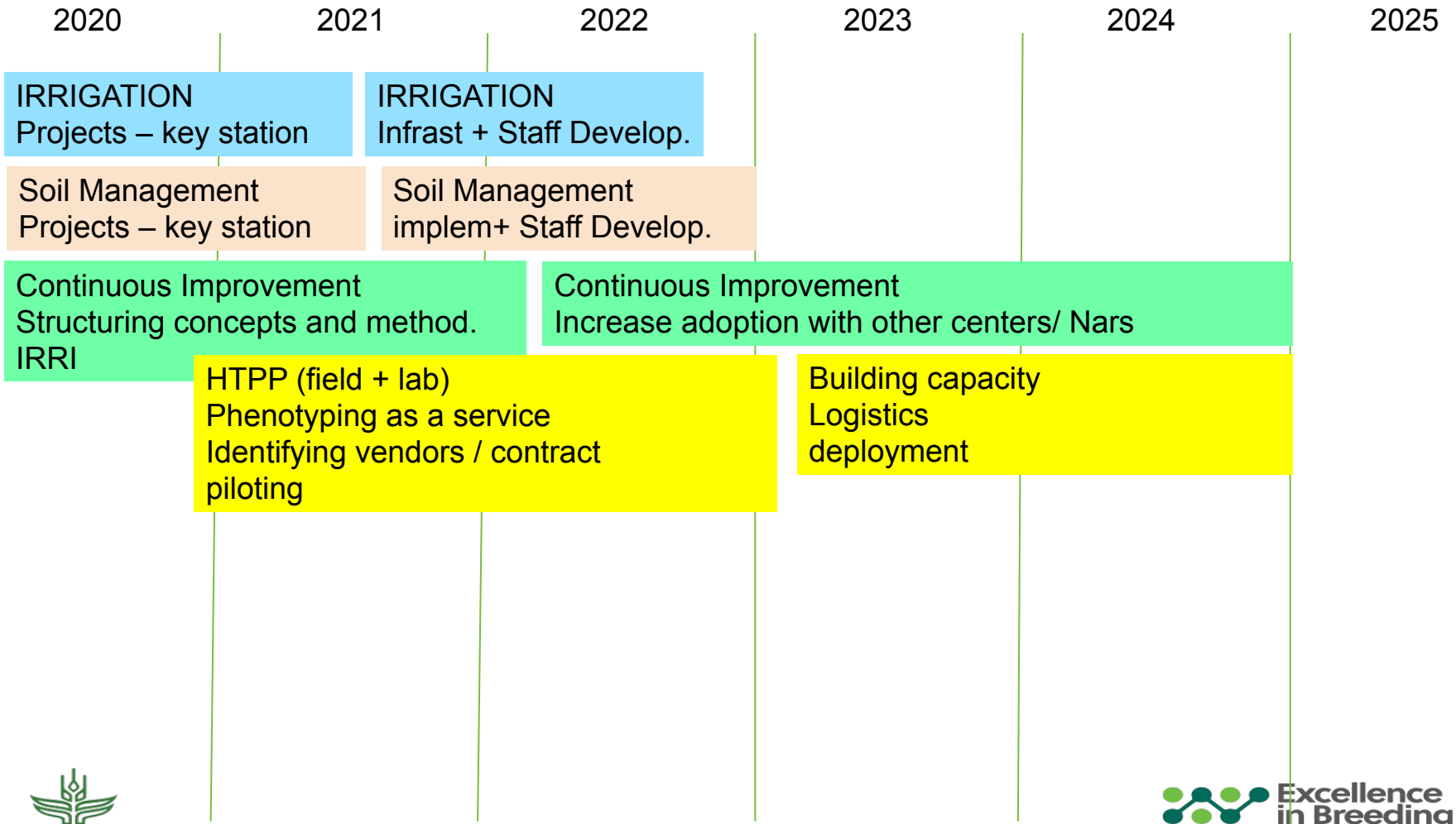
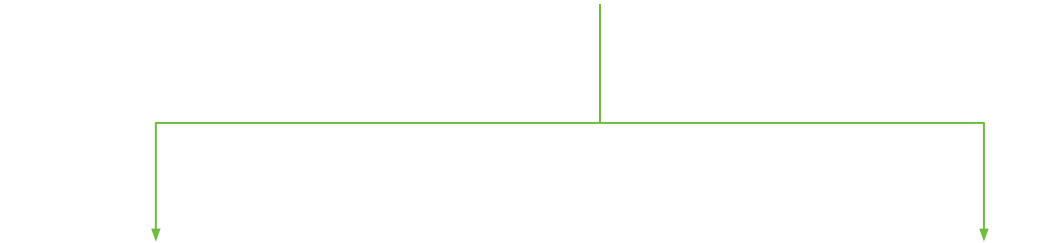

