United States Department of Agriculture

National Institute of Food and Agriculture

General Guidelines for Standardized Phenotyping

RosBREED

DISEASE RESISTANCE × HORTICULTURAL QUALITY → SUPERIOR CULTIVARS

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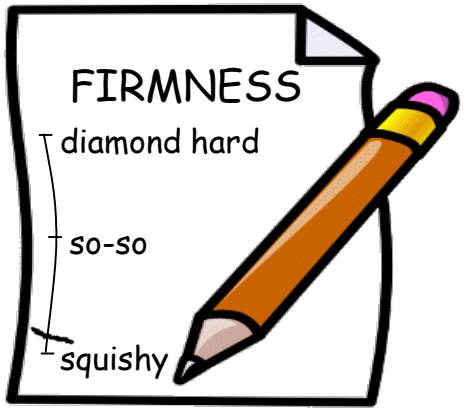
Instrumental vs. Sensory measures

Instrumental = directly related to industry measures
= high-throughput for quantitative measures



Sensory = directly related to consumer perception
= high-throughput for qualitative measures

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Eight Guiding Principles for Phenotyping

1. **Commercial relevance**
2. **Heritability & Precision** (Genetic relevance)
3. **Redundancy avoidance**
4. **Availability of expertise & instruments**
5. **Throughput**
6. **Personnel fatigue**
7. **Cost & Cost-efficiency**
8. **Standardization**

Guiding Principles for Phenotyping

1 **Commercial relevance**

a. relation to industry value

b. relation to consumer perception & value

Can be a disconnect between a. and b. if industry measures (e.g. quality indices) are not aligned with consumer value

2 **Heritability & Precision** (Genetic relevance)

- measures should closely represent genetic potential

- minimize “environmental” variation (noise)

- replicate as necessary (years, harvests, trees, fruit)

Guiding Principles for Phenotyping

3 Redundancy avoidance

- resource-efficiency
- avoid measuring the same thing in different ways (aim for no genetic correlation)

4 Availability of expertise & instruments

- plan ahead
- using only what is available/familiar can result in compromising Principles 2 & 3

Guiding Principles for Phenotyping

5 **Throughput**

- plants have limited windows for evaluation
- must keep up with incoming samples
- some methods allow storing tissue for quieter times

6 **Personnel fatigue**

- repetition of the same method all day in a field or lab can lead to loss of data reliability, morale, and personnel themselves
- instruments can replace repetitive labor

Guiding Principles for Phenotyping

7 Cost & Cost-efficiency

- with unlimited budget could measure everything, with massive replication

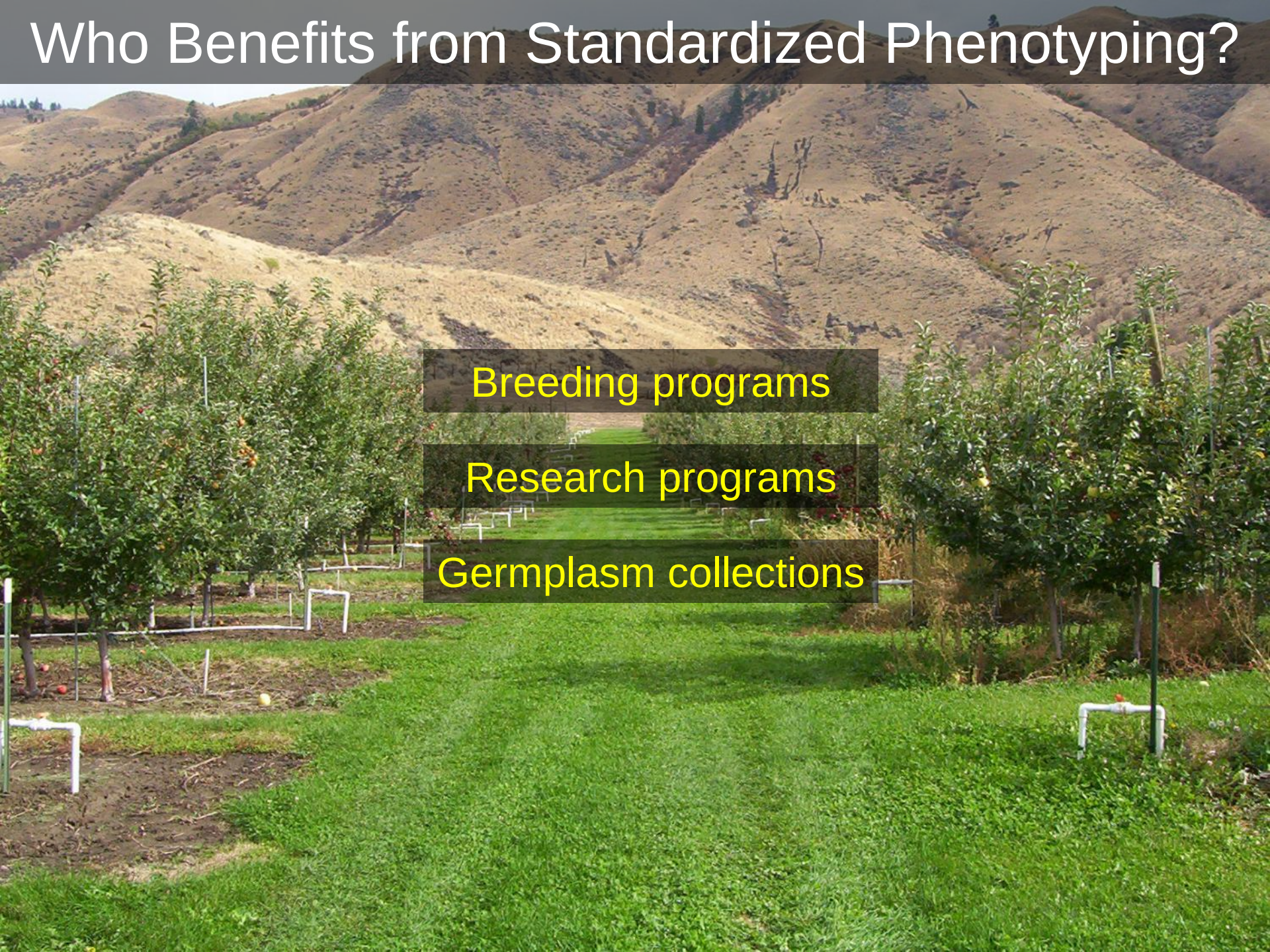
- compare costs of alternative methods & replication levels to achieve same genetic potential description

