



MALUMA CLONAL  
ROOTSTOCK  
RESEARCH  
Al de Villiers



7de  
jaarlikse  
Maluma  
dag 2017

90  
**allesbeste**  
*Boerdery. Kweekery. Padstal*  
90 PASSIEVOLLE JARE

 Maluma  
avo



# INTRODUCTION

- No factor of the avocado industry is more important than rootstocks, and there is no problem that we know less about or which requires a longer time to solve (Webber 1926).
- Brokaw (1987a) concluded that if variability among clonal trees exist it might be explained by differences induced in the nursery.

- The direct correlation between a good clonal rooting system and uniformity in any avocado orchard is a known fact.
- Therefore the importance of a proper and reliable clonal rooting technique in avocados that will guarantee a good clonal root system is a prerequisite (De Villiers & Ernst, 2007).

- According to De Villiers & Ernst (2007) a well-developed, evenly distributed and healthy clonal root system ensures maximum utilization of the tree's genetic potential.



- Clonal propagation of avocados is the only way to conserve and utilize certain tree characteristics like precocity and production (Hartman & Kester, 1975).



**Precocity**



**Production**

- The **two imperfections / defects of Hass namely fruit size and low production**, with no substantial improvement through the use of different rootstocks, emphasizes the **use of new generation scion cultivars in rootstock research**.
- As Maluma possesses certain horticultural and marketing attributes and since Maluma is well accepted by the market as a commercial cultivar, it in practice justifies to in favor of Maluma, **discontinue the using of Hass as the standard in future rootstock research**.
- Due to the Maluma cultivar's attributes and potential as a new generation scion cultivar, Allesbeste Nursery decided to **conduct all future rootstock research with Maluma as scion**.

7de  
jaarlikse  
Maluma  
dag 2017

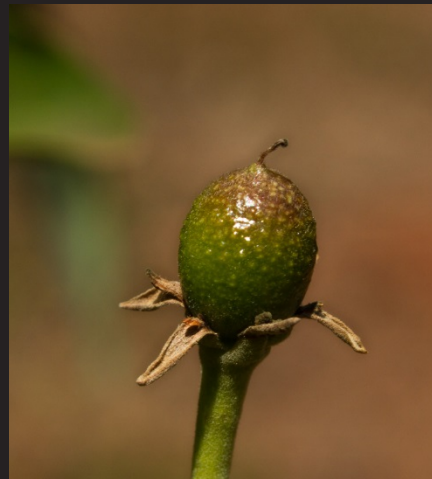
90  
allesbeste  
Boerdery, Kweekery, Padstal  
90 PASSIEVOLLE JARE

Maluma  
avo

- A new generation clonal rootstock not only has to be better than the current available clonal rootstocks but also have to support and enhance the genetically entrenched horticultural characteristics of the scion cultivar.
- The **shortcomings / DEFECTS** of a scion cannot be addressed or rectified with a rootstock IT RATHER SUPPORTS THE EXISTING CHARACTERISTICS OF THE SCION. (Example the small fruit or big stone problem)

# OBJECTIVE OF THIS STUDY

- The objective of this study is to compare the production potential of **different clonal rootstocks grafted with Maluma.**
- Determine the suitability of the clonal rootstocks **in different spacing and densities.**



7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
*Boerdery, Kweekery, Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

# Experiment 1

- A phase 1 high density planting (**808 trees/ha**) with Maluma grafted to Dusa, Bounty and Duke 7 clonal rootstocks .
- This block was **planted in October 2009** on the farm Allesbeste in the Tzaneen area.
- The production of each combination was **recorded for six years (2012-2017)** and evaluated.

## Experiment 2

- A phase two ultra–high density planting of **2.5m x 2.5m (1600 trees/ha)** with Maluma grafted to Dusa, Bounty and Duke 7 clonal rootstocks was planted in May 2012.
- The growth vigour and production of each combination was recorded for four years (2014-2017) and evaluated.
- This trial block was planted on the farm Avondshoek in the Tzaneen area and is a replant site, previously planted with Ryan on Duke 7 seedling rootstock trees.

## Eksperiment 3

- A high density planting of **5m x 2.5m (800 trees/ha)** with Maluma grafted to Bounty, Duke 7 and Dusa was planted in **December 2013**.
- This trial was planted on the Farm Humor in the Tzaneen area.
- This block was a replant, previously planted with Ryan on Duke 7 seedling rootstock trees.

