IRRI

Mainstreaming Zn in Rice

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Director General

Why Mainstreaming?

- Deliver the maximum impact
- Leverage existing breeding capacities, infrastructure and relationships
- Deliver packages of solutions in high quality varieties – nutrition ***with*** consumer expectations, yield, stress resistance, pest & disease resistance
- Leverage existing seed systems capacities and relationships
- Avoid expensive, inefficient and relatively low impact "niche" breeding programs

Potential Impact

- 2.7 billion rice farmers and consumers who depend on irrigated rice for their food supply will have access to rice with high levels of zinc in the grain.
- Number of DALYs (Disability Adjusted Life Years) saved annually in Asia from 500,000 to 1,000,000 depending on the level of adoption.
- Hundreds of millions of dollars savings in health costs.
- Higher productivity and economic growth due to healthy workforce.

Cost: *US$5 m per year over for 10 years*
$5-$10 cost per DALY saved

IRRI's Rice Breeding

Variety Replacement Strategy

- Product development pipeline
- Integration of all traits needed for market acceptance
- Population improvement strategy to drive genetic gain in complex traits
- Strategy increases the frequency of favourable alleles for key traits
- High zinc becomes an additional complex trait in across the program rather than a specialty niche product

High Zinc rice varieties released in Bangladesh

Variety	Season	Yield (t/ha)	Maturity	Zn (ppm)
BRRI dhan62	T. Aman	4.0-4.5	100	19.6
BRRI dhan64	Boro	6.0-7.0	145	24.6
BRRI dhan72	T Aman	6.0-6.5	128	22.2
Proposed for release				
BR7671-37-2-2-3-7	Boro	6.1-6.2	145	23.9
BRRI dhan28 (ck)	Boro	6.0-6.1	145	16.8

BRRI dhan62

BRRI dhan64

BRRI dhan72

First high Zn rice released in the Philippines among ASEAN

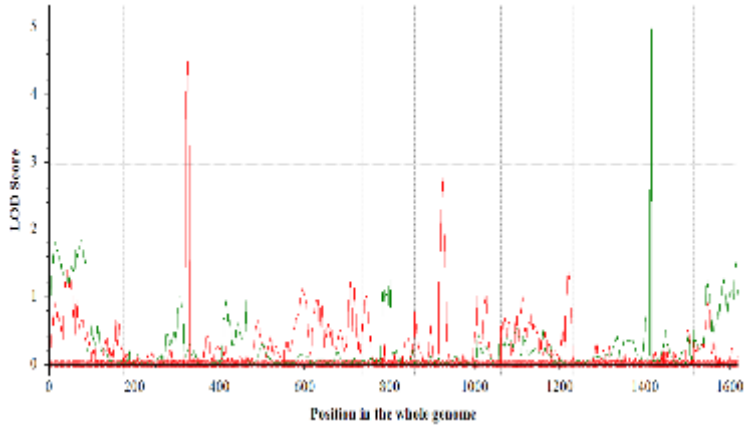
IRRIGATED LOWLAND (Special rice)	IR10M300	NSIC 2016 Rc460	Zinc rice 1 IRRI	National Recommendation (TPR/DWSR)

Department of Agriculture PHILRICE PHILIPPINE RICE RESEARCH INSTITUTE CLEAN I GREEN I PRACTICAL I SMART

