

New strategy for germplasm partnership under ABI

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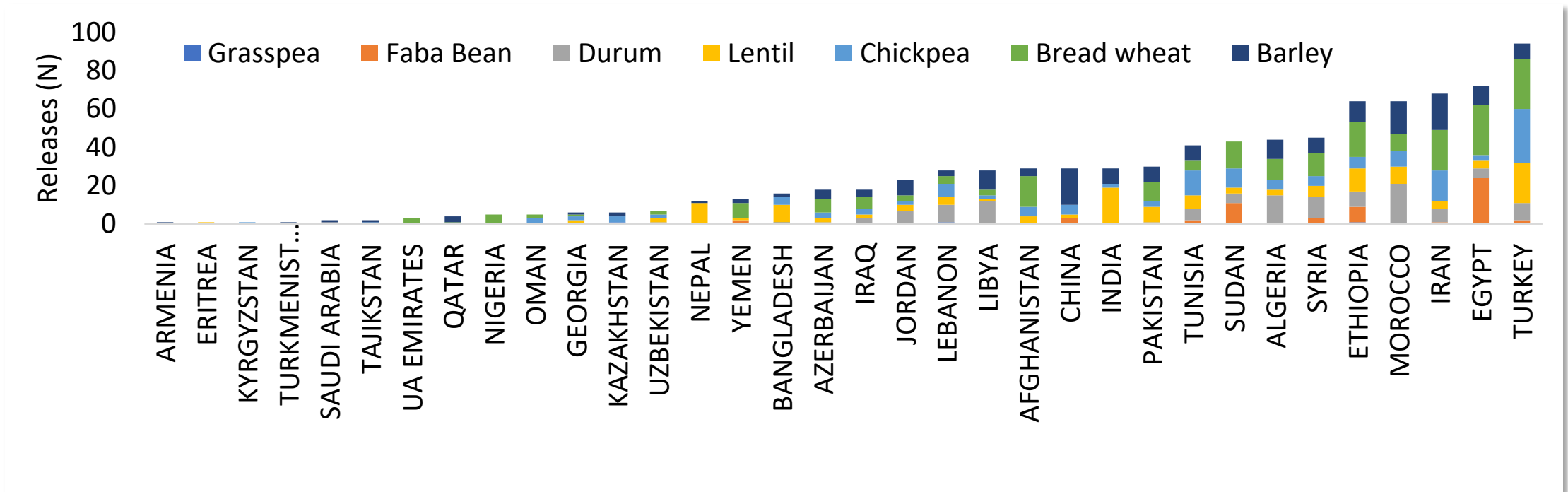
14th December 2022

