



SESSION FOUR

Session Four

New germplasm and global breeding programmes

New Zealand and Australia Avocado
Grower's Conference'05
20-22 September 2005
Tauranga, New Zealand



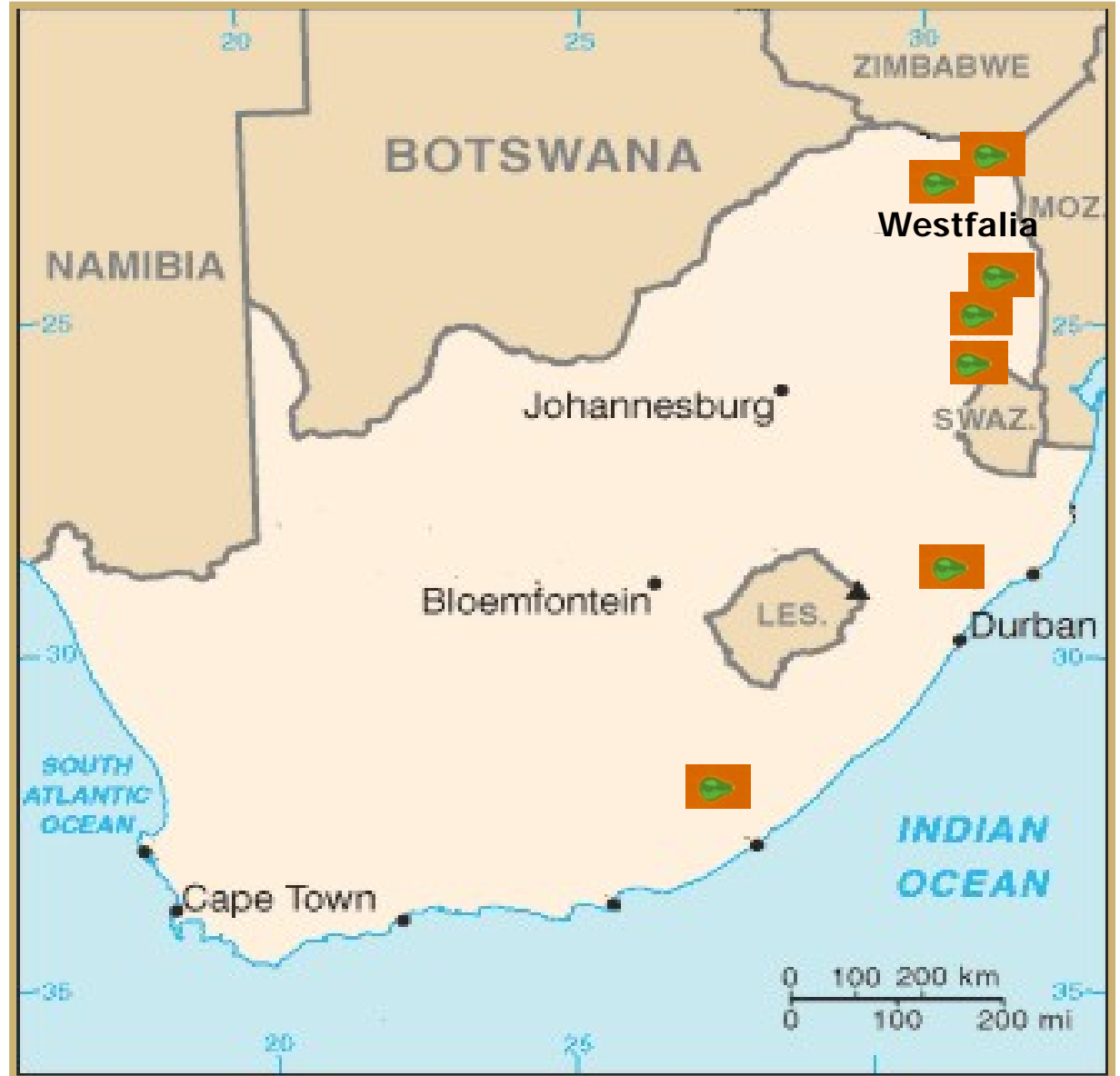
*AVOCADO BREEDING
AND SELECTION IN
SOUTH AFRICA*

STEFAN KÖHNE

Westfalia Technological Services
(WTS)