8 Standardization

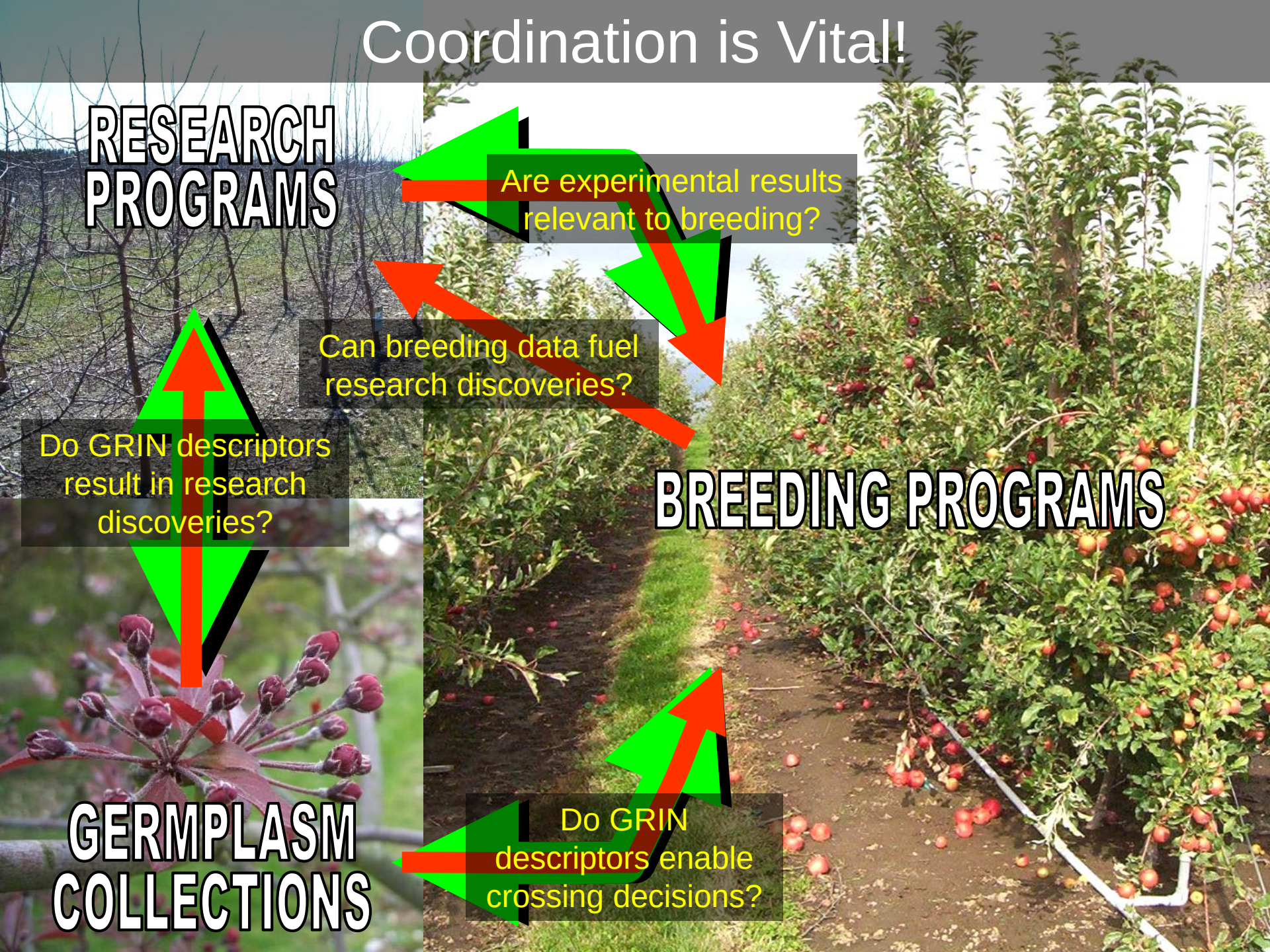
- transferability of information – other sites, institutions

- even at one site, important to be repeatable – other seasons, other personnel, scientific scrutiny

Who Benefits from Standardized Phenotyping?



Coordination is Vital!



Standardized Phenotyping
=
Spirit of Collaboration

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