2020
2021
2022
2023
2024
2025
IRRIGATION
Projects – key station
IRRIGATION
Infrast + Staff Develop.
Soil Management
Projects – key station
Soil Management
implem+ Staff Develop.
Continuous Improvement
Structuring concepts and method.
IRRI
Continuous Improvement
Increase adoption with other centers/ Nars
HTPP (field + lab)
Phenotyping as a service
Identifying vendors / contract
piloting
Building capacity
Logistics
deployment

HTPP



Phenotyping lab Quality / nutritional

Phenotyping Agronomic traits

HTPP – Quality and Nutritional trait

- Service – similar as HTPG

- Q2/Q3 identifying demand We are in the process of selecting vendors / contract

Aldo Rosales

HTPP – Quality and Nutritional trait

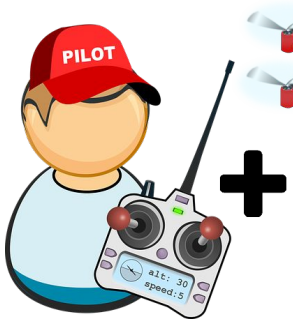
- Challenges
  - Understanding the demand per product profile (wish list)
  - We tried to cover too many crops

- How to mitigate
  - Reduce the scope (initiate the project with a limited scope)

- Next steps
  - Contract vendor
  - Define protocols (logistics)

HTPP – Agronomic traits / field phenotyping

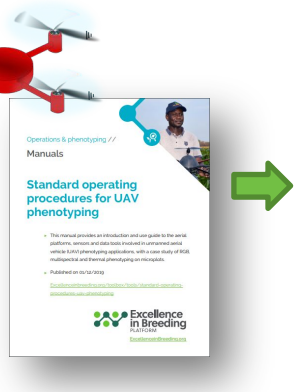
- Our goal



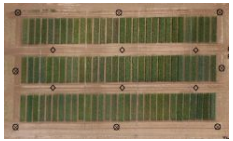
Operation team

Or

Service provider



Tools + protocols



Generate image

Upload Images 3rd party company platform

Company will send data directly To EBS

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HTPP – Agronomic traits / field phenotyping