Istanbul, Turkey

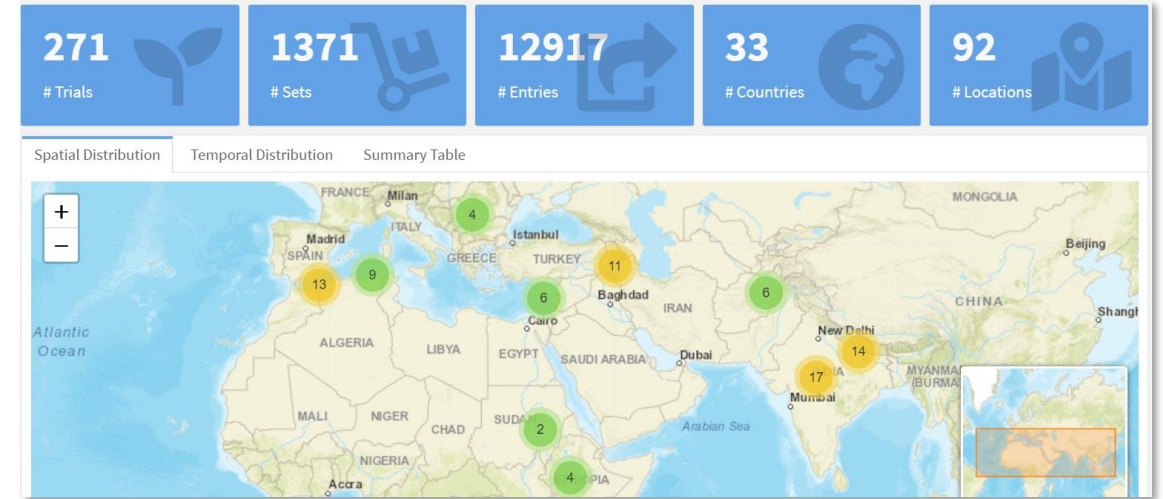
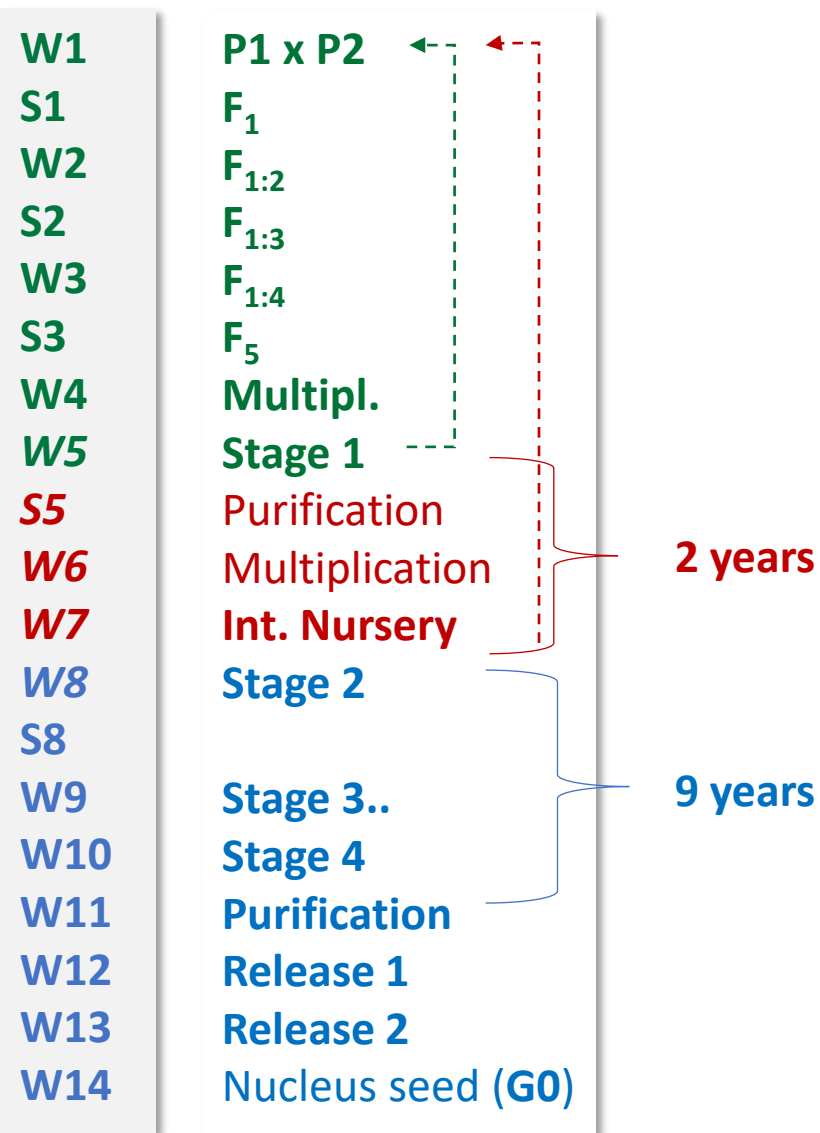


43 years of germplasm partnership

- **1979** first ever releases:
 - Karoon, Barley, in Iran
 - Sohag 1, Durum, in Egypt
- A total of **1045** variety released (top barley)



The international nursery system



- **International nursery:** 271 trials to 33 countries
 - Based on the concept of wide adaptation
 - Important economic effort
 - On average **9 years** between shipment and release
 - Crosses designed on own Stage 2 trials and corrected based on International Nursery results

Breeding Program Assessment Tool (BPAT)