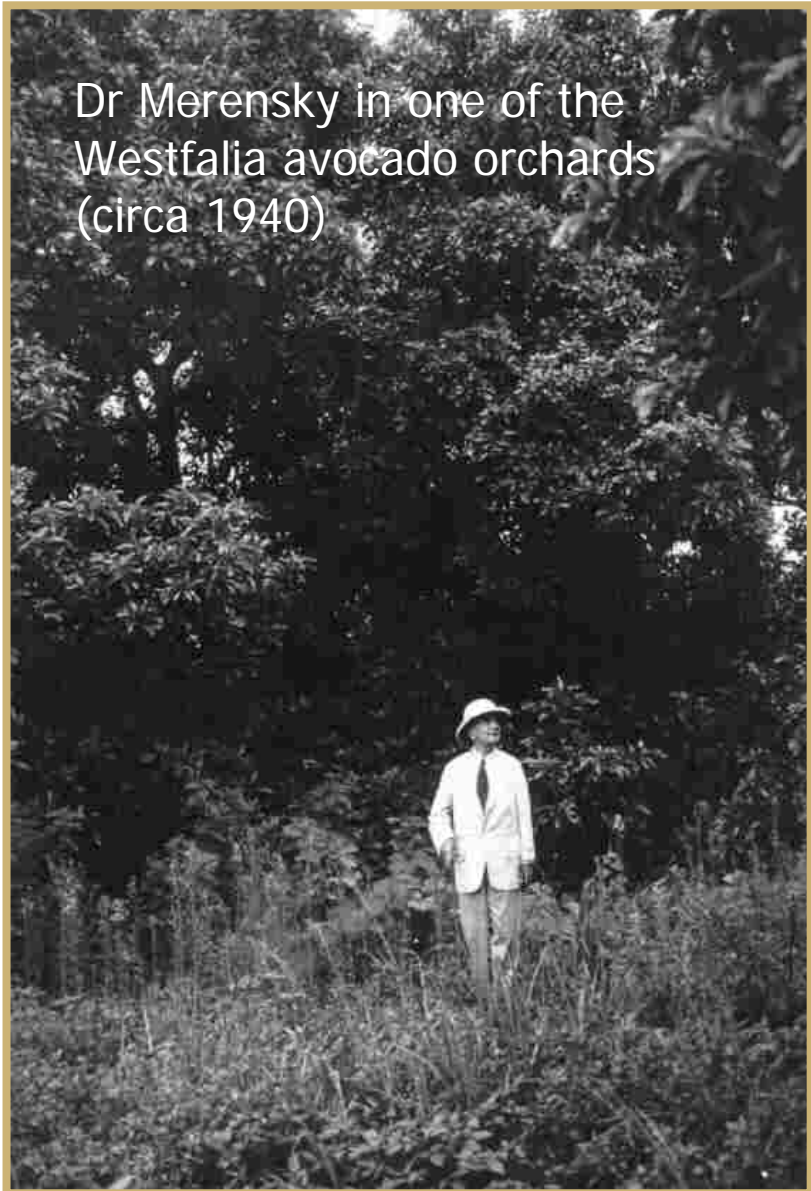


✦ First avocado seeds imported into South Africa just over 100 years ago





- ✪ First importation of budwood of specific cultivars from USA in the mid 1920's by Dr Hans Merensky



Dr Merensky in one of the Westfalia avocado orchards (circa 1940)