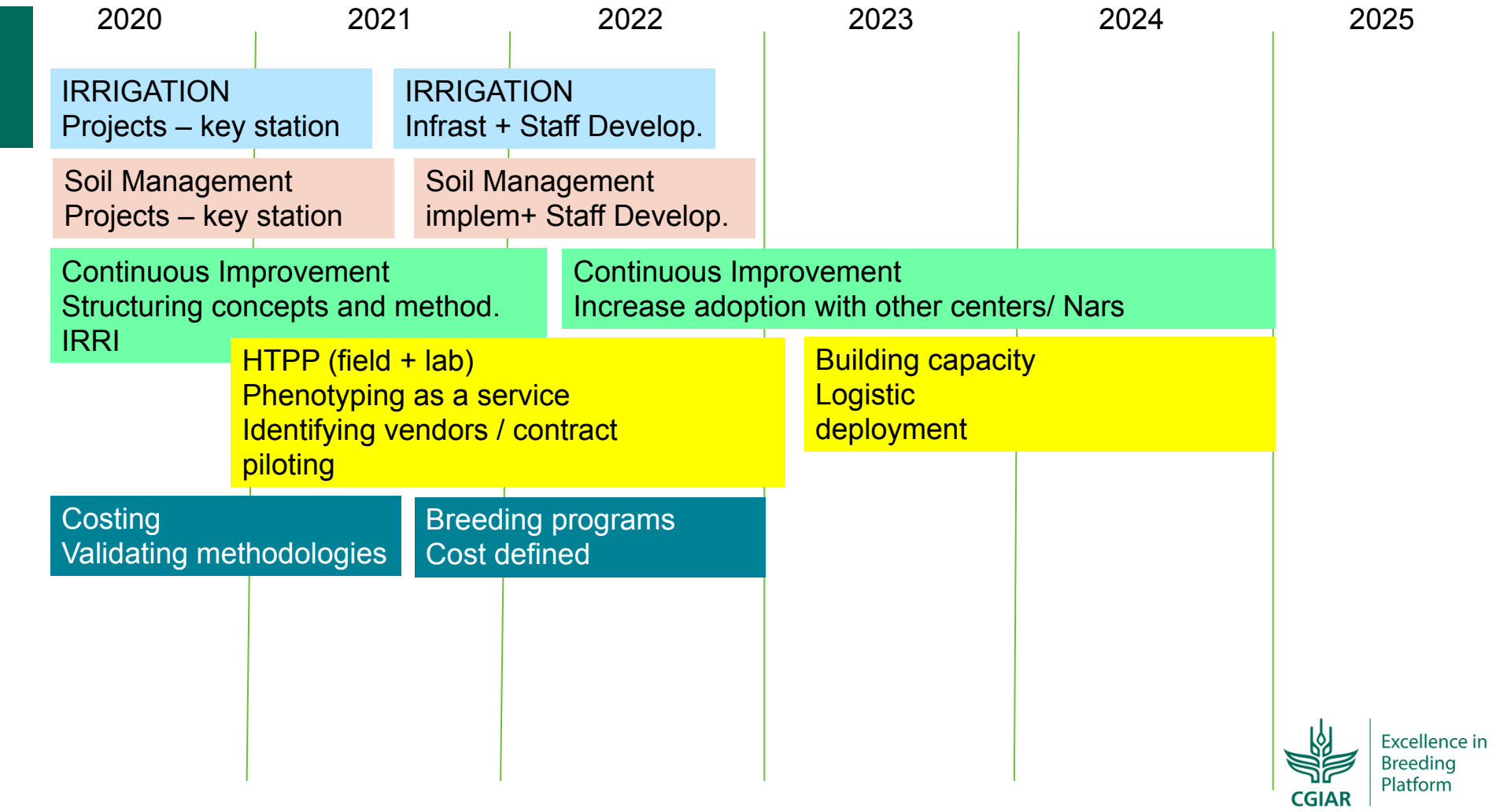
- What has been achieved?
  - Protocols are available in EiB toolbox
  - Hiphen (private company) was hired to run the first campaign (ICRISAT) – Proof of concept

Vincent Vadez

HTPP – Agronomic traits / field phenotyping

- Challenges
  - Internal processes
  - Regulations (drones)

- Next steps
  - Deliver the PoC
  - Develop the implementation plan (3yp) – considering other centers/ crops/ regions
  - Additional vendors / partners



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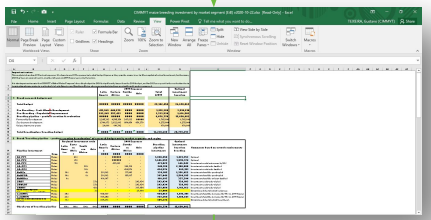
Questions

Cost/ market segment?
Cost/ pipeline?
Cots/ breeding stage?