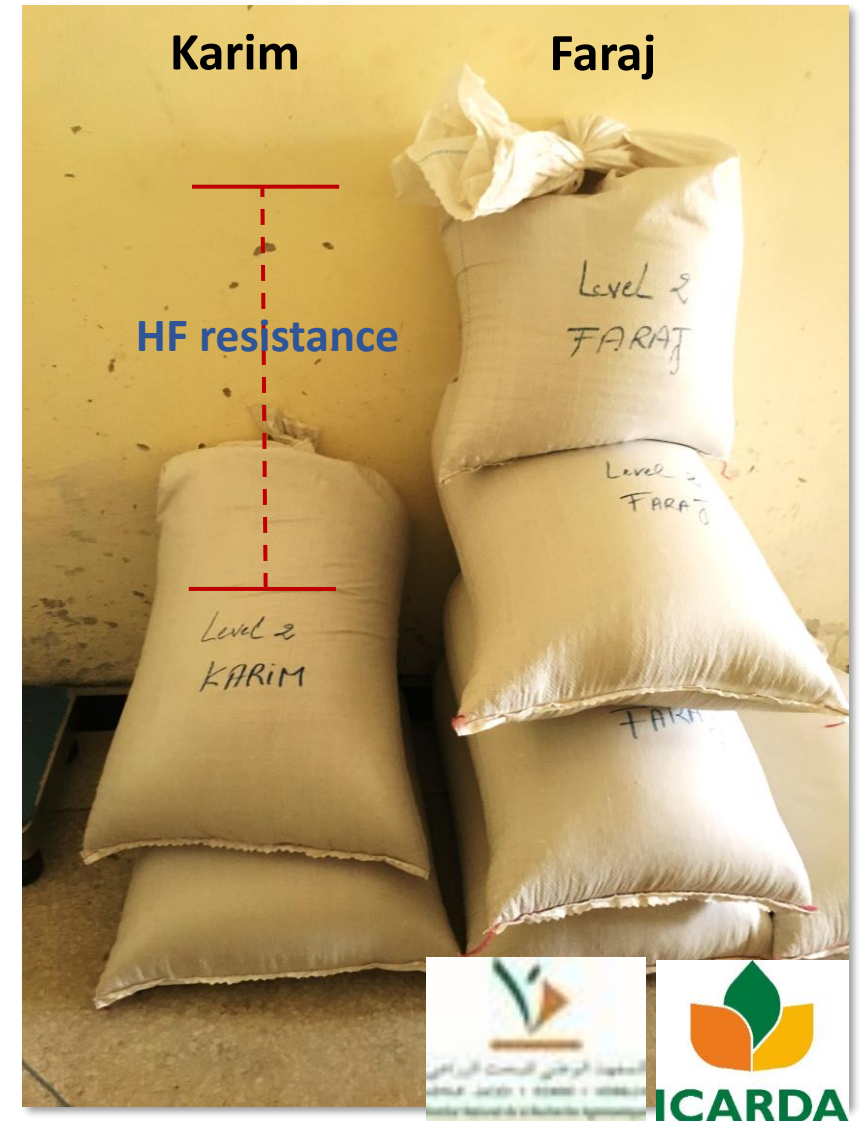
BPAT Assessment of ICARDA Programs – spring bread wheat and durum wheat

- 18-22 February 2019 by Yilma Kebede, Jayne Semple, and Christopher Lambrides
- A total of 20 high level recommendations:
 - R2: define variety needs as **market inputs**
 - R3: **accelerate** advancement to inbreeding
 - R4: increase **accuracy** of selection
 - R9: define **target population of environments (TPE)** and integrate that into the yield trials testing
 - R12: monitor **release and post release** performances

What is a successful variety?

- A **variety** is cultivated in some areas within a country (specific adaptation)
- It fits within a **farming system**
- It has **some characteristics** for which it is better than what previously available

*A mental change to describe beforehand the goals rather than selecting among what is available: **product profile***



Product profiles: NARES setting goals

- **32 NARS breeders from 10 countries in Rabat** for a 2 days
- **>90 EiB PP replacement agreements** have been signed
- These were then merged into **25 breeding pipelines**

Crop	Pipeline	Area (Ha)	Rural pop in poverty (N)
Barley	Feed barley for semi-arid and arid regions	6,730,000	2,305,414
Barley	Feed and Forage barley for favorable regions	1,960,000	88,574,054
Barley	Food and Feed Barley	2,288,000	31,167,418
Barley	Malt and Feed Barley	800,000	28,818,179
Spring wheat	Rainfed wheat for CWANA and SSA dry lands	11,650,000	12,306,071
Spring wheat	Heat tolerance for SSA and CWANA regions	7,590,000	109,102,015
Durum wheat	South Asia drylands - limited irrigation	600,000	189,101,386
Durum wheat	West/Central Asia drylands - rainfed	3,460,000	4,752,384
Durum wheat	North Africa drylands - rainfed	2,500,000	177,352
Durum wheat	East Africa drylands - rainfed	220,000	26,390,980
Durum wheat	High-cold drylands -rainfed	700,000	35,471
Durum wheat	West Africa savannas - irrigated	110,000	17,167,882
Winter wheat	Cold-Irrigated Cereal System	3,570,000	9,382,221
Winter wheat	Cold-Rainfed Cereal System	6,050,000	2,591,093