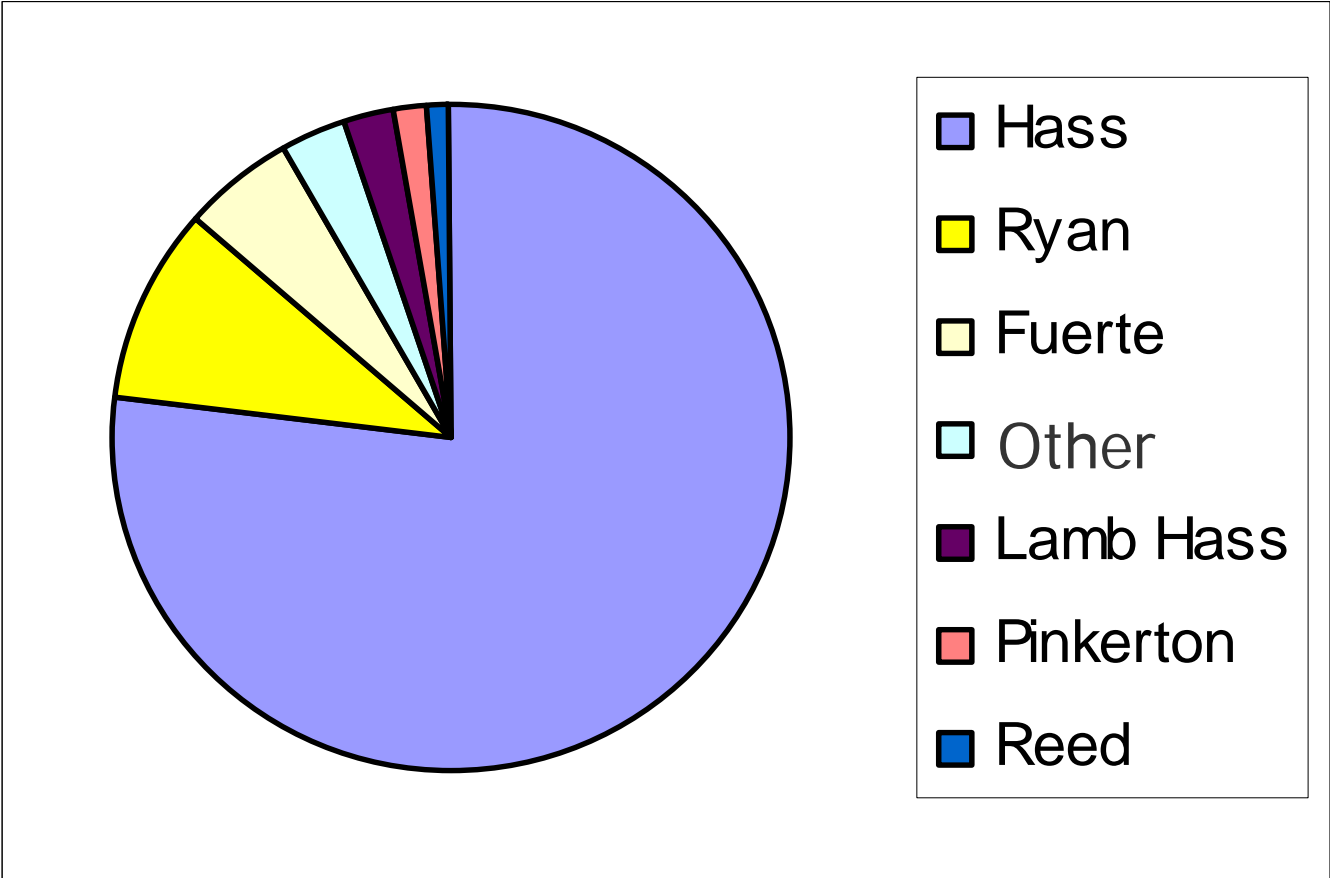


Cultivars and yield of avocados grown at Westfalia Estate 1967

Cultivar	Origin	Yield (tons) 1967
Anaheim	California	1.0
Dickey 'A'	California	-
Edranol	California	2.5
Hass	California	5.0
Ryan	California	5.0
Collinson	Florida	5.0
Lula	Florida	2.5
Itzamna	Guatemala	15.0
Linda	Guatemala	0.5
Fuerte	Mexico	70.0
Hamaboya	South Africa	1.0
Lydia	South Africa	1.0
Makaya	South Africa	1.0
Westfalia 1-3	South Africa	1.5



Cultivars: Trend towards Hass



South African avocado tree sales for the 2003 – 2004 season
(Source: Avocado Nursery Association of South Africa)



Avocado cultivar breeding

- ✦ Presently, industry focus on Hass (-types)
- ✦ Impossible to predict future market preferences (e.g. size, shape, colour)
- ✦ No early screening mechanism for seedlings (long juvenile phase, high level of heterozygosity, unpredictable hybrids)
- ✦ Long term, expensive





Avocado cultivar evaluation at WTS

Parameters monitored

- Time of maturation
- Yield
- Fruit size distribution
- Taste
- Fruit quality





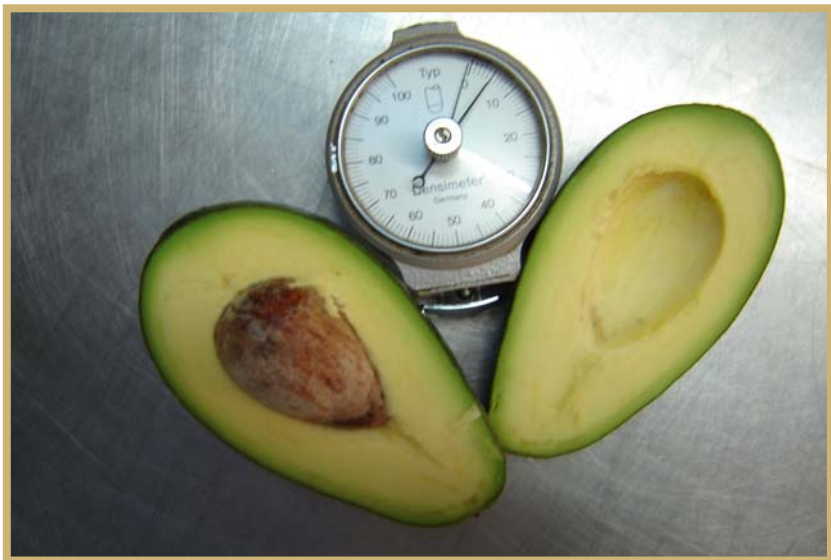
Evaluation of new Hass-like avocado cultivars at WTS