Fixed and Variable costs?
Minimum cost per region?
Per station?

Cost/activity?

- Simulation
- Opportunities for Improving breeding processes

FCR

Centralized Operation
- IRRI
- ICRISAT

Support

UQ – Costing tool

Toolbox

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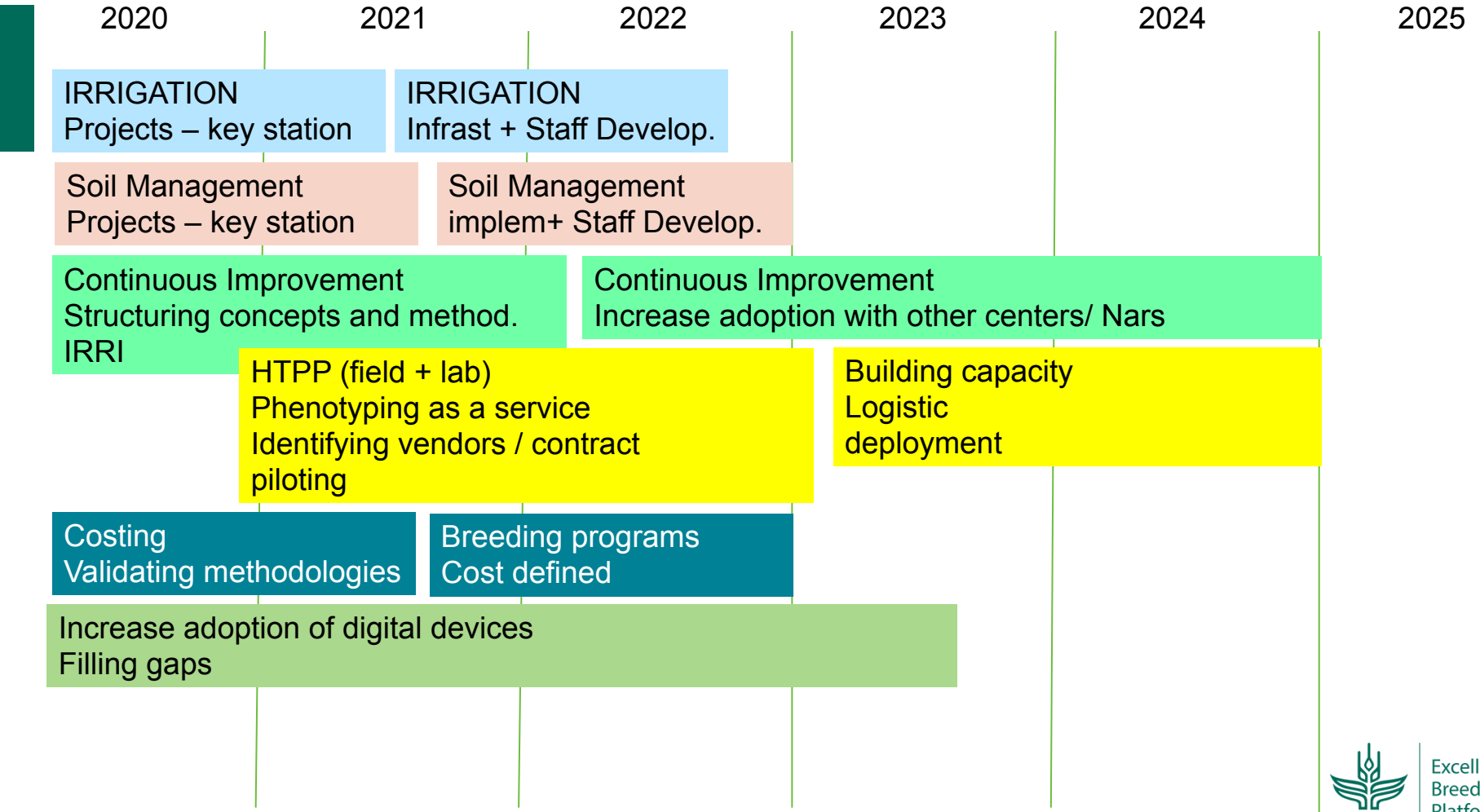
Costing