7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
Boerdery. Kweekery. Padstal  
90 PASSIEVOLLE JARE

Maluma  
avo

## Experiment 4

- An extensive trail where Maluma grafted to 28 different clonal rootstocks was planted in **December 2015**.
- This trail was planted at a density of **1250 trees/ha (4m x 2m)** and include **Dusa, Bounty, Duke 7, 10 of Allesbeste nursery's own selections, 6 x SAAGA/Westfalia selections as well as some promising international rootstocks and selections.**
- Trail was planted on the farm Allesbeste in the Tzaneen area.



January 2016



January 2017

7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
*Boerdery. Kweekery. Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

# RESULTS

## Experiment 1.

Maluma grafted to Dusa, Bounty and Duke 7 and planted at 808 trees/ha.



October 2009



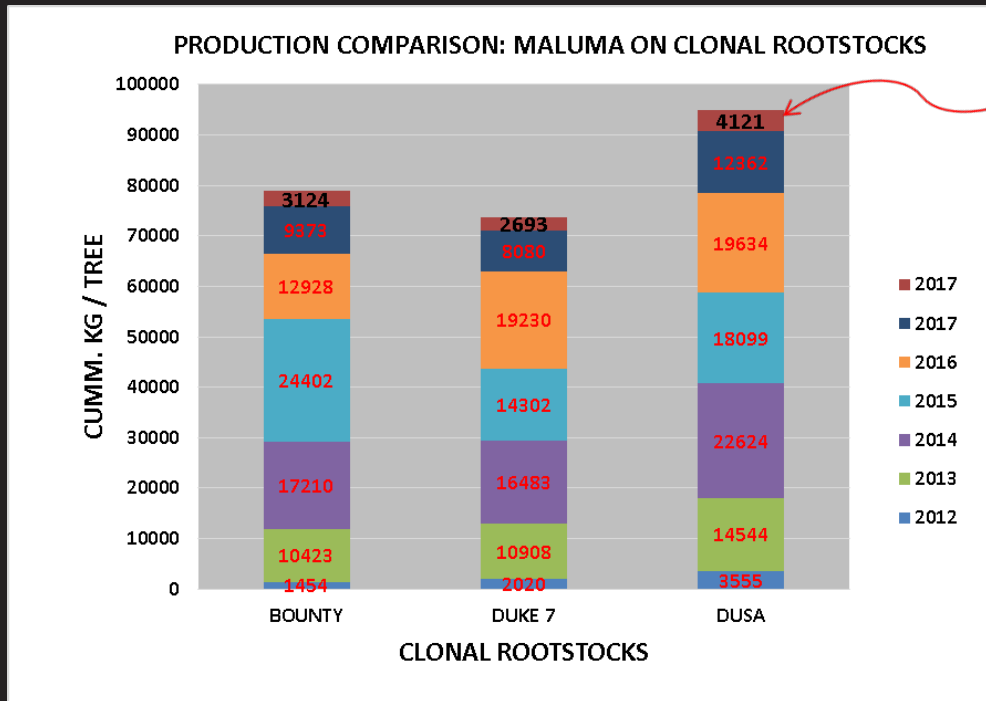
February 2017

7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
*Boerdery. Kweekery. Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

# Experiment 1.



**Loss due to hail & wind**

## Cumm. Production (kg/ha)

- Dusa = 94939 kg
- Bounty = 78914 kg
- Duke 7 = 73716 kg

## Avg production (kg/ha)

- Dusa = 15823 kg/ha
- Bounty = 13152 kg/ha
- Duke 7 = 12286 kg/ha

**Figure 1.** Production of Maluma grafted to three different clonal rootstocks(808 trees/ha).

- Maluma grafted to clonal Dusa, Bounty and Duke 7, the highest cumulative yield was recorded with Dusa.
- Hail and wind damage in February 2017

## Experiment 2.

An ultra – high density planting of 2.5m x 2.5m (1600 trees/ha)with Maluma grafted to Dusa, Bounty and Duke 7. Trail block was planted in May 2012.