Rc460 has Zn levels 4.5 ppm higher than the baseline comparison variety

High Zn Rice Genetics

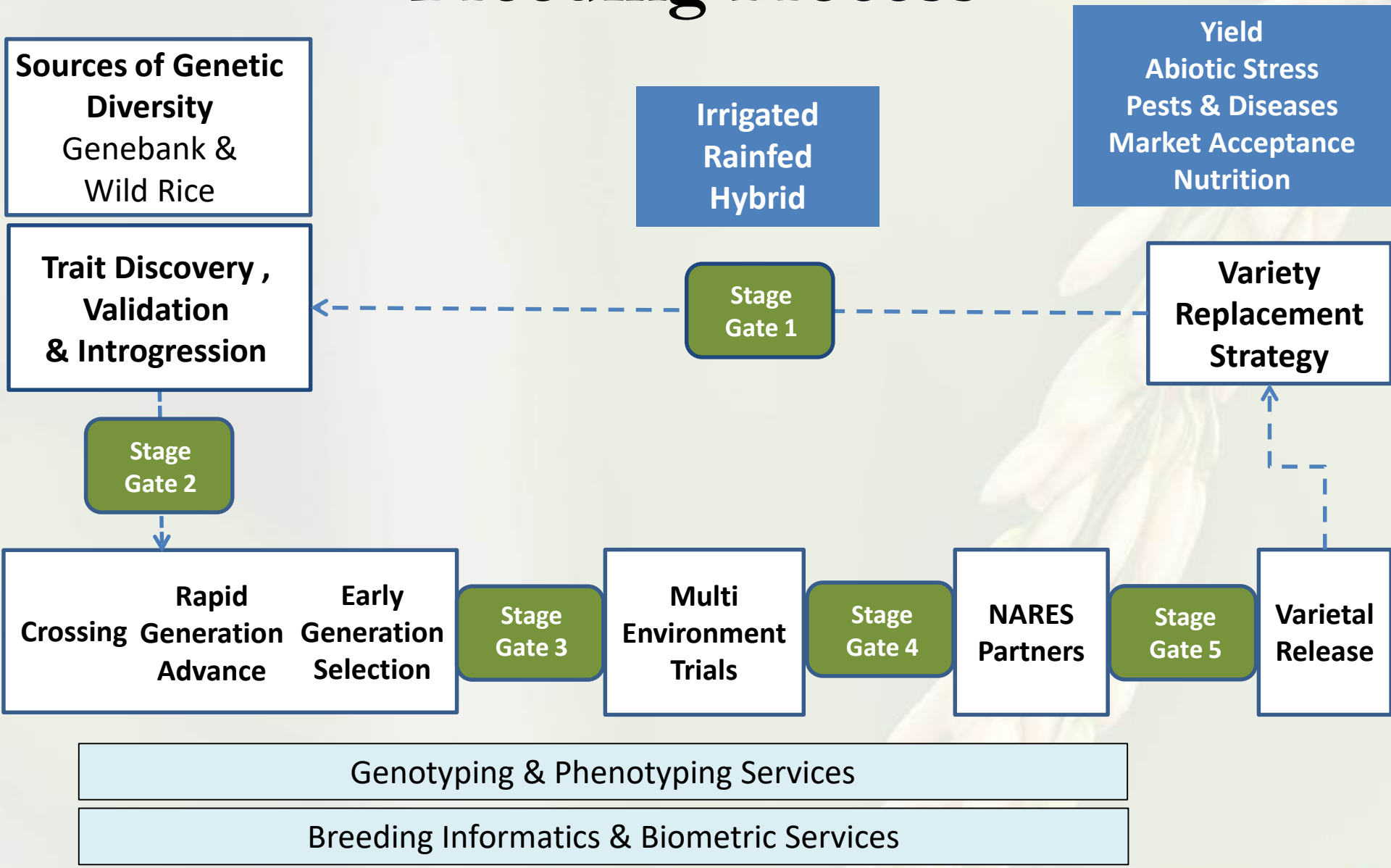
Season	Ch	Position	LOD	PVE(%)	Add
DS	2	29	7.04	10.30	-1.41
	3	149	4.57	20.30	0.98
	6	80	10.32	16.10	-2.13
	8	64	9.15	14.10	-1.43
	12	8	5.22	7.50	1.13
WS	2	15	5.68	17.31	-1.01
	6	73	5.30	15.27	-1.53
	11	10	5.14	22.77	-1.64
	12	23	4.33	12.22	-0.93