- What has been achieved?
  - Bish and Lenin supported 3 NARES to adopt UQ tool.
    - KARLO Maize
    - NARO Maize
    - CRI Rice
    - Starting now the support for Zimbabwe (Maize)
  - CIMMYT maize validated the excel template
  - CIOT (ICRISAT) and IRS (IRRI) – Sharing experience and best practices

Costing

- Challenges
  - Different needs
  - Different operational modality

- Next steps
  - Promote the adoption of available tools (Template and UQ tool)
  - Supporting programs to get the cost defined



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Increase adoption of digital devices

- Achievement
  - Bulk purchase

17
Packet Printers

21
Seed Counters

22
Label Printers

48
Laser Printers

295
Handhelds

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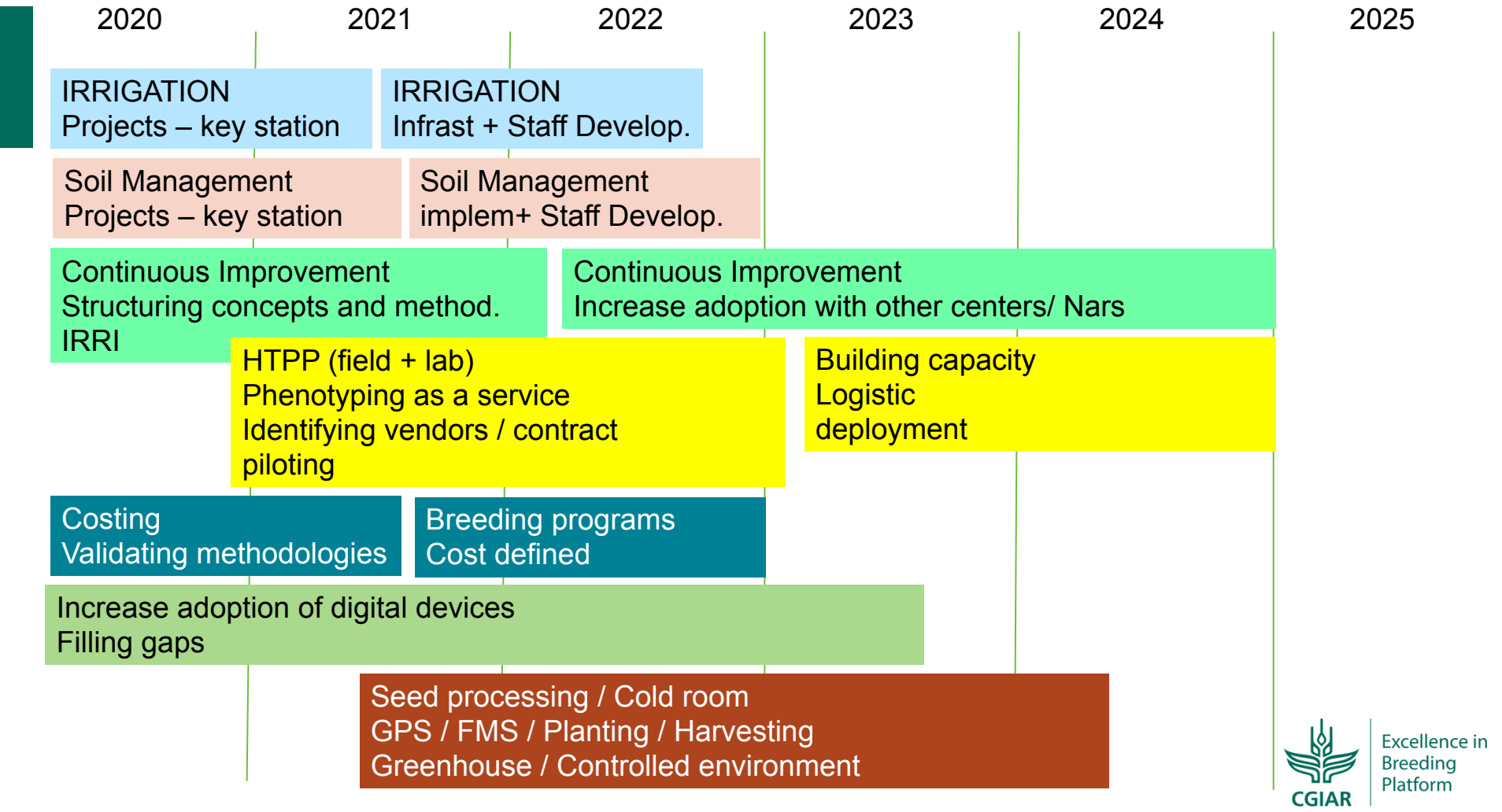
Increase adoption of digital devices

