Phytophthora cinnamomi resistant rootstocks for South Africa

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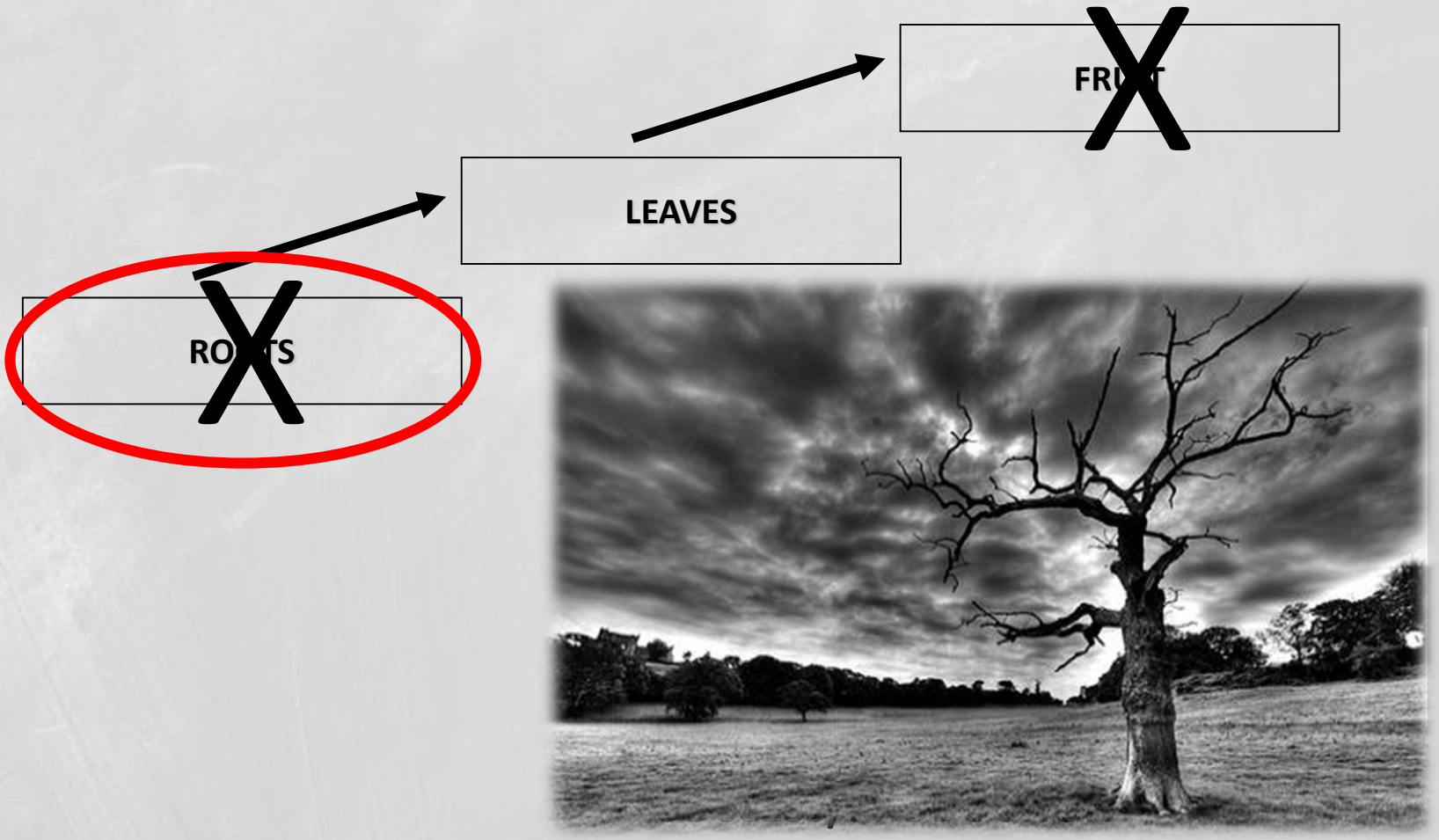
Why do you need the right rootstock?



How to pick the right rootstock?

Important to know what your production challenges are

- Disease
- Salt
- Too little water
- Too much water
- Poor drainage (compaction/
- New to growing avocado

South Africa

1. *Phytophthora cinnamomi* Rands.
2. Rosellinia necatrix (new to avocado)

} 2 soil borne diseases

Affects (if no intervention):

- Tree health
- Tree yield
- Fruit quality
- Orchard management

South Africa

- Main production areas (17 500ha)
  - In northern parts of South Africa (Limpopo, Mpumalanga) (90%)
  - Along East coast/Midlands (Kwazulu Natal) (9%)
  - Other (1%)