Dusa



Bounty



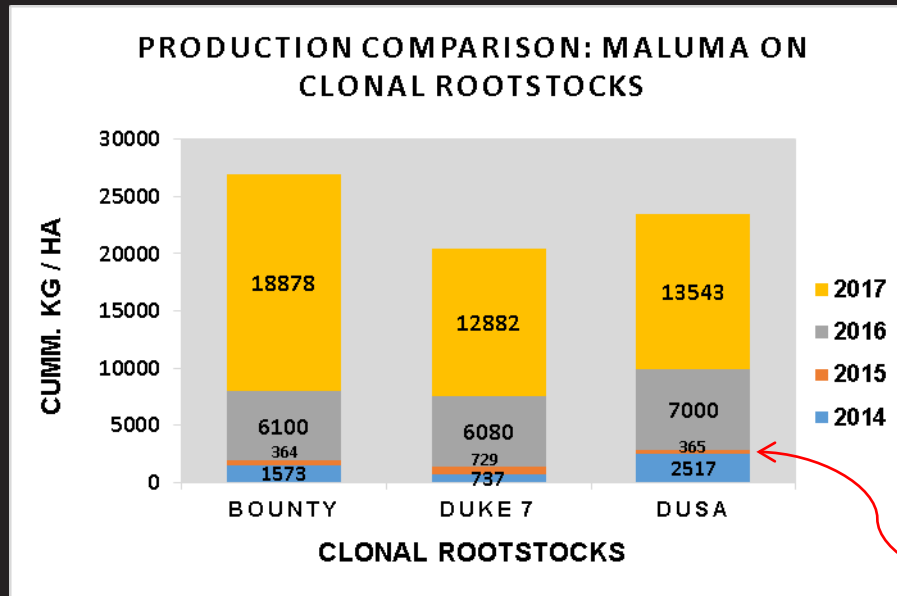
Duke 7

7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
*Boerdery. Kweekery. Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

## Experiment 2.



### Cumm. Production (kg/ha)

- Bounty = 26915 kg
- Dusa = 23425 kg
- Duke 7 = 20428 kg

### Avg production (kg/ha)

- Bounty = 6729 kg/ha
- Dusa = 5856 kg/ha
- Duke 7 = 5107 kg/ha

**Heavy hailstorm**

Figure 2. Production of Maluma grafted to three different clonal rootstocks (1600 trees/ha).

Bounty outperformed Dusa and Duke 7 clonal rootstocks.

## Experiment 2.

			EFFICIENT YIELD	EFFICIENT YIELD FULLY GROWN (9,82 M <sup>3</sup> )	EFFICIENT YIELD KG / HA FULLY GROWN
	YIELD KG/TREE	PROJECTED T / HA	KG / M <sup>3</sup>	PROJECTED/ TREE KG / 9,82 M <sup>3</sup>	9,82 M <sup>3</sup> X 1600 PROJECTED KG / HA
BOUNTY	11.8	18878	1.2	11.8	18880
DUSA	8.5	13543	0.9	8.8	14080
DUKE 7	8.1	12905	0.8	7.9	12640

Table 1. Efficient yield of Maluma grafted to three different rootstocks (1600 trees/ha).

### Experiment 3.

- This block was a replant and field observations shown that Bounty established the best of the three rootstocks.



BOUNTY

DUKE 7

# Experiment 3.



7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
Boerdery, Kweekery, Padstal  
90 PASSIEVOLLE JARE

Maluma  
avo



# Experiment 3.



	YIELD (KG/TREE)	EFFICIENT YIELD KG / M <sup>3</sup>	EFFICIENT YIELD FULL GROWN(KG /19.6M <sup>3</sup> )	EFFICIENT YIELD KG/HA FULL GROWN 19.6 M <sup>3</sup> X 800 (PROJECTED KG/HA)
BOUNTY	14.3	1.9	37.2	29760
DUKE 7	2.6	1.1	20.9	16720

Table 2. Production of Maluma grafted to two different rootstocks (800 trees/ha).

Dusa results not included as trees were planted 7 months later..



- Measured every tree: stem diameter, tree height, tree diameter and fruit were counted.
- SAAGA / Westfalia rootstocks (R0.05, R0.06, R0.07, R0.16, R0.17, R0.18) Toro Canyon and 1 x international selection was cloned and planted as ungrafted clonal rootstocks due to the late receiving of the plant material.
- The Maluma scion grafting on the above rootstocks was done later in the trailblock and due to the time difference, including these tree measurements will be unfair at this stage. No fruit were set on these rootstocks as well.



