



# The A to Z of avocado cultivars

Therese Bruwer

WiTeam, Westfalia Fruit, South Africa

6 May 2022





## Who are we?

- Westfalia fruit is a multinational company
- Leading supplier of fresh and processed produce to international markets
- Offering a diverse range of quality fruit and related products via our vertically integrated supply chain
- As a frontrunner in the avocado industry, Westfalia grows, sources and ripens, packs, processes and markets accredited avocados across the globe and throughout the year
- A world leader in applied research dealing with subtropical crops and the WiTeam is the largest privately-funded subtropical research organization in the world.





## Introduction

- The avocado (*Persea americana* Mill) originated from central America and is classified into 3 horticultural races according to their putative centers of origin:
  - Mexican (*Persea americana* var. *drymifolia* Blake)
  - Guatemalan (*Persea americana* var. *guatemalensis* Williams)
  - West-Indian (*Persea americana* var. *americana* Mill)





## Significance of the different races



	Mexican	Guatemalan	West-Indian
Climate	Subtropical	Subtropical	Tropical
Cold tolerance	Most	Intermediate	Least
Anise scent	Present	Absent	Absent
Fruit size	Tiny - medium	Small - large	Medium – very large
Fruit shape	Elongated	Round	Variable
Skin colour	Purple	Black/green	Pale green/maroon
Skin thickness	Very thin	Thick	Medium
Flavour	Anise-like	Rich	Sweet, mild
Cold storage tolerance	More	More	Less



## Introduction (cont.)

---

- Ethnobotanical data and genetic marker studies suggests
  - The 3 races underwent separate domestication
  - Only came into contact after European contact in the 16'th century
- By the late 1800's
  - Avocado improvement gained momentum through interracial hybridization
  - California: Guatemalan & Mexican
  - Florida: Guatemalan & West-Indian (Cuban)
- A long period of open-pollination and interracial hybridization has resulted in our modern cultivars that are hybrid cultivars with combined traits of the 3 horticultural races





- Hundreds of cultivars have been described and are in existence





## Introduction (cont.)

---



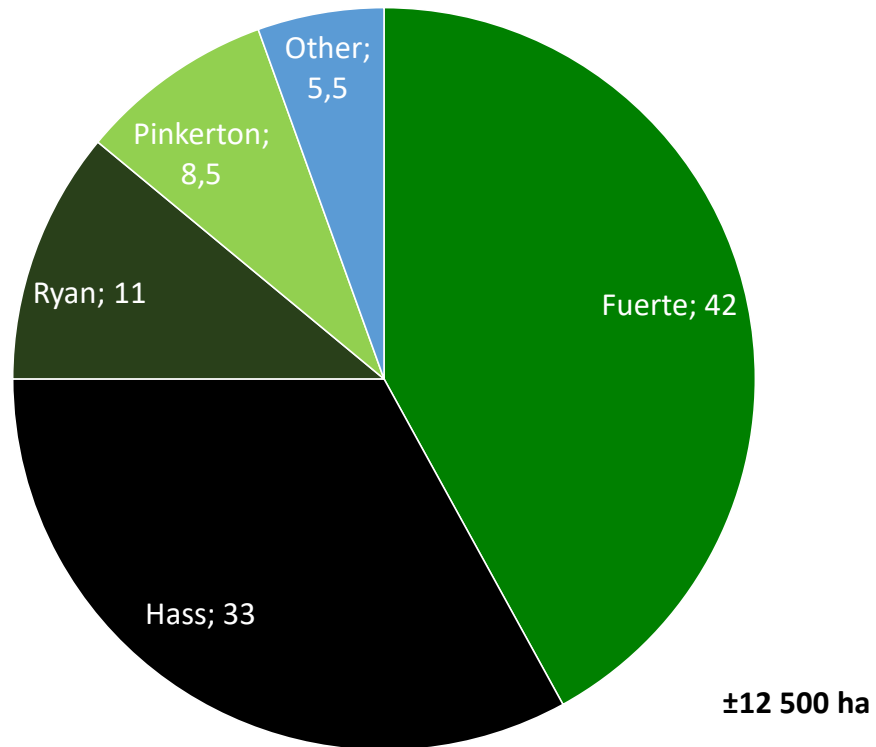
- However, the world avocado market at present is dominated by a single cultivar Hass
  - Chance seedling from Rudolph Hass, California,
  - Discovered in the early 1930's
  - Patented in 1935
  - Only became commercial in the 1970's in California
- Most of the world's major avocado producing countries are moving away from other cultivars