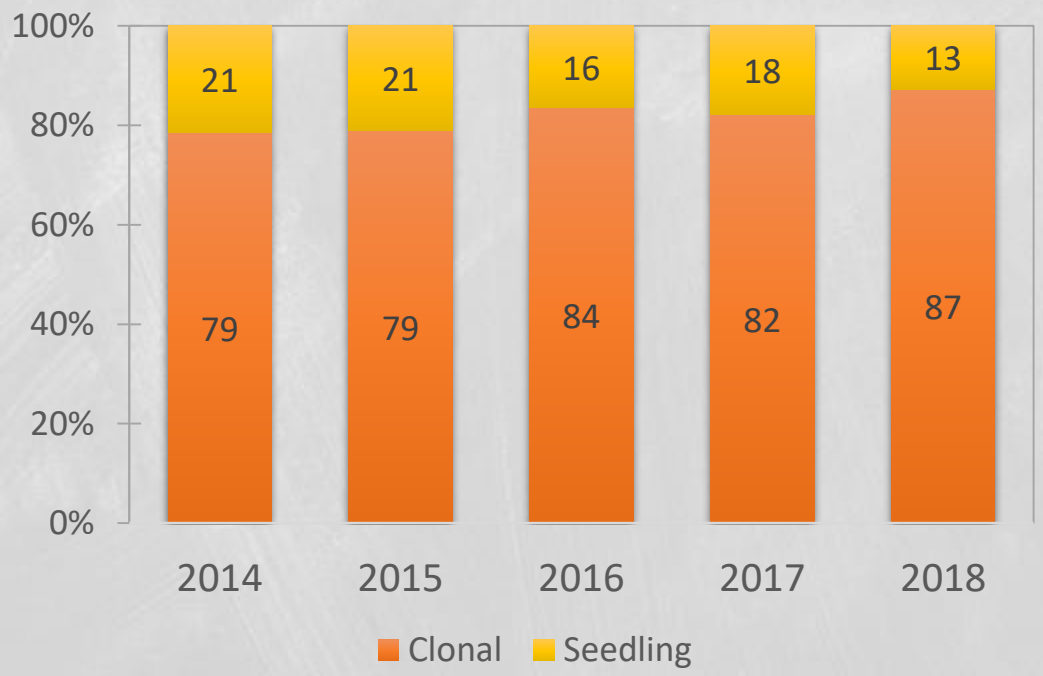
Climate

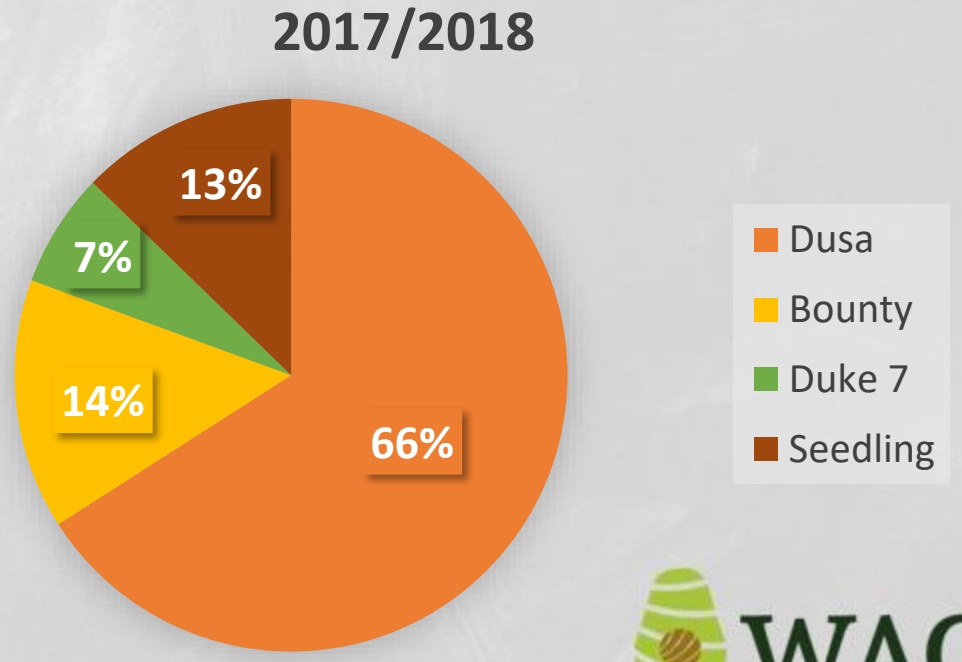
		Avg Rain (mm)	Avg Min T (oC)	Avg Max T (oC)	Avg T (oC)	Altitude (m)	Challenge
Limpopo	Tzaneen	965	-2	38	20	681	Pc
Mpumalanga	Nelspruit	796	7	29	20	719	Pc, hail, heat waves, hail
KwaZulu Natal	Howick	861	2	26	16	1066	Pc, frost, hail
Eastern Cape	Adelaide	450	4	30	18	587	Drought, salt?, heat waves
Southern Cape	George	740	8	24	16	233	Wet winter
Western Cape	Heidelberg	472	5	29	18	107	Wet winter

Be careful looking at averages!