Cultivar	Yield (t/ha) ¹					Count Peak ²
	1999	2000	2001	2002	Cumulative	
Harvest	29.2	37.0	52.4	19.3	137.9	12-16
Gem	11.4	28.2	23.8	27.0	90.4	12-14
Hass	2.8	20.0	29.7	35.4	87.9	16

¹ extrapolated to 200 trees/ha

² based on a 4kg carton

S Kremer-Köhne & M L Mokgalabone (2003)





Avocado rootstocks



- ❁ The devastation caused by P.c. in avocado orchards in many countries resulted in research focusing on finding resistant or tolerant rootstocks



Avocado rootstock breeding at WTS

- ✿ Clear aim: tolerance to P.c. root rot and high yield
- ✿ Advantage: Early screening mechanism for P.c.
- ✿ Long term project with long term benefit
- ✿ Expensive, however less land required than for scion cultivar screening



Avocado rootstock breeding & screening at WTS



Breeding Block



Screening of seedlings in
P.c. infested substrate



Results after 6 weeks of P.c. exposure



Healthy seedling selections cloned



Rootstock evaluation at WTS

- ✿ Over 30 clonal rootstock selections evaluated
- ✿ Origin of rootstocks:
 - imported plant material
 - SA rootstocks of survivor & super trees
 - selections from WTS Breeding & Selection Program
- ✿ 25% of evaluated rootstocks originate from Westfalia

WTS rootstock evaluation orchard
(high P.c. pressure, no treatment)



Block 1

Block 2

Block 3



Rootstock field evaluation



WTS rootstock evaluation block 2

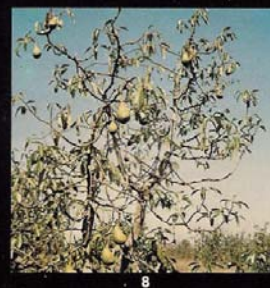
- ✦ 24 to 30 trees / rootstock planted in randomised block design
- ✦ All trees grafted to Hass
- ✦ Initially Duke 7 used as control, now Dusa
- ✦ Evaluated for minimum of 6 years (yield, tree condition)
- ✦ Blocks established in 1996, 1998, 2000, 2003



Stages of root rot decline according to 0 – 10 scale

Stadia van agteruitgang
as gevolg van wortelvrot
volgens die 0-10 skaal

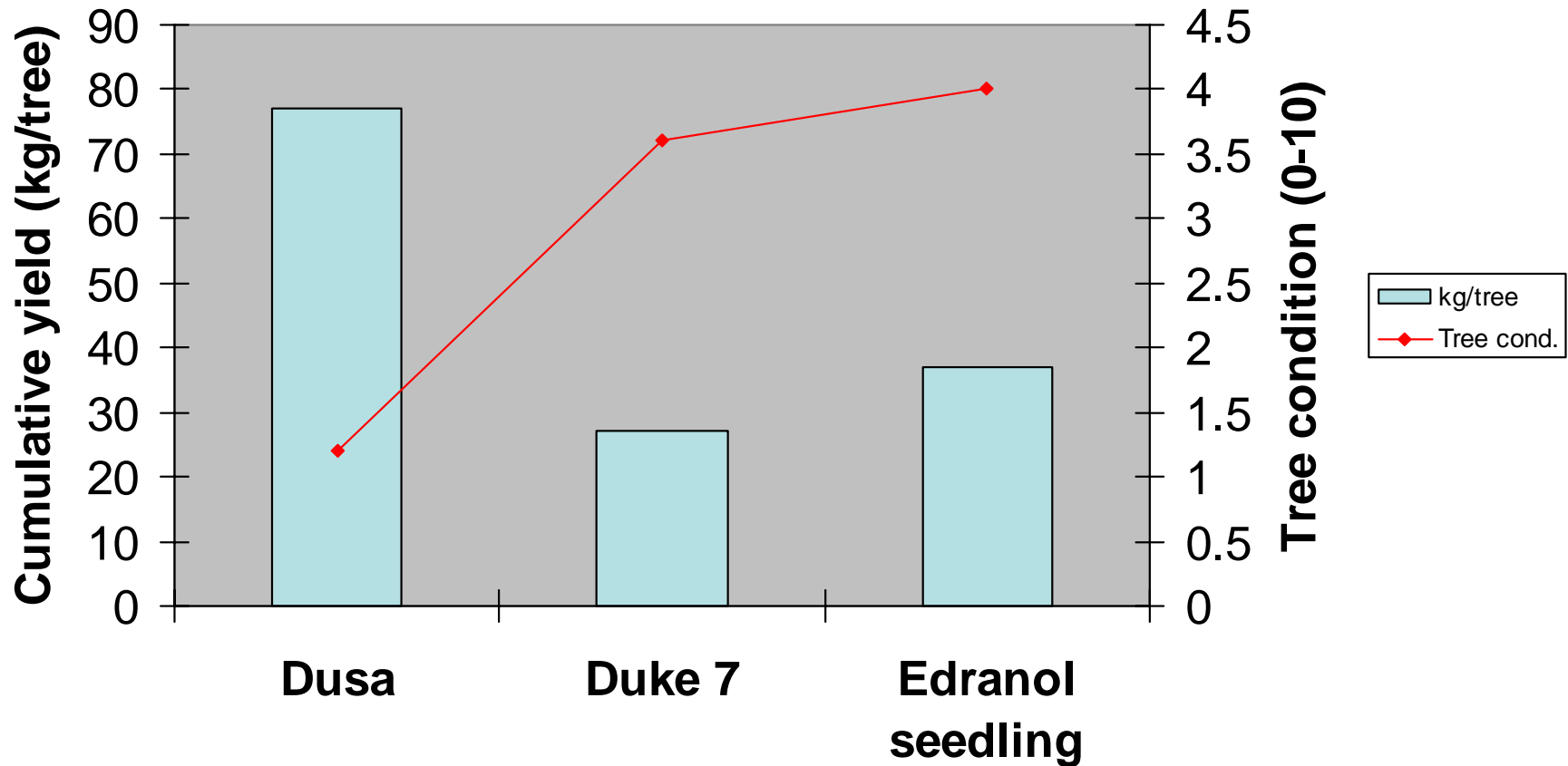
Stages of root rot
decline according to
the 0-10 scale.