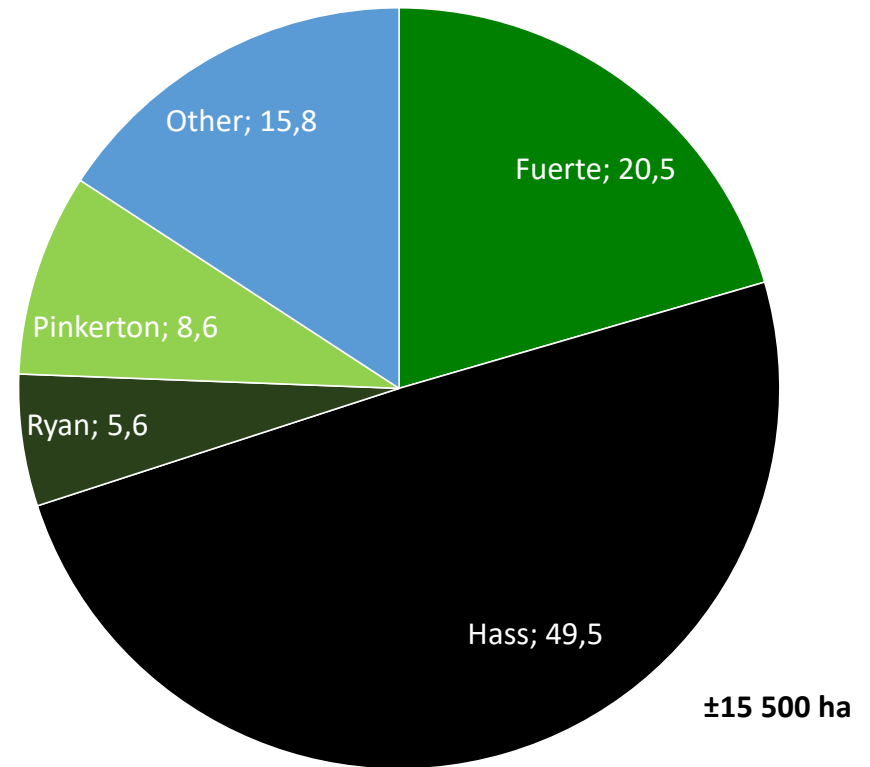
## South African avocado production per cultivar



**2002**



**2021**



Source: Subtrop tree census



## Introduction (cont.)

---

- A cultivar monoculture of Hass
- A monoculture of any crop carries the risk of pest and disease epidemics as a result of too little genetic diversity within the crop
- Thus, a range of properly tested cultivars to rely on would be to the advantage of the world avocado industry



## Introduction (cont.)

---



- Westfalia has been involved in the evaluation of avocado genetic material since the 1970's
- Aim:
  - Find superior cultivars when compared to the commercial cultivars
  - Extend the season for a year-round avocado supply
- How do we “find” new cultivars?
  - Westfalia search for, and collect promising (or interesting) genetic material from all over the avocado growing world
  - Material from abroad undergoes a quarantine period of approximately 1 year
  - The material is then established and tested under South African growing conditions in order to determine or confirm its commercial potential
- Since 2014 Westfalia also actively got involved with the breeding of new avocado cultivars



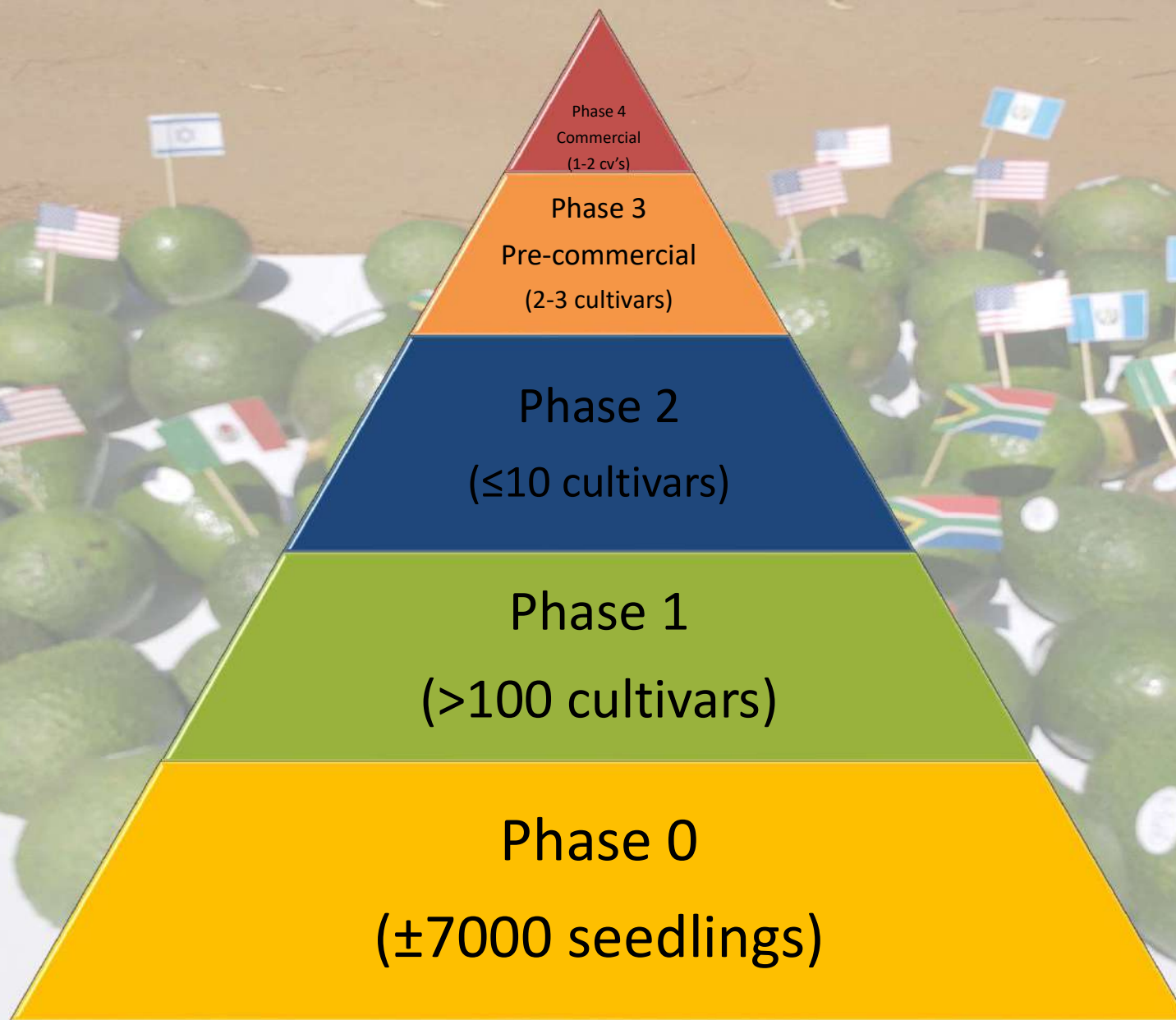
WiT cultivar breeding, selection and evaluation program