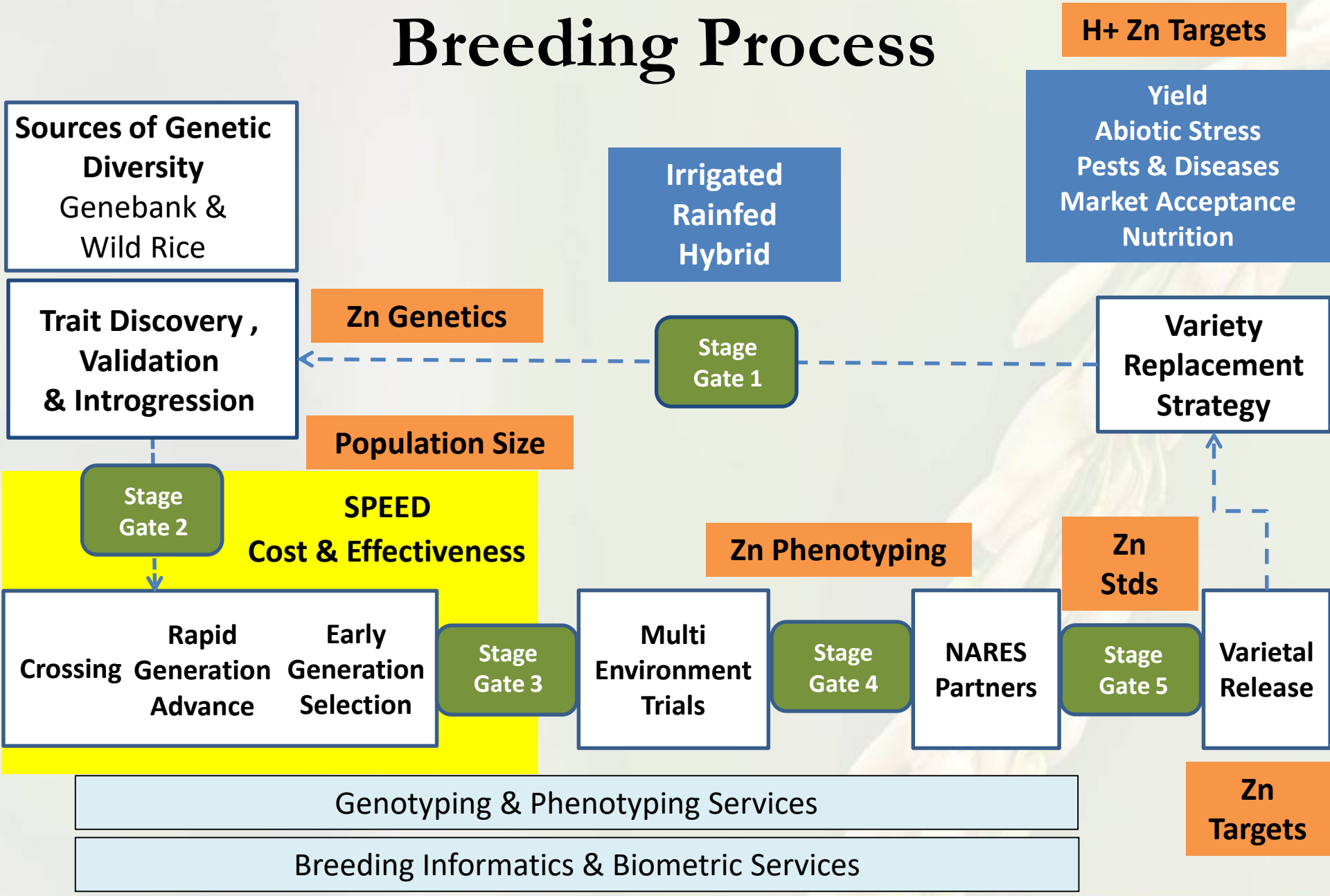
Zinc increase genes identified but are not in themselves sufficient to generate lines with target Zn levels through a simple backcrossing strategy (for example as was used for sub1).