Submitted on Tuesday, February 26, 2019 - 13:15 Submitted by : Sourour Ayed

Purpose: Real Data
 Breeding Product Focus: Cereals
 Cereals: Wheat (Durum)
 ==Page 1==
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==Page 2==

==Product to be replaced==

Name of commercial product to be replaced: karim, Rezzak

Agro-ecology zone: semi-arid area of Tunisia

==Basic traits==

Basic trait 1: Early flowering

Basic trait 2: plant height (65-75 cm)

==Commitment==

==trait 1==

Value-added trait 1: Grain yield

Benchmark line or variety: Maali, INRAT 100

Your trait compare to the benchmark: Greater than the benchmark

by

percentage: 10%

Accelerated breeding strategy

W1
S1
W2
S2
W3
S3
W4
S4
W5
S5
W6
W7
W8
W9
W10
W11
W12
W13
W14

P1 x P2
F₁
F_{1:2}
F_{1:3}
F_{1:4}
F₅
Multipl

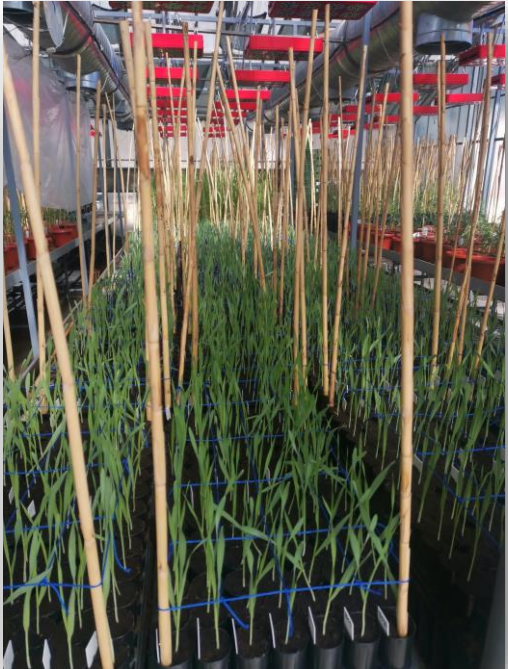
Stage 1
 Purification
 Multiplication
 Int. Nursery
Stage 2
Stage 3..
Stage 4
 Purification
 Release 1
 Release 2
 Nucleus seed (**G0**)

P1 x P2
F₁
F₂, F₃, F₄
F₅
Multipl.