WTS Block 2: planted 1998

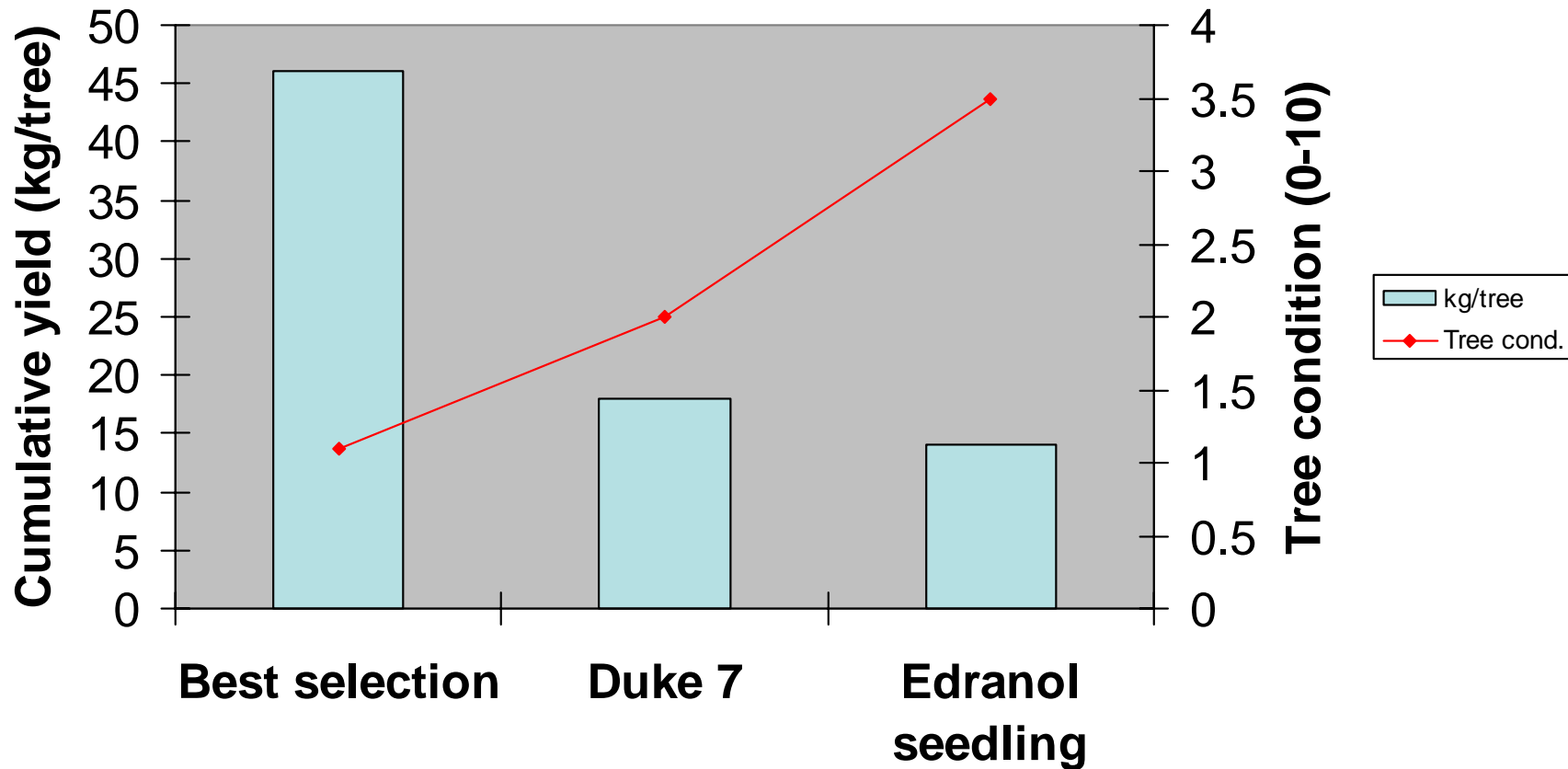
Tree condition & Hass yields (cum 6 years)