7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
Boerdery. Kweekery. Padstal  
90 PASSIEVOLLE JARE

Maluma  
avo

# Experiment 4.

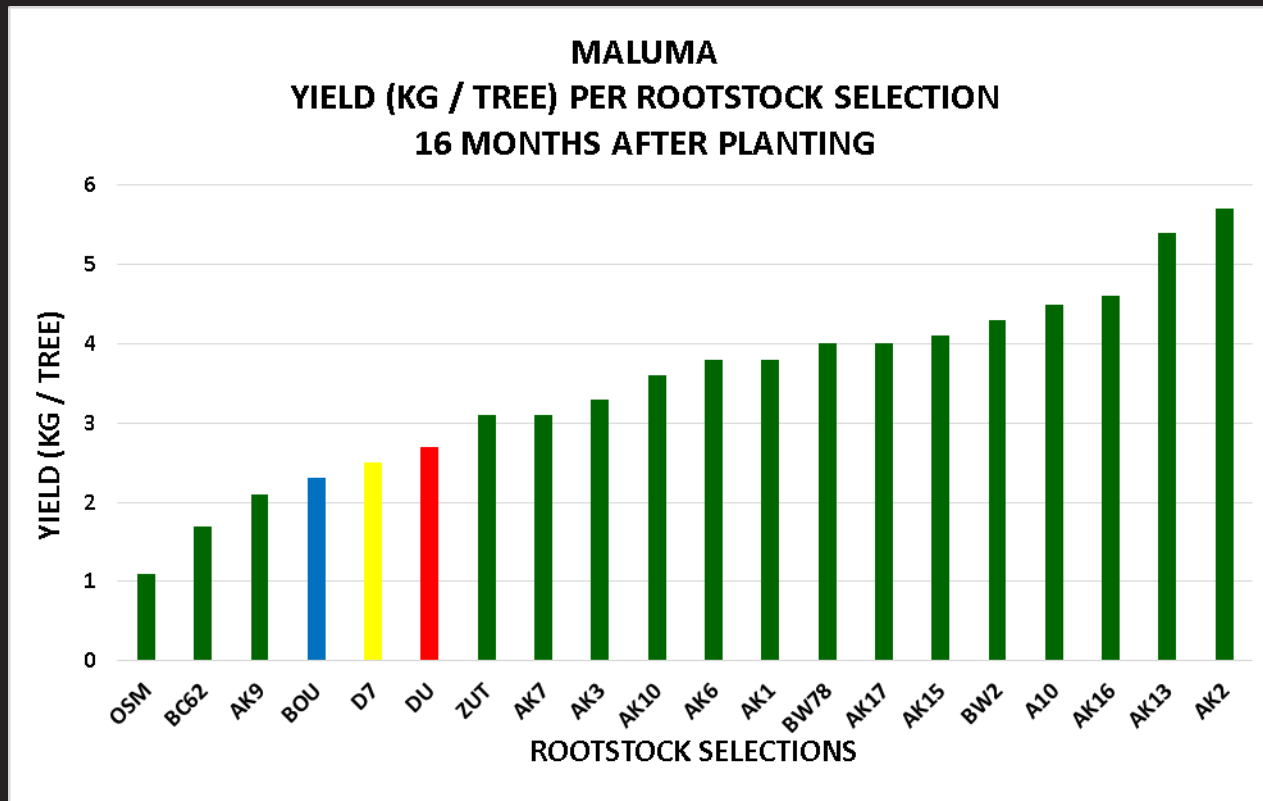


Figure 3. Production of Maluma grafted to different clonal rootstock selections(1250 trees/ha).

