Recommendations for the National Passionfruit Breeding Program

2019-2020

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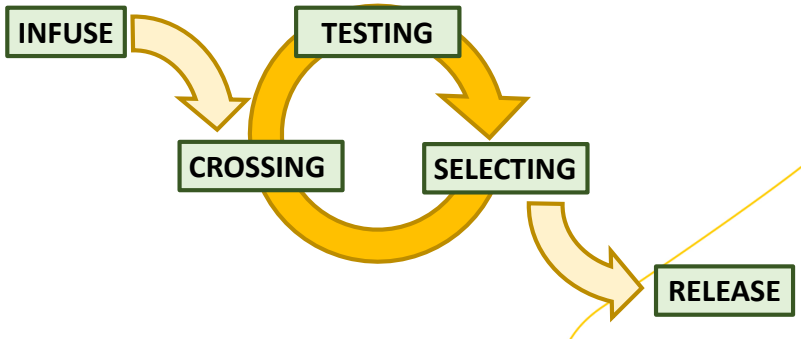
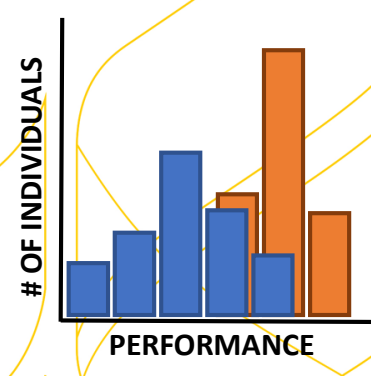
24/07/2019

What is a Breeding Program?





$$\text{GENETIC GAIN} = \frac{\text{SELECTION INTENSITY x SELECTION ACCURACY x “DIVERSITY”}}{\text{TIME TO COMPLETE A BREEDING CYCLE}}$$

The National Passionfruit Breeding Program

- Three year breeding Project: 2016-2019
  - Levy Funded - HIA Administered
  - PAI as peak industry body
  - SCU as Research Provider
  - End 1st of July 2019
- No-Cost Extension: 2019-2020
  - No available Levy funds through HIA in 2019-2020
  - Implement recommendations from Review
  - Keep the breeding program ticking over
  - In-Kind contributions from DPI, PAI and SCU
  - Get a scholar involved PAI-SCU co-funded

1. Centralize Core Breeding Activities

- All Crossing by SCU at SCU
  - Quality Control and Assurance
  - Standardize and increase throughput
- Line advancements at SCU/DPI
  - Speed up Breeding Cycle
- 1st Stage Trials at SCU/DPI
  - Quality Control and Assurance
  - Reduce Cost

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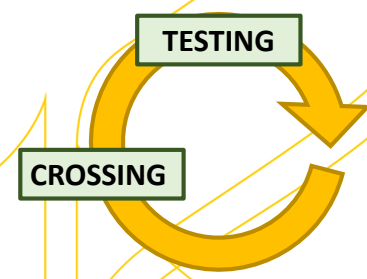
2. Implement Rapid Generation Techniques

- Use controlled processes for crossing
  - Quality Control and Assurance
  - Genetic "fingerprinting"
  - Standardize and increase throughput
- Use controlled environments for selfing
  - Rapid line fixation through inbreeding
  - Generate genetically stable breeding pool
  - Speed up Breeding Cycle
  - Reduce Cost



These Processes will be developed under an MSc project.

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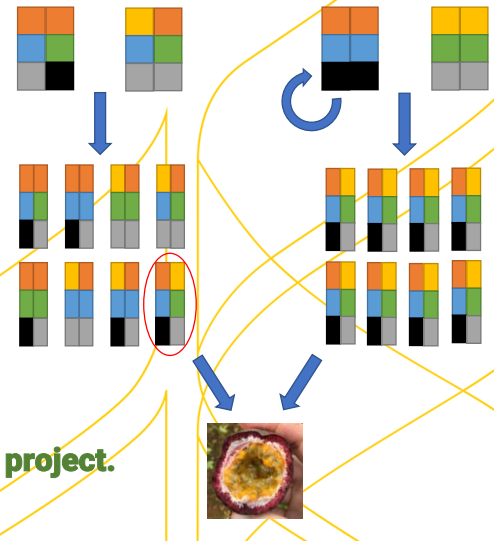
3. Implement an Inbred Breeding Strategy

- Inbreeding
  - Generate True Breeding materials
  - Adopt a "Standard Breeding Paradigm"
  - Generate genetically stable breeding pool
  - Overcome Self-Incompatibility
- True F1 Hybrid Production
  - Produce consistent hybrids from inbred parents
  - Generate perpetual and stable hybrid lines
  - Regenerate "Old Winners"