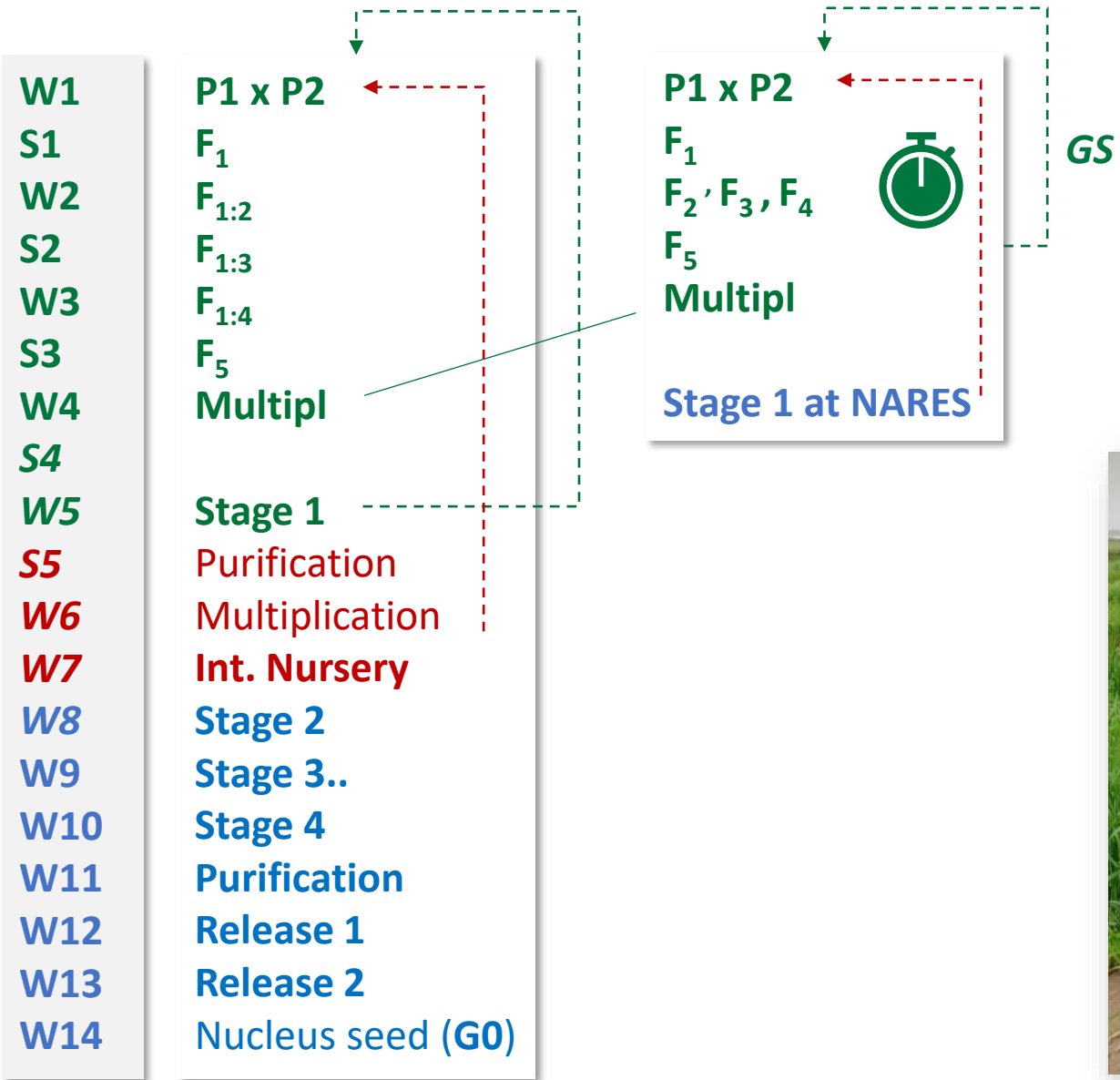


GS

- **Speed breeding:** to gain 1 year
 - 150,000 progenies (seeking partners)
- **Genomic selection:** fast recycling and gain accuracy
 - Training available