- Challenges
  - Internal processes

- How to mitigate
  - We'll involve procurement and legal team earlier in the process
  - We got the commitment from CIMMYT team to improve the support

- Next steps
  - Deliver products
  - Train staff (Module V)
  - Start the second round of the project / considering other devices



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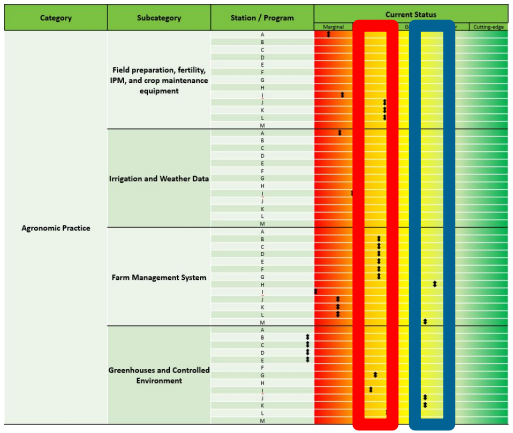
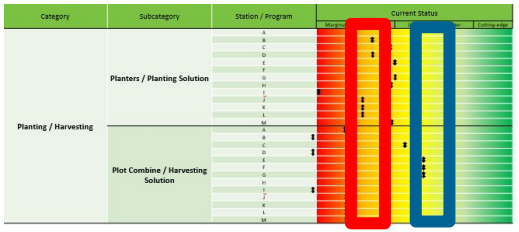
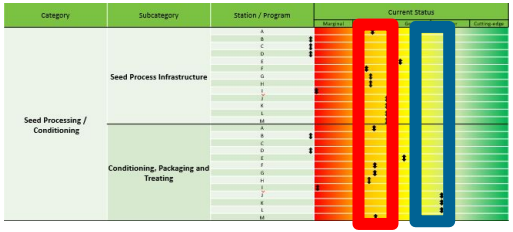


Agronomic Practices



Planting and harvesting

Phenotyping



Seed Processing

Continuous Improvement

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- Technical aspect

- Organizational aspect

Organizational aspect
How to implement?

Current scenario

Centralized Operation

- IRS – IRRI
- CIOT – ICRISAT

Operation managed by breeding team

- NARES
- Most of CGIAR programs

- Cost control
- Dedicated staff
- Breeders focusing on breeding
- SOPs
- Harmonized results

This is the operation mode
We believe to be the most appropriate and the one we promote