In addition to existing genetic loci, we need to combine multiple “small effect” loci through enrichment of elite populations using high efficiency breeding methodologies

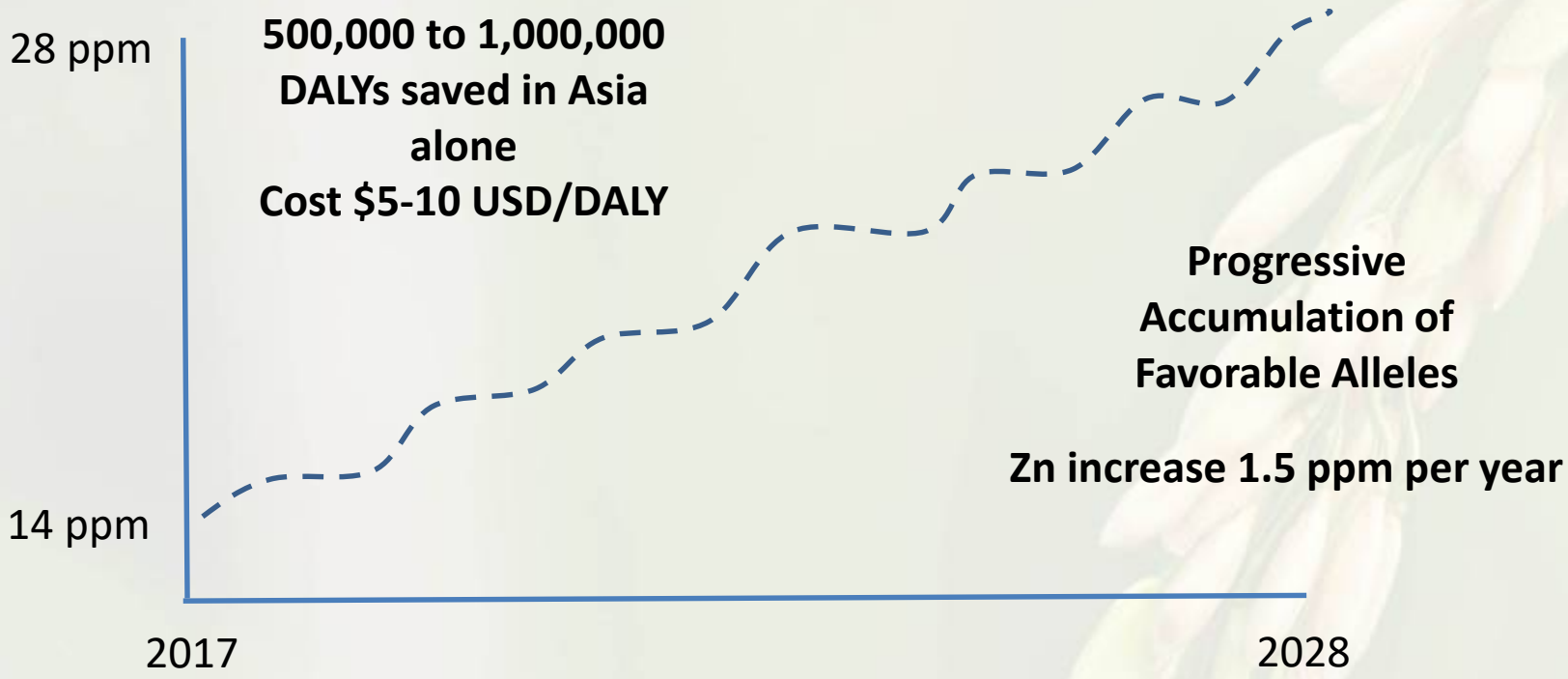
Breeding Process



Breeding Process



Progress To The Target



Minimal Impact on Rate of Genetic Gain for Yield, Climate Resilience, Pests & Disease, Market Acceptance

Global Reach Through IRRI, AfricaRice and CIAT through the RICE CRP