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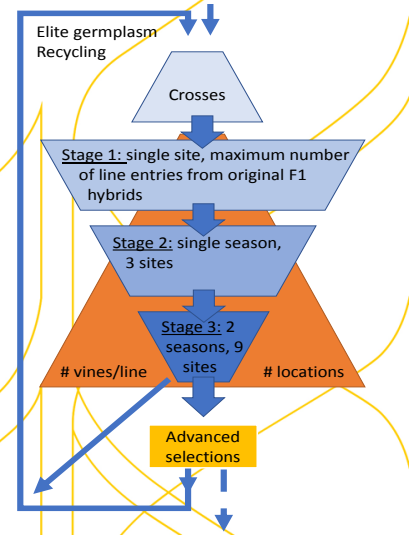
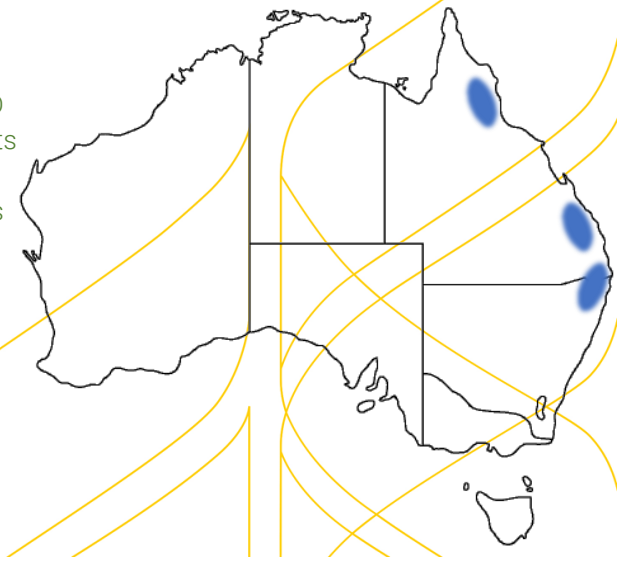
4. Implement Stage-to-Stage Advancement Plan

- Stage 1 (single season, single site)
  - Field assessment sheet for discarding 95%
  - Must have traits
- Stage 2 (single season, three sites)
  - Industry index score & fruit quality parameters
  - 25% productivity, 25% pest & disease, 20% fruit appearance, 20% taste, 10% suited to environment
- Stage 3 (multiple seasons, multiple sites)
  - Monthly scoring sheet & fruit quality parameters
  - 1-9 scoring vine, flowering, fruit performance



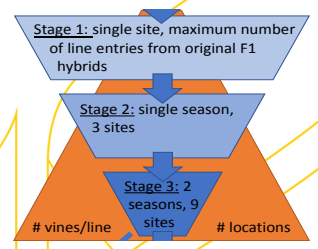
5. Secure long-term Agreements for Trials

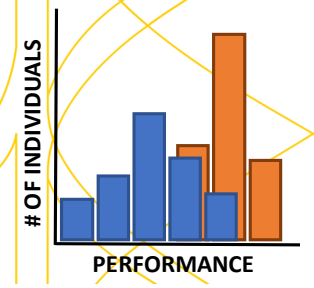
- Breeding Zones
  - Northern NSW, Southern QLD, Northern QLD
  - Distinct zones with distinct trait requirements
  - Radiation of Stage 1 "winners"
  - 1 site per zone for Stage 2 and Stage 3 trials
  - Collect multi-year multi-location data
  - Multiple controls at each site
- Participatory field trials
  - Voluntary grower-trialled stage 2 selections
  - Simplified performance indicators
  - Grower acceptance testing



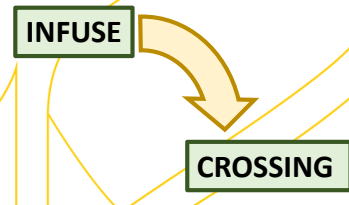
6. Collect & Analyse all Data for all Field Trials

- Consistent Scoring sheets for each Stage
  - Field assessment sheet for discarding 95% from stage 1
  - Lost of data not collected for stage 1
  - Industry index score for stage 2
  - Comprehensive1-9 categorical trait scoring sheet for stage 3
- Genetic Gains Evaluation
  - Relative of increase of performance across program over time
  - Long term metrics
  - Towards a distinct product profile and/or ideotype





7. Characterize Gene Bank Collection



Not feasible under the No Cost Extension period of 2019-20

8. Implement Change of Nomenclature in Trials

- Full anonymization of all entries
  - Reduce potential bias due to pedigree
  - Avoid cherry picking by trialists
  - Avoid errors due to mislabelling
  - Standardization of naming convention

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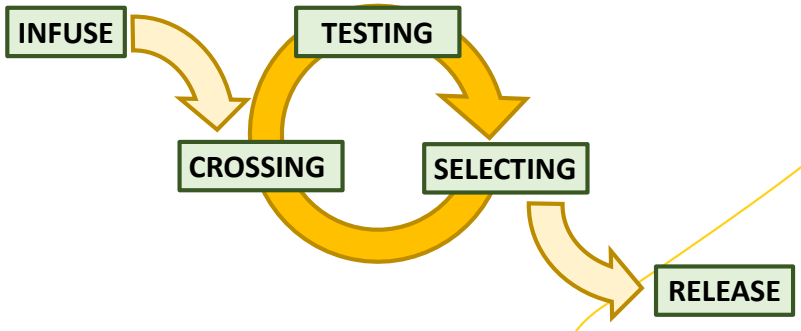

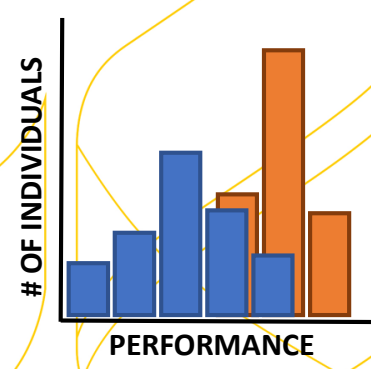

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