Industry stats

- SA Industry >85% clonal based
  - Duke 7, Dusa, Bounty,
  - Seedlings e.g. Edranol, Velvick, Zutano, Nabal etc (<13%)





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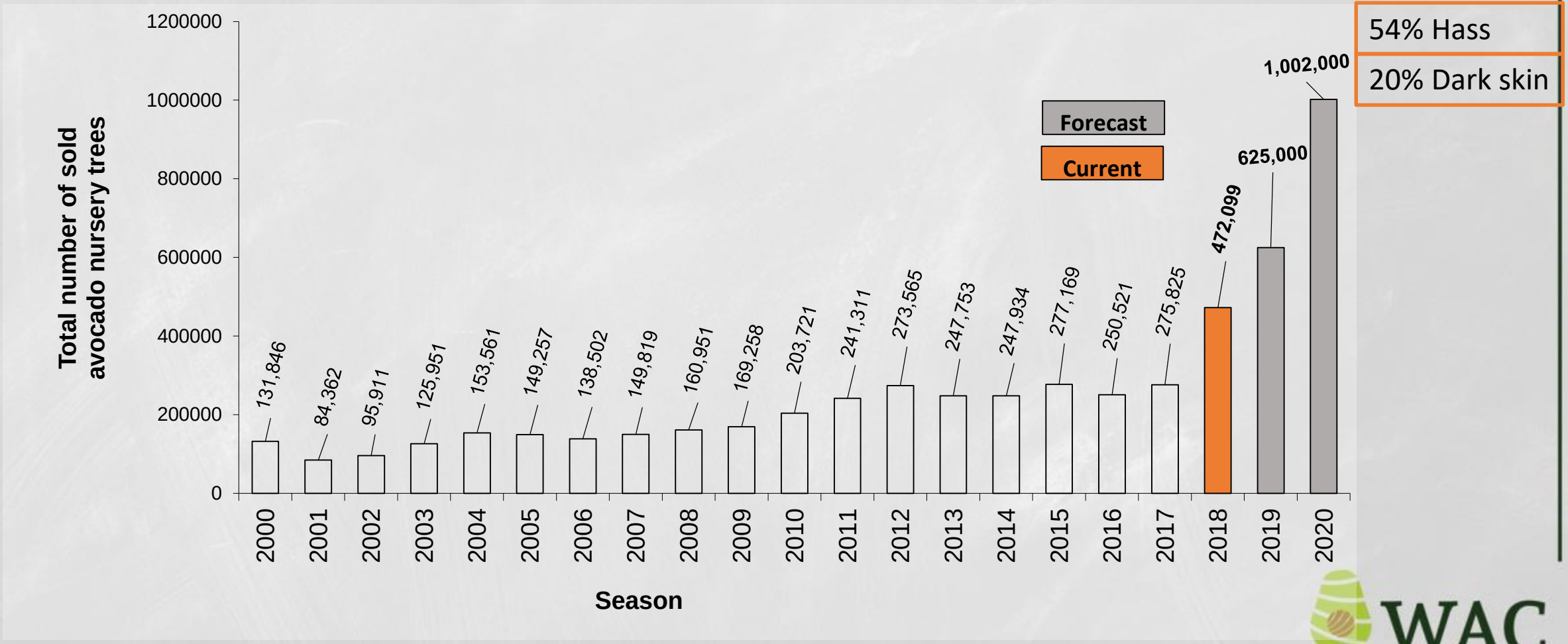
SA Industry stats – Tree sales



*ANA Nursery stats – SAAGA 2019

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Rootstocks available in RSA

Rootstocks mainly Mexican race.
Interest in West Indian more recent due to drought and salinity.

