General Guidelines for Standardized Phenotyping
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

RosBREED
DISEASE RESISTANCE × HORTICULTURAL QUALITY
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?

- Breeding programs
- Research programs
- Germplasm collections
Do GRIN descriptors result in research discoveries?

Are experimental results relevant to breeding?

Can breeding data fuel research discoveries?

Do GRIN descriptors enable crossing decisions?

Coordination is Vital!
Standardized Phenotyping = Spirit of Collaboration
International Partners