Accelerated breeding strategy

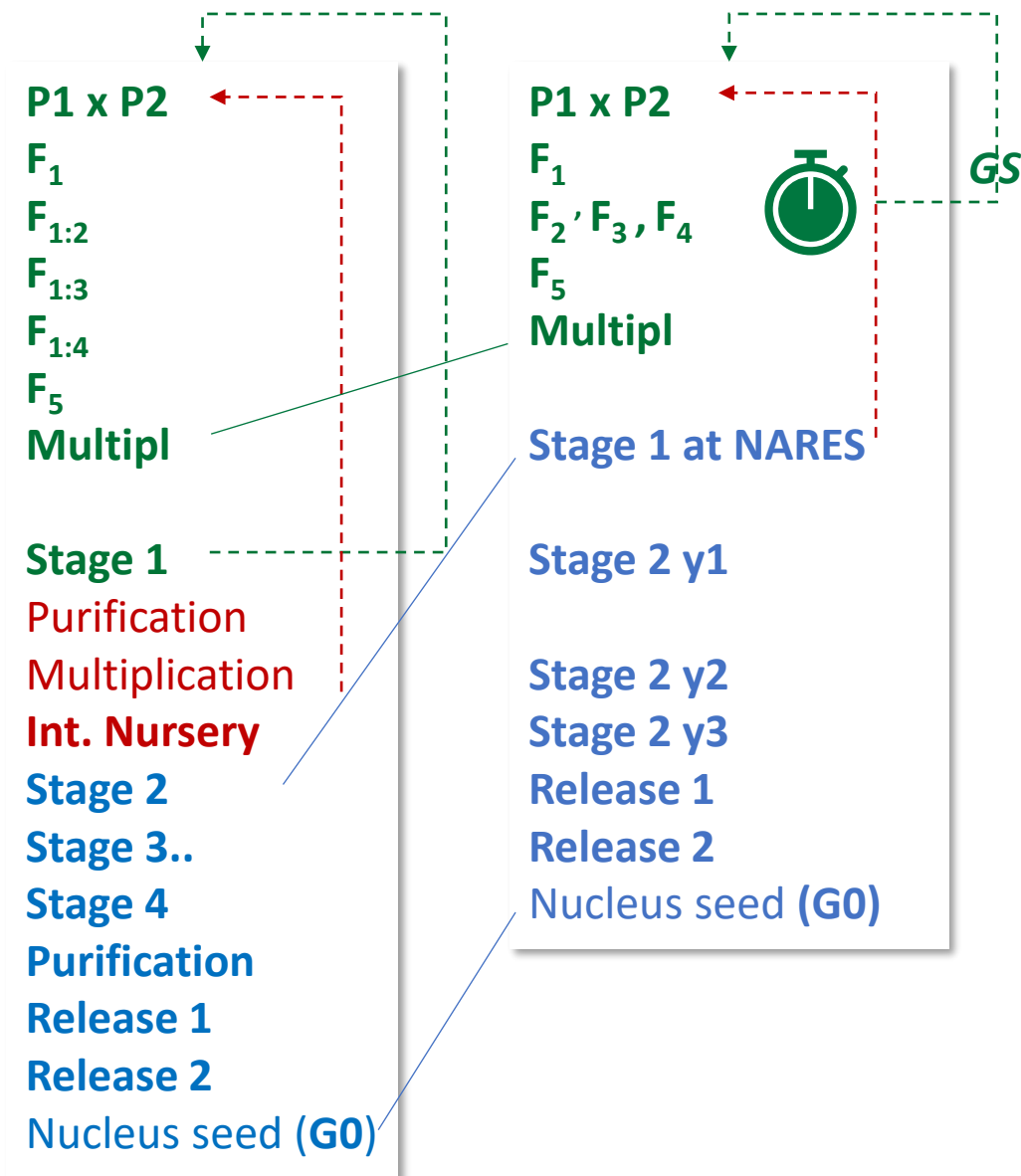


- **Stage 1 at TPE**
 - **Research Agreements** with NARES
 - Shift **budgets** while reducing costs
 - Strengthen **partnership**
 - **More and better** germplasm





- W1
- S1
- W2
- S2
- W3
- S3
- W4
- S4
- W5
- S5
- W6
- W7
- W8
- W9
- W10
- W11
- W12
- W13
- W14



Accelerated breeding strategy

- No need for **International Nurseries**
- Reduces time to release by **4 years**
- Integrated joint **advancement** decisions



Partnership for change

Historical ICARDA-NARES

- Few entries via Int. Nurseries
- NARES test for purpose
- CG decides crosses
- NARES decide releases/CB
- Programs are independent
- Occasional discussions on targets

Improved ICARDA-NARES

- Stage 1 at NARES
- Selection index to guide
- CG decides crosses
- NARES decide releases/CB
- Programs are independent
- Programs objectives are well aligned

Symbiotic ICARDA-NARES

- Stage 1 at NARES
- Selection index to guide
- Joint decision of crosses
- Joint advancement decisions
- Programs are inter-dependent
- Commonly set objectives



ICARDA as Int coordinator only

Conclusions

- **The international nursery** approach has worked but its potential for the future is not sure
- Stronger alignment of **breeding objectives** can be achieved via Product Profiles and Selection Index
- NARES can take greater advantage from ICARDA using its **speed breeding and genomic selection**
- Shifting **Stage 1 to NARES** can be a game changer
- Achieving a **symbiotic partnership** could benefit both NARES and ICARDA
- The long-term goal is to “close” ICARDA’s breeding



Thank you



Product profiles: selection index

Specific adaptation *Farming system suitability*

Portfolio value (30%)

Wide adaptation (85%)

PP assign 22	TPE	FLW	PLH	Frost tol	HF	YR	SR	LR	Gluten strenght	Yellow Pigm.	Heat tol	Drought tol	Stability	TKW	GY Pot
1. West Asia drylands	Tel Amara, LEB	M	M	0%	0%	5%	10%	0%	5%	10%	10%	10%	15%	15%	20%
2. North African Drylands	Marchouch, MOR	E	M	0%	10%	0%	5%	0%	5%	10%	10%	10%	15%	15%	20%
3. East African Drylands	Debre Zeit, ETH	E	M	0%	0%	0%	15%	0%	5%	10%	10%	10%	15%	15%	20%
4. South Asia Drylands	Amlaha, IND	M	M	0%	0%	5%	5%	5%	5%	10%	10%	10%	15%	15%	20%
5. High Drylands	Annoceur, MOR	L	T	10%	0%	0%	5%	0%	5%	10%	10%	10%	15%	15%	20%
6. West African Savanhas	Fanaye, SEN	E	M	0%	0%	0%	0%	0%	5%	10%	25%	10%	15%	15%	20%

- **Specific adaptation** is a major element
- It guides the germplasm **advancement** strategy
- It guides the **pre-breeding**
- It guides the **crossing** program