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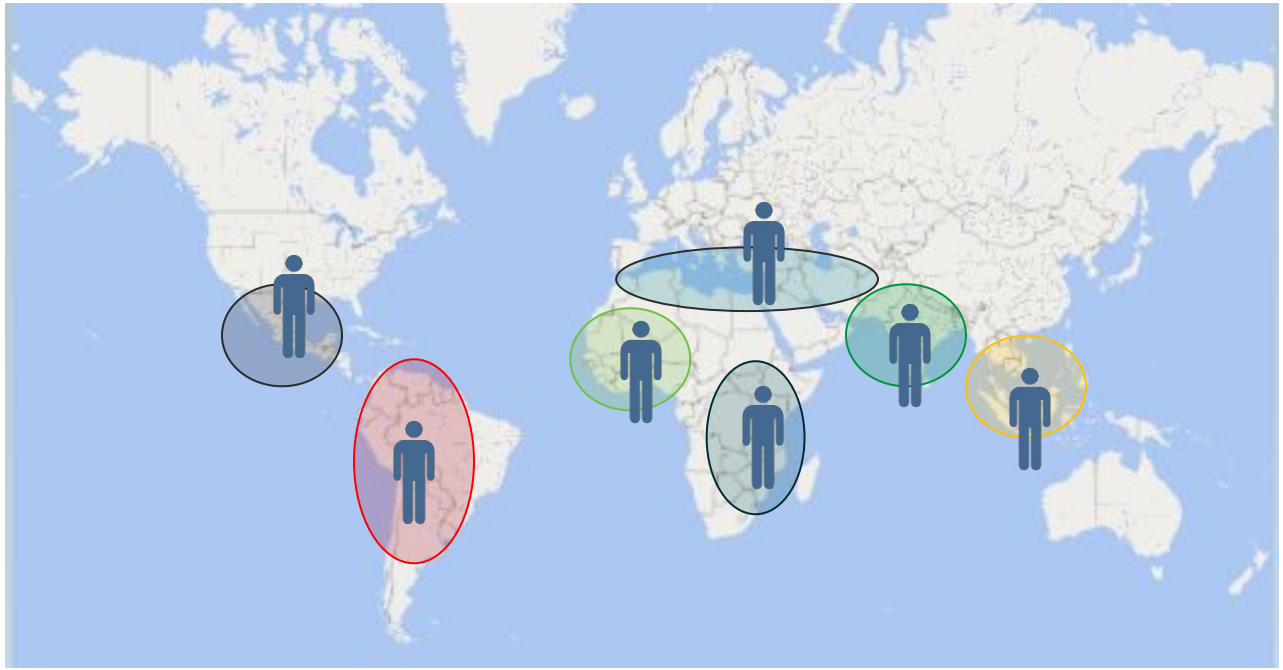
What is our vision?

CGIAR regional operational team – heads of operation

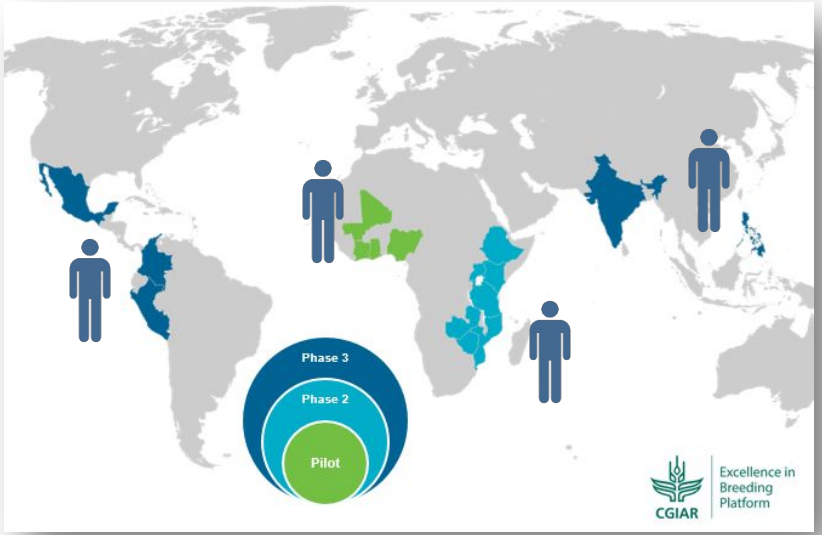


Excellence in Breeding Platform

How would EiB support that?