WTS Block 3: planted 2000

Tree condition & Hass yields (cum 4 years)



Other observations

- ✦ Propagation
- ✦ Compatibility with Hass
- ✦ Susceptibility to diseases, e.g. stem canker caused by *Phytophthora sp.*



Commercial evaluation of rootstocks at Westfalia Estate



Data trees:



Hass on Dusa



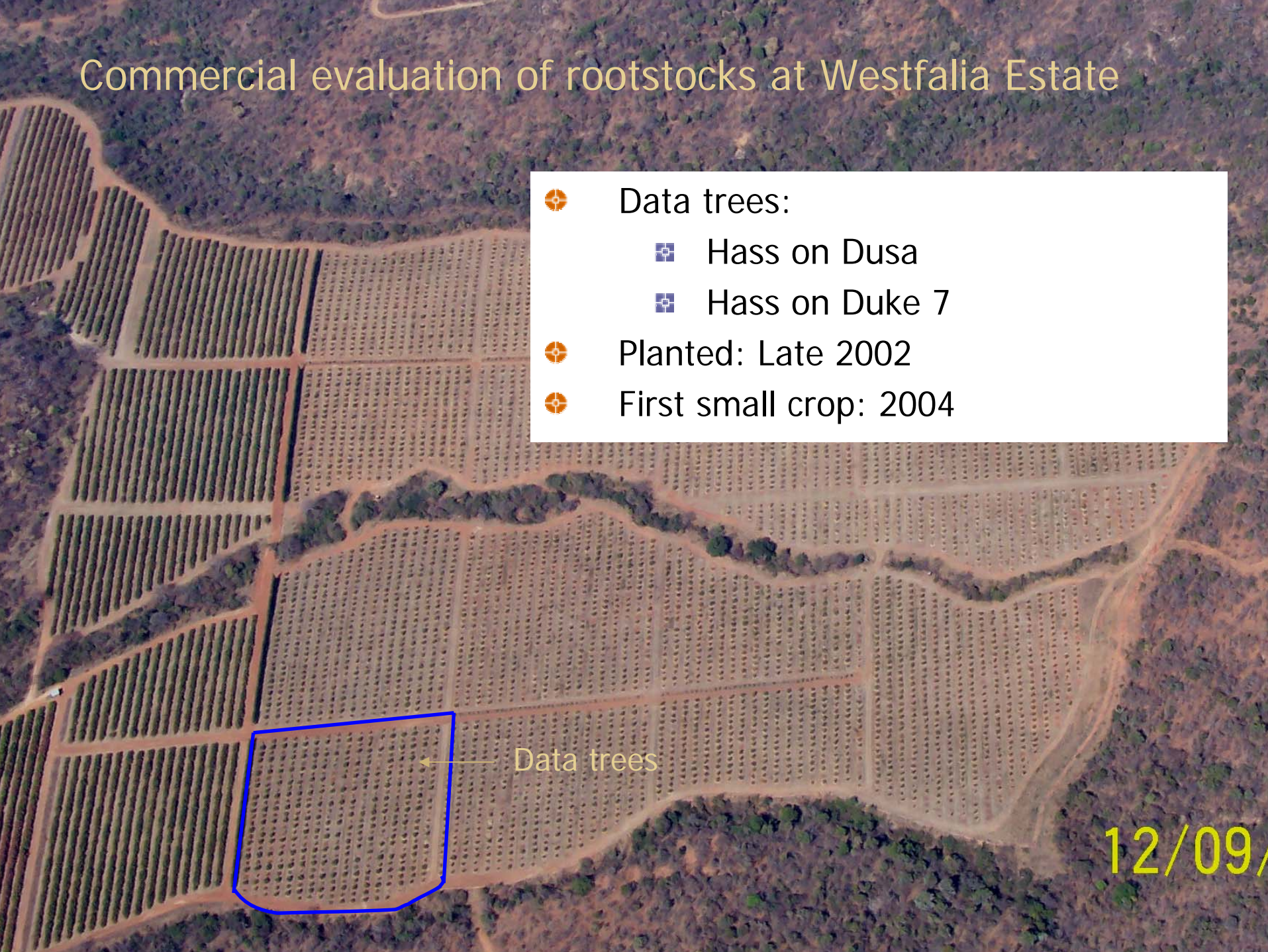
Hass on Duke 7



Planted: Late 2002



First small crop: 2004

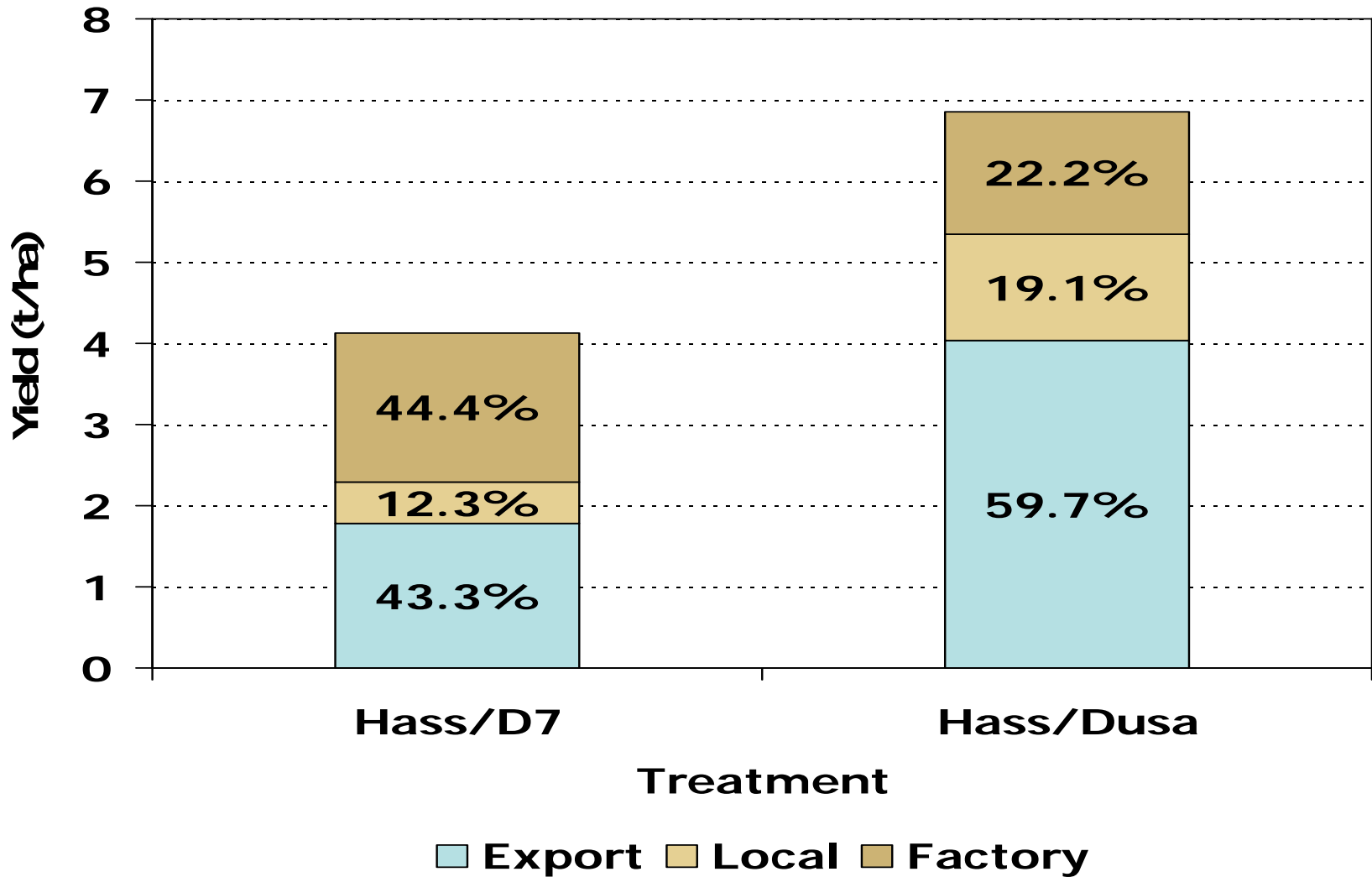


Data trees

12/09/



Commercial rootstock evaluation: Yield 2005



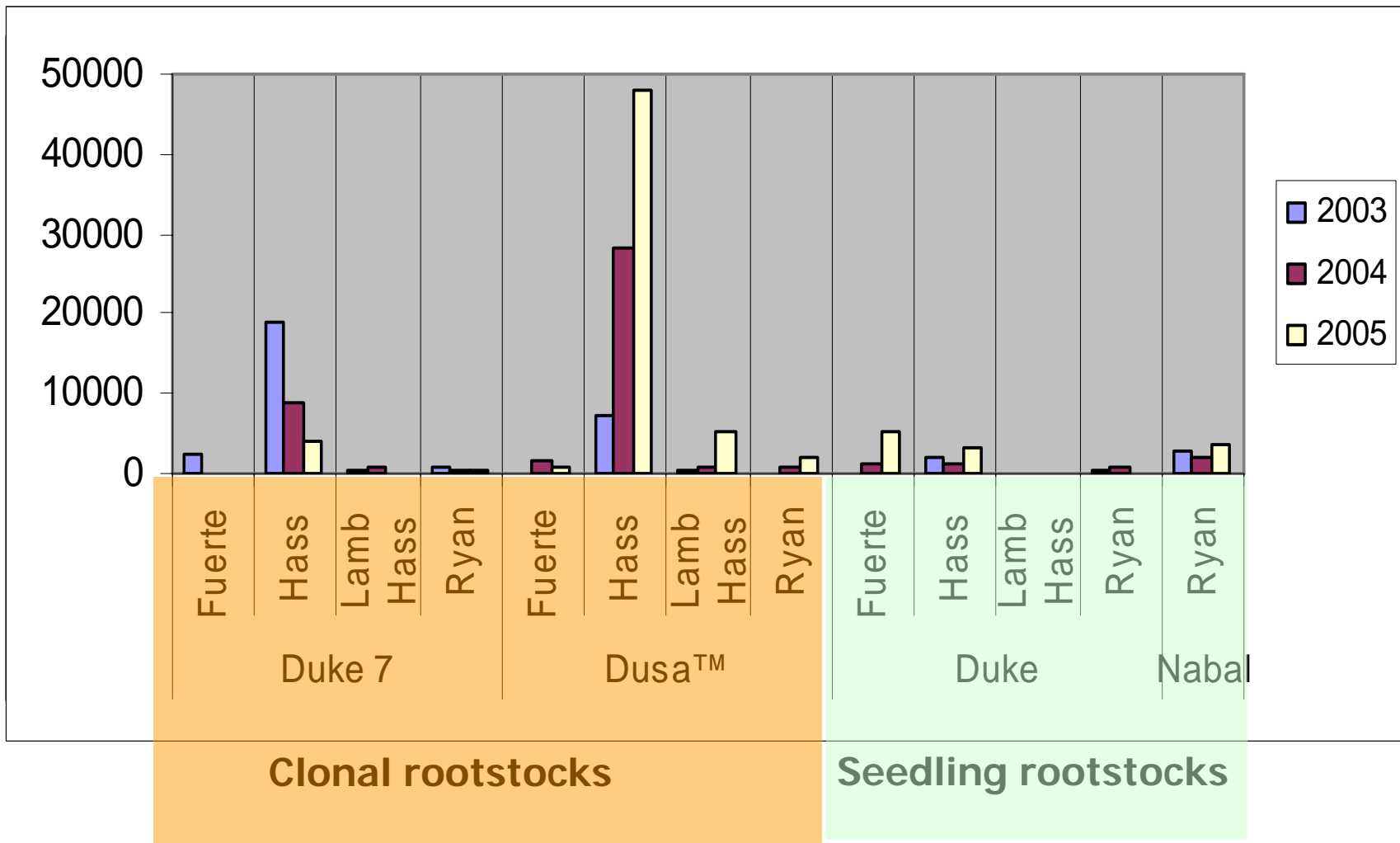


New plantings in South Africa: Hass on Dusa





Avocado tree sales of Westfalia Nursery





California

- ✿ Dusa rootstock patented in USA after extensive field trials conducted by Prof. John Menge
- ✿ Released to Californian avocado growers in 2004
- ✿ Extensive re-plantings of Hass on Dusa



Re-planting site in California : Hass on Dusa





Australia & New Zealand

- ✿ Australia: initial plantings on Dusa undertaken 2004, larger scale plantings 2005.
- ✿ New Zealand: Dusa presently in quarantine, release pending to NZAIC





Conclusions

- ✿ We trust that the superior results achieved with Dusa in South Africa and California will be repeated in Australia and New Zealand.
- ✿ Not only have we, through selection and thorough testing, released a proven superior rootstock, Dusa, but we are striving to assist the avocado industry with even better alternatives.
- ✿ Presently WTS has 15 new clonal rootstocks under field evaluation at Westfalia Estate.
- ✿ We look forward to sharing our exciting breakthroughs with you in the future.



Acknowledgements



Joe
Darvas



Robbie
Maddison



Jan Toerien



Anita Willis



Lawrence
Mukhomo



Sylvie
Kremer-
Köhne