# Experiment 4.

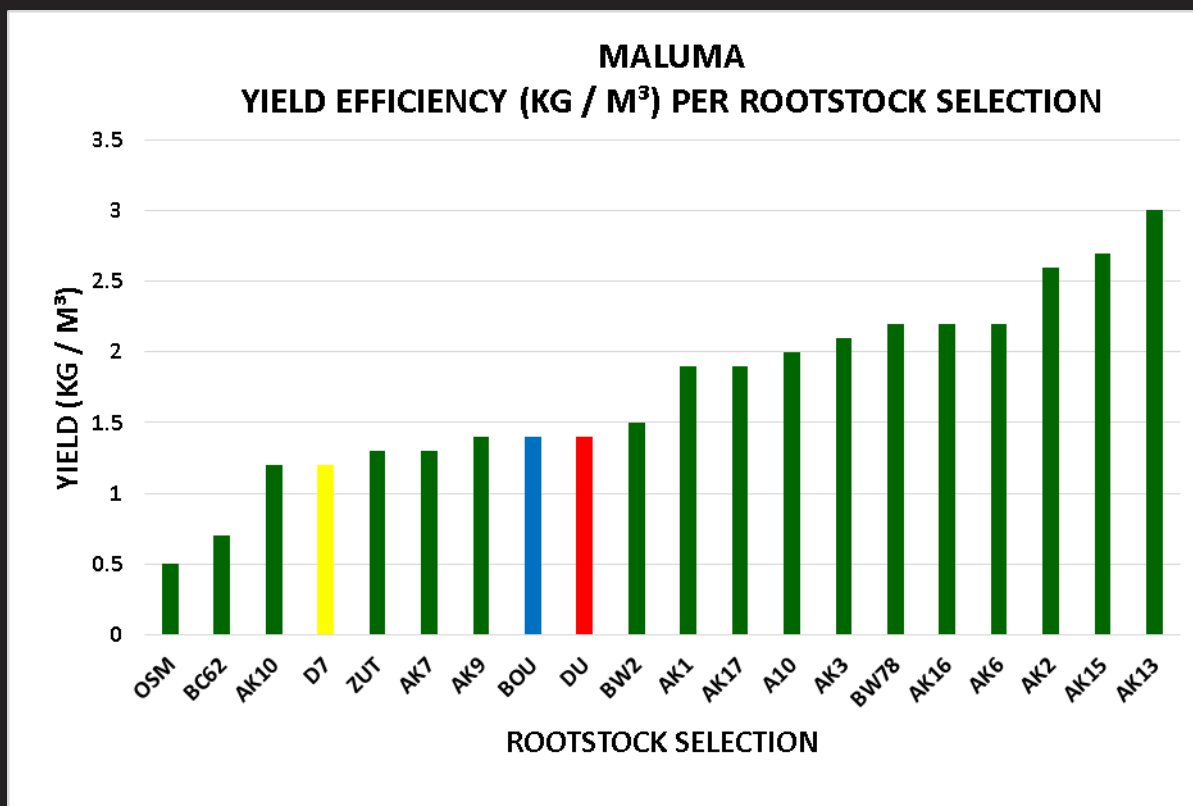


Figure 4. Production of Maluma grafted to different clonal rootstock selections(1250 trees/ha).