Years per phase

30  
29  
28  
27  
26  
25  
24  
23  
22  
21  
20  
19  
18  
17  
15  
14  
13  
12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0





## Phase 0: Seedling screening (7ha, 7000 seedling trees)

---





## Phase 0: Seedling screening

- Fruit is collected from known maternal parents
- The seeds are extracted from the fruit, germinated and planted in bags in the seedling tree nursery
- Seedling trees are planted in the evaluation orchard
- The trees are monitored continuously for tree characteristics, flowering and fruiting
- In-depth evaluation of fruit characteristics are done once fruit is available
  - External
    - General appearance
    - Fruit shape
    - Fruit size
    - Skin colour (unripe/ripe)
    - Blemishes
  - Internal
    - General appearance
    - Skin thickness
    - Seed size
    - Physiological disorders
    - Taste and texture of the flesh
- A selection is made based on the following criteria
  - Taste
  - Seed: flesh ratio
  - Skin thickness





## Phase 1: Cultivar evaluation (2.5ha, 2-3trees/cultivar)





Phase I:  $\geq 100$  cultivars





## Phase 1 cultivar evaluation

- In depth evaluation for 5-6 years
  - Season of maturity
  - Productivity
  - Fruit size
  - Fruit quality
  - Storability
  - Pest and disease tolerance
  - Tree characteristics
- Successful cultivars are moved to the larger scale Phase 2 evaluation.
- Unsuccessful cultivars are not discarded, but kept in order to preserve the genetic material for future use





## “Weird & Wonderful” – Niche markets



- Avozilla™
  - Launched in the UK in 2013
  - Tesco's
  - Huge social media coverage
  - Publicity good for the avocado industry in general



## Phase 2: Larger scale cultivar evaluation (1.5 ha, 24 trees/cv)







## Phase 2: Larger scale cultivar evaluation ( $\leq 10$ cv's)

- 24 trees/cultivar are established in a randomized block design
  - Commercial cultivar as comparison
- Evaluation for 5/6 years
  - All Phase I parameters
  - Multiple harvests: to determine earliest, optimum and latest harvest date
  - Sensory evaluations
  - Trial exports
  - Market and consumer acceptance







## Phase 3: Pre-commercial evaluation (2-3 cv's)

---

- Performance of the promising cultivars are checked in other production areas
  - Different growing conditions
- 0.5-1ha area of the new cultivar & commercial comparator cultivar is established
- Pre-commercial exports are done to confirm market acceptance



## Phase 4: Commercialization

---



- Commercial release of a cultivar is depended on
  - Successful completion of the first 3(4) phases of rigorous testing
  - Ownership of the cultivar
  - Extent and reach of the master license agreement
  - Potential value of the cultivar
- Plant protection (PBR's or Plant Patents) is put in place allowing commercialization in a sensible way



## Commercially released cultivars



- WiTeam cultivar evaluation program
  - Carmen<sup>®</sup>-Hass (Mendez #1)
  - Gem<sup>®</sup> (3-29-5)



## Concluding remarks

---



- In 1920 Wilson Popenoe (Agricultural explorer, USDA) wrote the following:
- *“In selecting varieties for commercial planting, it must be borne in mind:*
  1. *The tree must be **vigorous and hardy** enough to grow successfully in the **particular location** which the planter has in view.*
  2. *It must in time produce **sufficiently large crops of marketable fruit** to make its culture commercially profitable.*
  3. *The **fruit** itself must be given consideration from a commercial standpoint. **Attractiveness, flavor, shipping qualities, season** and other important characteristics should be considered in respect to the **market** it is proposed to supply.”*





# Grazie/Thank you!

---



For more information on Westfalia Fruit please visit:  
[www.westfaliafruit.com](http://www.westfaliafruit.com)