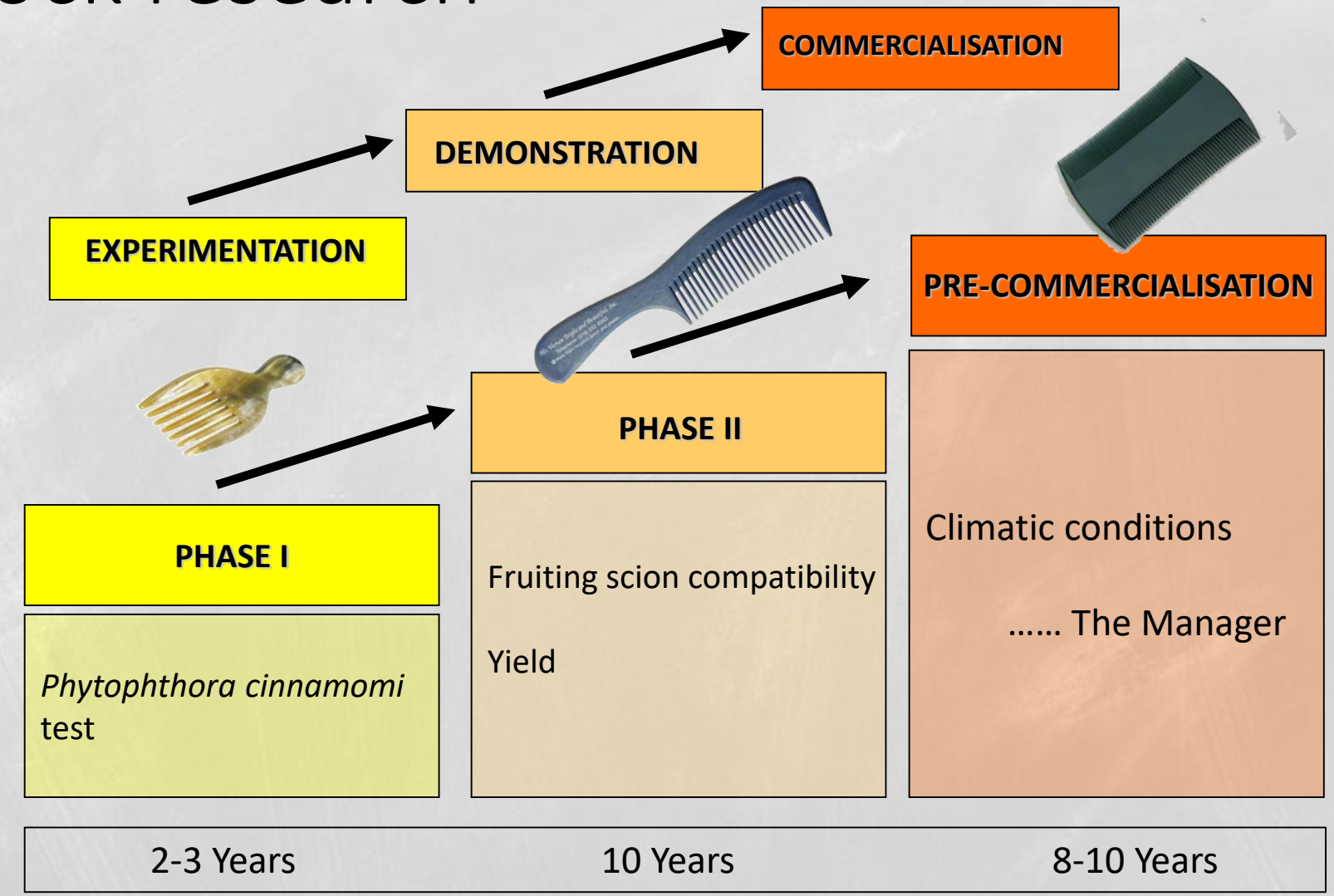
- 1970s = seedlings (mostly Mexican)
- 1980s = First clonal import from USA
  = Duke 7 (most successful), G755, Barr Duke, Thomas, D9
  = Super Tree's are identified on farms (where surrounding trees sick)
- 1990s = Duke 7, seedlings
  = some small plantings of Velvick and Nabal seedlings
  = South Africa (Westfalia) start own breeding/screening program
- 2000s = Dusa™ (new commercial standard), Latas, Duke 7, Bounty
- 2010s = Dusa™, Latas, Bounty, Duke 7, Zentmyer (USA) (small tests)
- 2020s = *RSA will release 2 new rootstocks (x1 Pc, x1 Salt)*

Westfalia Fruit rootstock program

- Having a breeding and screening program means extensive testing
  - Takes 20 - 25 years to release a rootstock
  - Need extensive field testing
  - Disease tolerance without production (yield) is unacceptable

- Traditionally all trials have ‘Hass’ as fruiting scion
  - With the release of so many “new” cultivars more trials are getting planted to evaluate “best fits”.
  - New cultivars: 3-29-5 (Gem), Mendez#1, Maluma

Rootstock research



The Westfalia way

Rootstock research: Phase 1

- Collect interesting “Survivor” tree material, or collect seed from our Breeding block

- Breeding block
  - 30 most promising rootstock trees from around the world
  - Seeds collected annually for screening
    - +/- 9 000 seeds per annum

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Rootstock screening process – Phase 1

Seedlings are subjected to *P.c.* in a mistbed (6 weeks), and then retested and compared to the industry standard (Dusa®)

Super tree-material is exposed to the same process. = 2 years.

Success = < 0.1%

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Rootstock screening – Phase 2

Survivors from mistbed are then put into a field trial, with high *P.c.* pressure, to test whether the trees bear well ('Hass' as scion)

= 6-8 years.

Killing fields

Promising clonal

Seedling

Healthy seedling selections cloned

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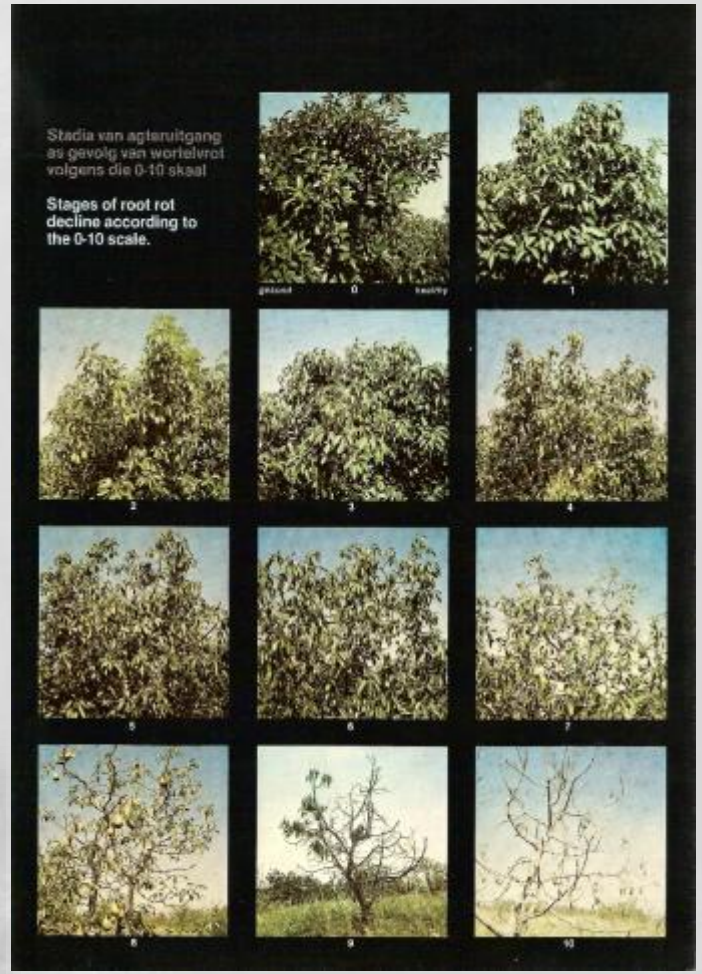
Rootstock screening – Phase 2

- Annually measure:
  - tree health,
  - yield efficiency,
  - fruit size,
  - graft compatibility (although rare).