# Experiment 4.

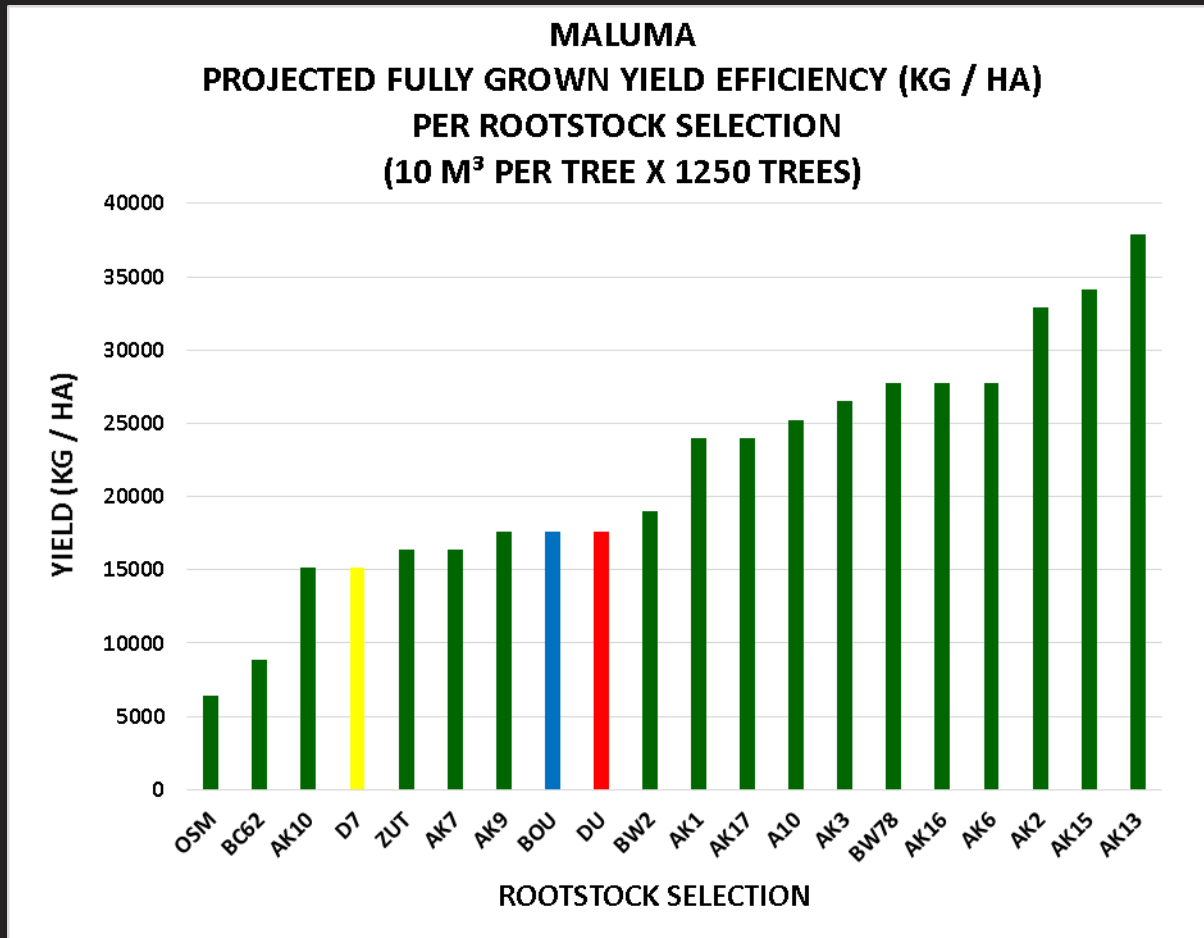


Figure 5. Production of Maluma grafted to different clonal rootstock selections(1250 trees/ha).

# Hail – February 2017



7de  
jaarlikse  
Maluma  
dag 2017

allesbeste  
*Boerdery, Kweekery, Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

# DISCUSSION AND CONCLUSION.

- There is enough evidence that tree uniformity observed in the field not only directly relates to the rooting technique used in the nursery but also to the specific rootstock selection.
- Improving the clonal root system in the nursery will undoubtedly have a positive effect on the tree performance in the field.
- This study also confirms that the production potential of the scion will be optimized by the correct clonal rootstock-scion combination.

- A superior clonal rooting system, as reported by De Villiers & Ernst (2007), not only resulted in uniformity in the orchard but ensures maximum utilization of the tree's genetic potential.



7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
*Boerdery. Kweekery. Padstal*  
90 PASSIEVOLLE JARE

Maluma  
avo

- It is evident that the avocado industry **will in future rely more on clonal rootstocks**, not only because of its higher production and resistance against Phytophthora root rot but more specifically due to its advantage in replant situations.



**MALUMA**

7de  
jaarlikse  
Maluma  
dag 2017

90  
**allesbeste**  
*Boedery, Kweekery, Padstal*  
90 PASSIEVOLLE JARE

 Maluma  
avo

- Of the third generation rootstocks **Dusa grafted with Maluma is still the best combination**, especially on virgin soils.
- The results indicate that **Bounty rootstock grafted to Maluma** to be the best performing rootstock for marginal soils and especially in replant sites.
- Three (3) of Allesbeste's own rootstock selections nl. **AK2, AK13 and AK15 looks very promising and** came out on top with **more than double** the production (Kg/Ha) compared to Dusa and Bounty when projected to fully grown yield efficiency. This is a clear indication that these rootstocks have dwarfing characteristics.

- In the on-going search for a superior high productive clonal rootstock, a new trail is already in the planning where Maluma will be grafted to the most promising of the 28 clonal rootstocks that was planted in **December 2015**.
- This trail will be planted at a density of **1250 trees/ha (4m x 2m)** and will once again include **promising international rootstocks and selections**.

“The best way to predict the future is to create it”  
- Abraham Lincoln -



MICRO - CLONE



- MALUMA



MALUMA

THANK YOU

7de  
jaarlikse  
Maluma  
dag 2017

90  
allesbeste  
Boerdery, Kweekery, Padstal  
90 PASSIEVOLLE JARE

Maluma  
avo