- From EiB annual meeting - 2019

Breeding Operation / Mechanization specialists



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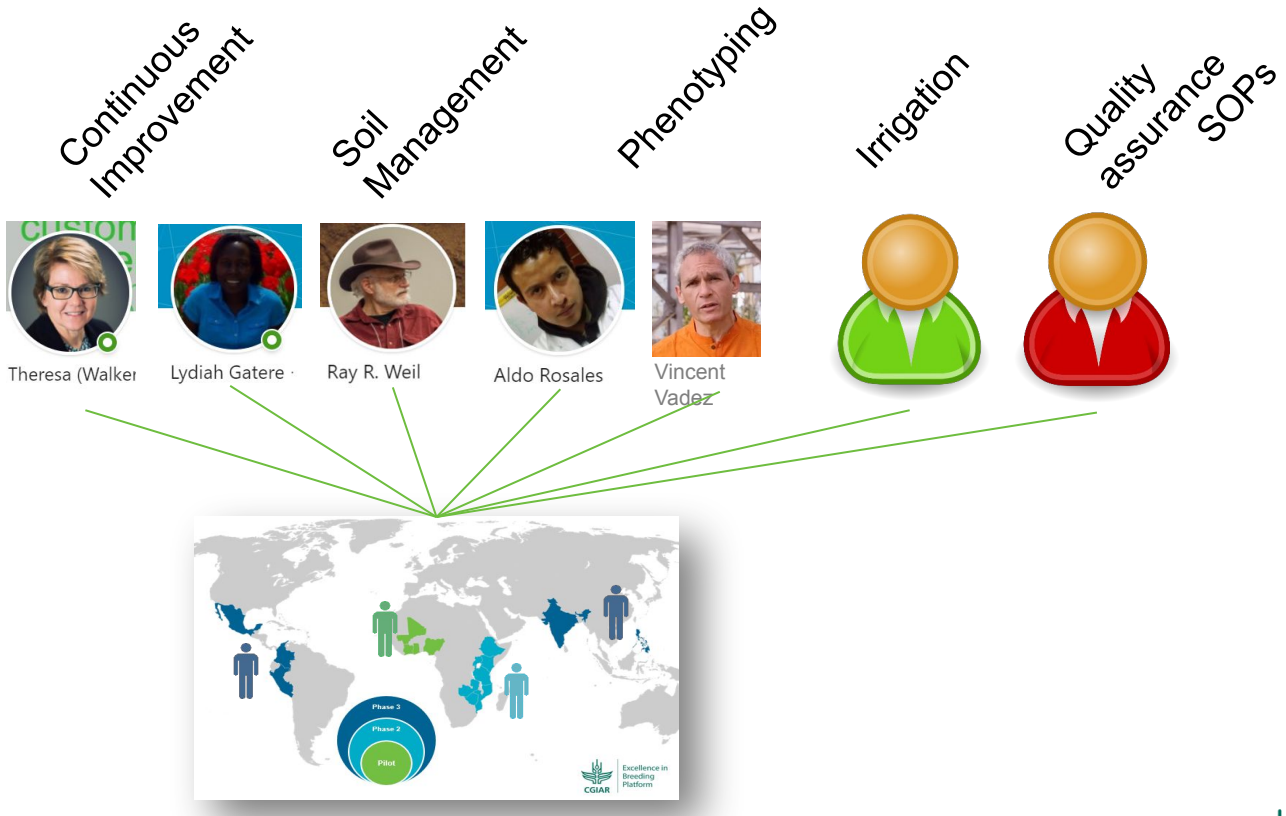

Breeding Operation /
Mechanization specialists

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Breeding Operation Alliance of Excellence

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Breeding Operation Exchange Program

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