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Rootstock screening – Phase 3:

Successful selections are then planted on a semi-commercial scale, in various geographic areas, and compared to the industry standard.

Not all trial sites have a high *P.c.* pressure.

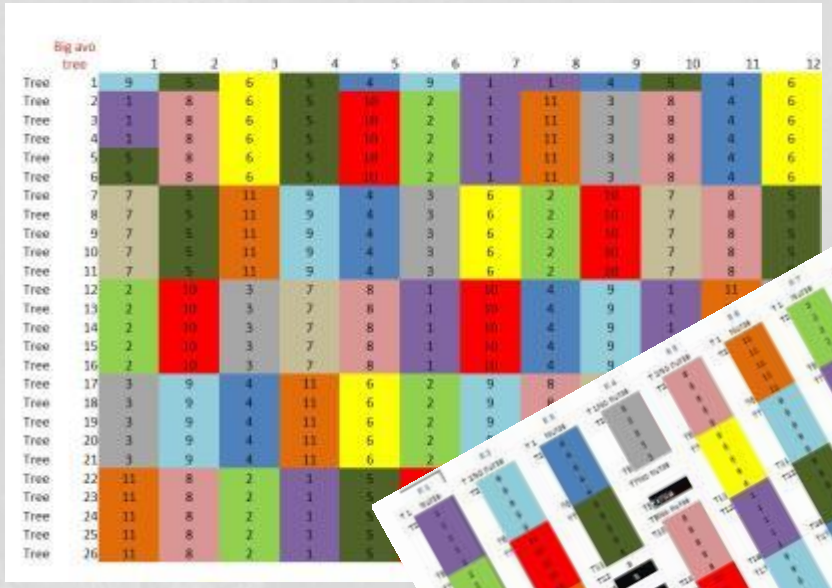
Not all sites are managed the same – i.e. grower manages as per his/her protocols. 6-8 years.

Dusa® vs Duke 7

Pre-commercial trials: Example

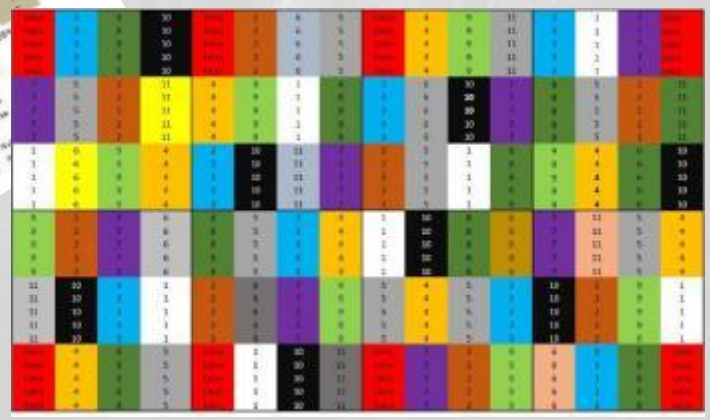
- Trials planted in November 2013/2014
- 3 Locations planted
  - Mooketsi (Dec 2013) (7x4m)
  - Tzaneen Dam (Nov 2013) (8x4m)
  - Soekmekaar (Nov 2014) (8x4m)
- Commercial standards:
  - Dusa®, Duke 7, Bounty, Velvick (Agrivet)
- 25-30 trees per rootstock
- ‘Hass’ as fruiting scion
- Same nursery, same tree age

Mooketsi
Planted December 2013



Tzaneen
Planted November 2013

Soekmekaar
Planted November 2014



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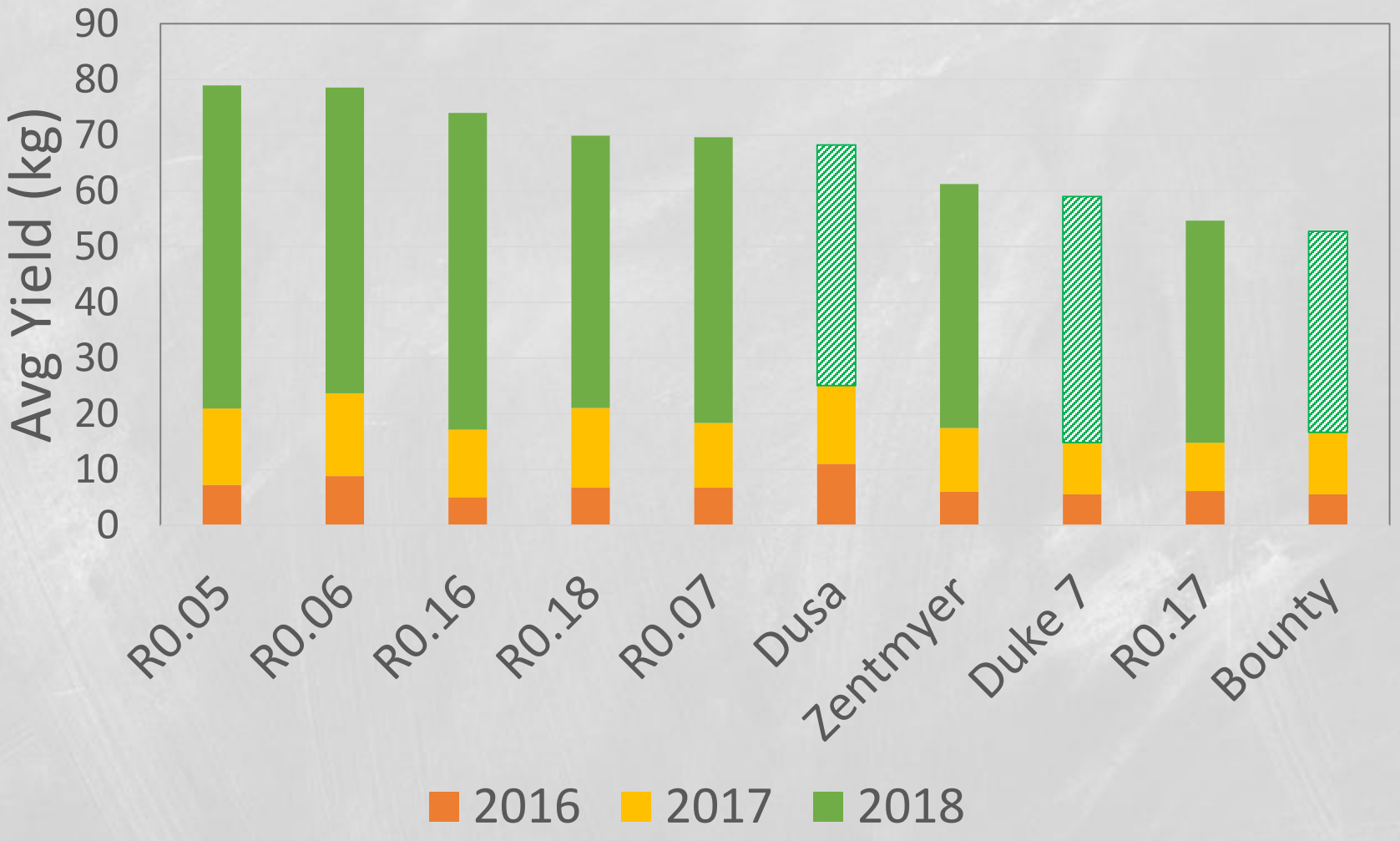
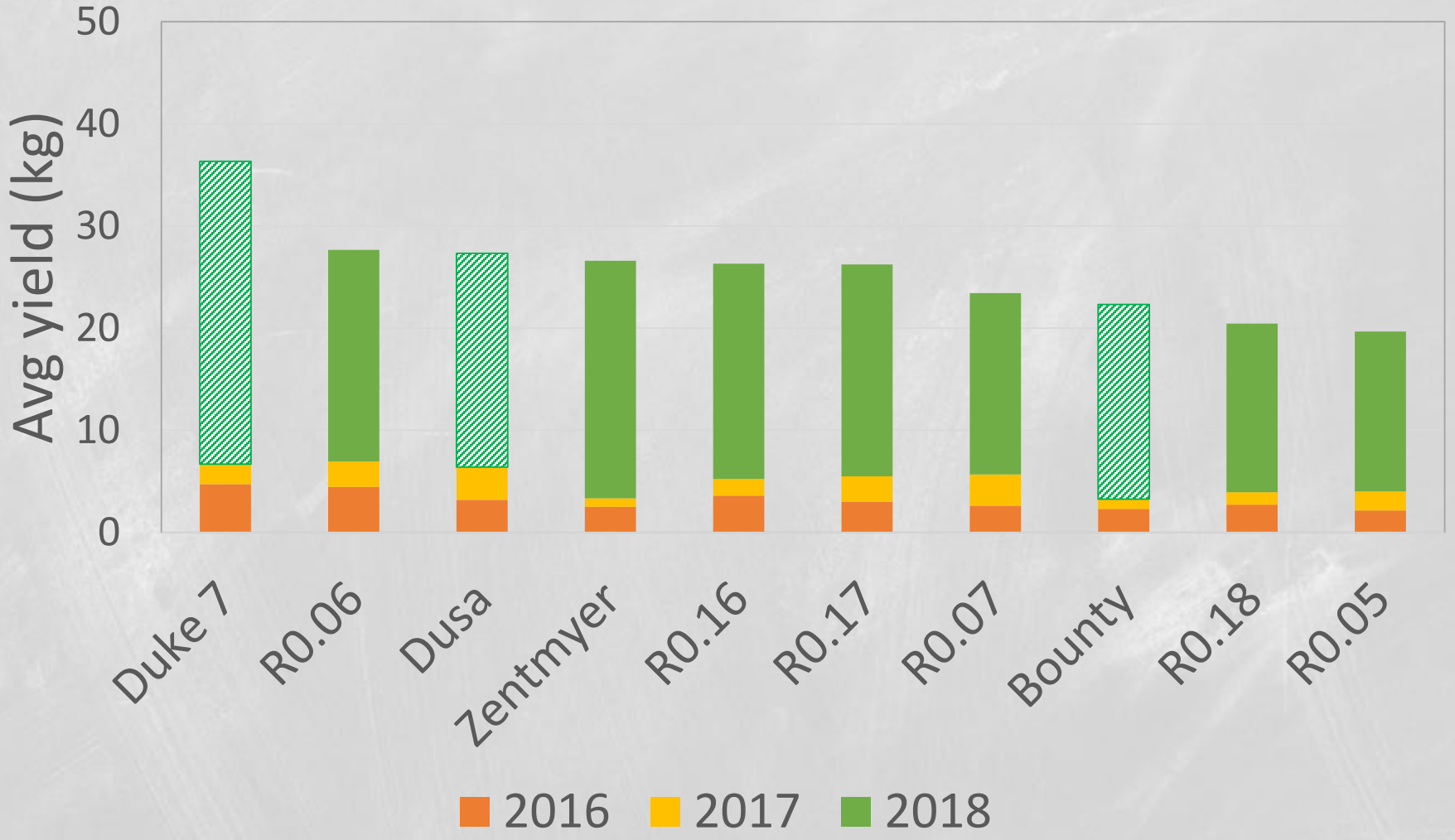
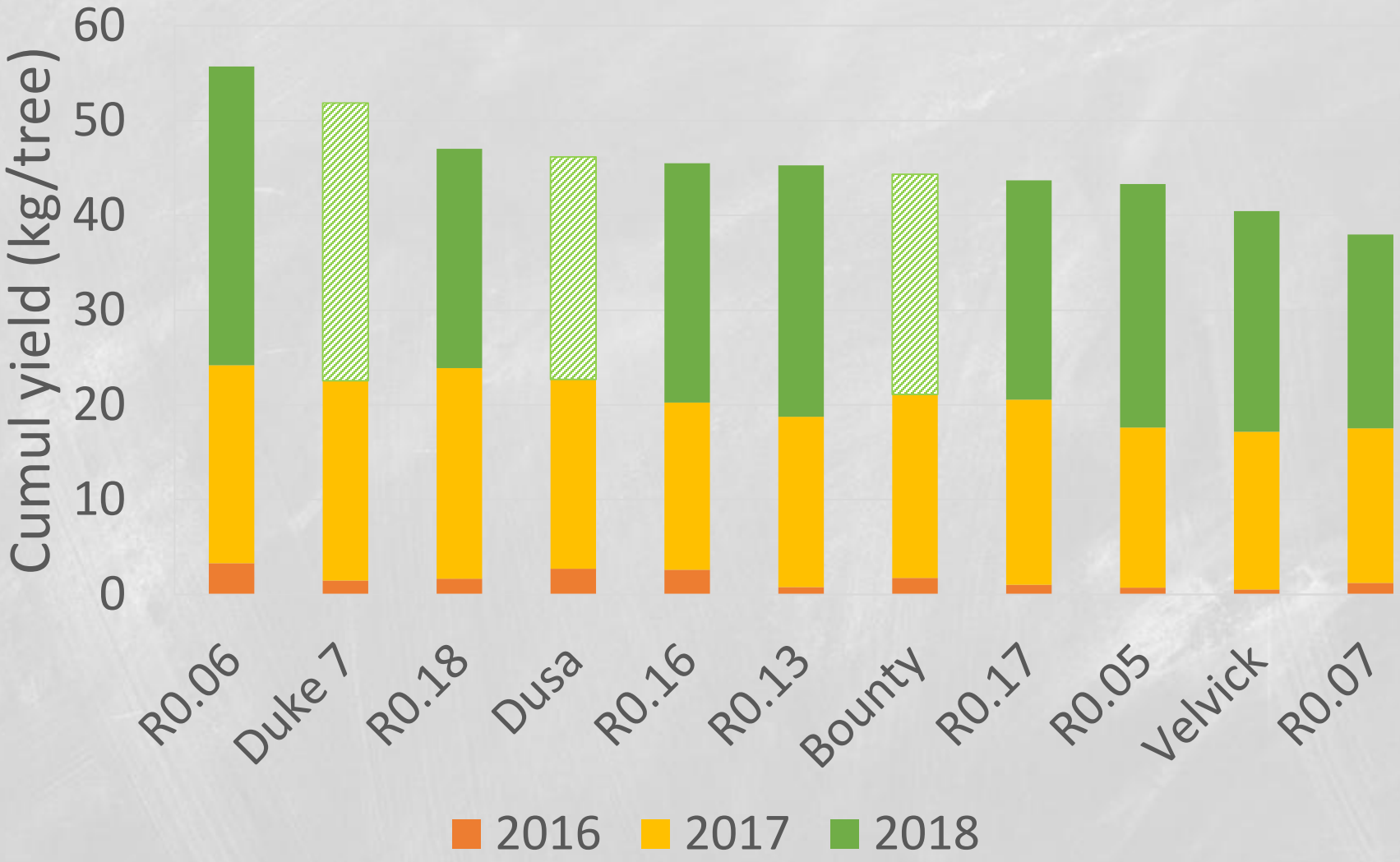
Yield – Tzaneen (Hot, good rainfall)



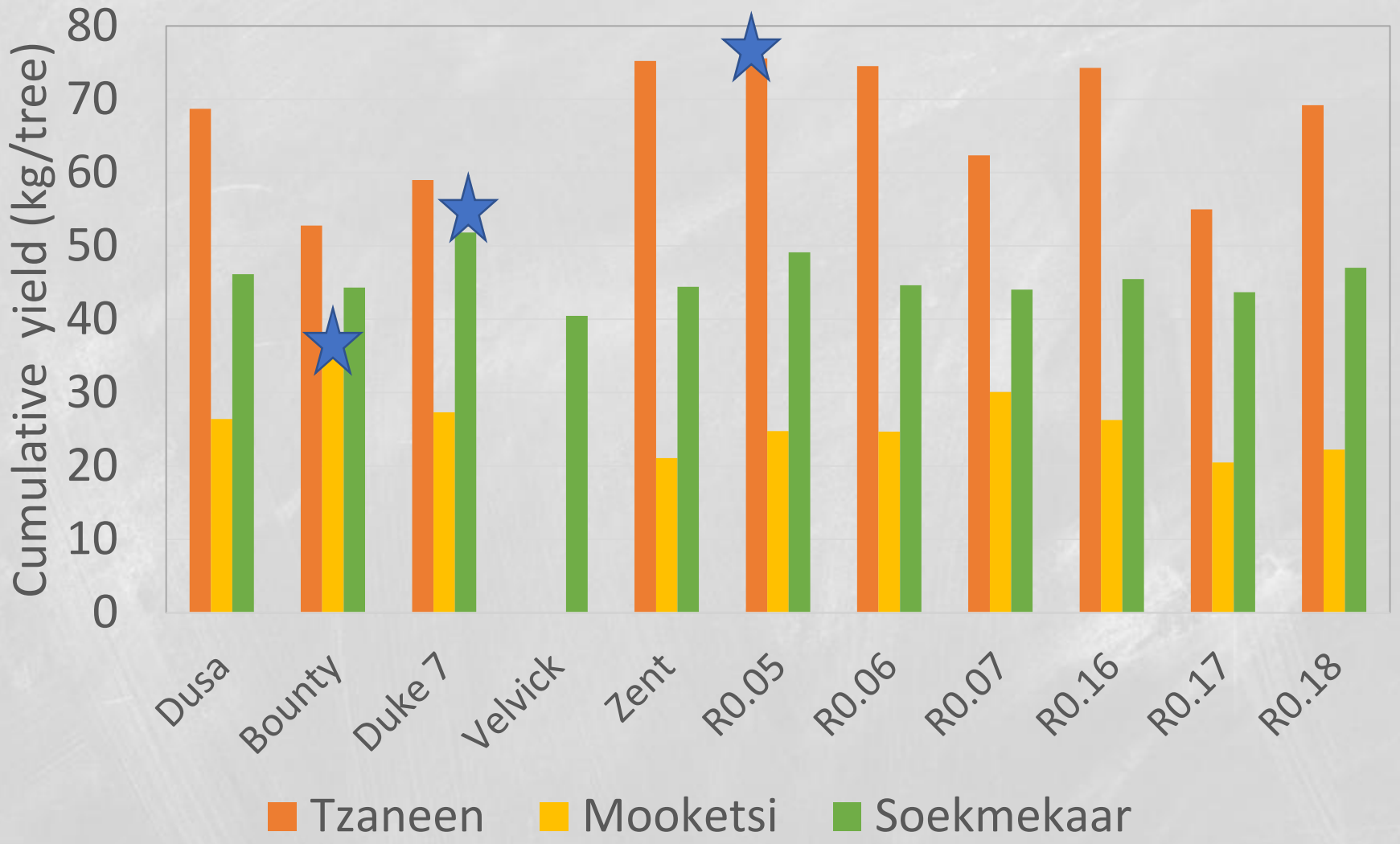
Yield – Mooketsi (Very hot, dry <500mm rain)



Yield: Soekmekaar (Warm, good rainfall)



Yield summary (2016-2018)



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Conclusion

- Field testing under different conditions (and management styles) is important for seeing how robust a rootstock is.
- Need to test over a few years to see real benefits.
- Not one rootstock for all conditions (or cultivar?)
- International testing (with partners) allows rootstock material to be subjected to different conditions
  - E.g. California – salinity; Spain - Rosellinia
- South Africa hopes to release two new rootstocks in the next 2 years.

Tree sources in SA

- Best clonal selections and trees come from accredited avocado nurseries (Avocado Nurseryman's Association - ANA)
- Growers have to wait about 5-6 years for trees
- Clonals are more expensive than seedlings (x2)
  - It's an investment and making the right choice is important for the long term success of your orchard

• Hass/Seedling	ZAR 85	(USD 6)
• Hass/Duke 7	ZAR 145	(USD 10)
• Hass/Dusa™	ZAR 165	(USD 12)

¡Gracias!