

REPORT: Visit to Italy, Belgium &
The Netherlands



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1. **Introduction**

- Research in the Crop Production programme at HORTGRO Science is aimed at achieving and addressing risks to the “Orchard of the Future”.
- Access to high quality plant material has been identified as one of the major requirements to achieve the “Orchard of the Future”.
- The findings of recent research and also observations local and abroad gave rise to the perception that room for improvement exists in terms of plant material quality available to South African fruit growers.
- The ISHS Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems is held every 4 years – the 2012 symposium was held in Stellenbosch – and is the primary scientific event where orchard system research is discussed.

2. **Objectives of the visit:**

The objectives of the visit were the following:

- To learn what’s new in the fields of orchard design, rootstock research and plant-environment interaction at the Orchard Systems symposium in Bologna.
- To ascertain new developments relating to tissue culture propagation of pome and stone fruit.
- To apprise of EU best practice with regards to plant material management and nursery tree practices.
- To investigate best practice with regards to commercial apple and pear breeding.
- Assess the state of applied research in Belgium and The Netherlands.
- To build relationships with researchers, technical experts and industry members in the EU.

3. XI ISHS Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems

Extracted from **Chronica Horticulturae 2016, Volume 56, Number 4, pp. 39-40.**

Event	XI International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems Section Pome and Stone Fruits #ishs_sefr
Date	28 August to 2 September, 2016
Organiser	Prof. Luca Corelli Grappadelli, University of Bologna, Italy
Participating ISHS workgroups	• Orchard and Plantation Systems • Rootstock Breeding and Evaluation • Environmental Physiology and Developmental Biology ISHS Working Groups
Delegates & RSA participants	• 130 delegates (10% South Africans) • Hugh Campbell, Karen Theron, Xolani Siboz, Wiehann Steyn, Ferdie Ungerer, Graeme Krige, Pierre du Plooy, Keith Bradley, Frederik Voight, Adam Mouton, Anton Muller, Willie Kotze, Brian Makedredza (Phd student)
Sessions	• Training and architecture • Light management and pruning • Rootstocks (the highest number of contributions) • Environmental physiology • Tree productivity • Sink/ source relations • Fruit quality • Flowering, Fruit Set and Plant Growth Regulators ○ M Whiting reported on “precision pollination” involving pollen collection and application in water as spray onto the tree. Work was done on cherries in Washington State. • Water relations and soil management
Main research findings/ focus areas	• Development of novel planting systems to double production. Stuart Tustin’s “planar cordon”. ○ Explore future orchard planting system: Maximum light interception / row spacing 1,5m / 1667 – 2222 trees per ha / 2 dimensional – canopy 40 -50 cm wide / 10 vertical fruiting stems 30 cm apart / minimum pruning / spur extinction / have 3 years data: year 2 – 27t/ha, Year 3 – 34 to 73 t/ha. • Automation of pruning. • New rootstocks and evaluation results. • Possible link between carbohydrate reserves and dormancy – input on growth and productivity in warming environment.
Field visits	• Pome – bi-baum, orchard protection, new cultivars • Stone – Slender Fusetto system
Achievement	• Xolani Siboz presented results on SA apple rootstocks. Unpacked the concern of a senior international researcher on rootstocks relating to “bunk data” with regards to yield efficiency on high density orchards.

	Brian Makedredza was the recipient of the award for the best poster presentation by a student at the symposium. His poster looked at canopy factors influencing sunburn and fruit quality of Japanese plums and formed part of a larger project funded by SASPA.
General impressions	- There were relatively few young researchers presenting at the symposium – there has been erosion of capacity in this field. - The work presented at this symposium, albeit of high importance to fruit producers, generally does represent the forefront of innovation in physiology of horticultural crops.



Some of the South Africans attending the XI International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems in Bologna, Italy.

4. Better3Fruit

Company	Better3Fruit - http://www.better3fruit.com/
Host	Nicolas Stevens, CEO
Origin	Founded in 2000 as a private spinoff breeding company from the breeding programme of Katolieke Universiteit Leuven & Johan Nicolai. The KU Leuven apple programme initiated in 1988 with pears following in 2005.
Composition	KU Leuven, Geuma Frisius (Investment firm), EFC (Belgium, Netherlands, Denmark), Agri (grower) investment fund, BelOrta
Products	Breeds apples and pears

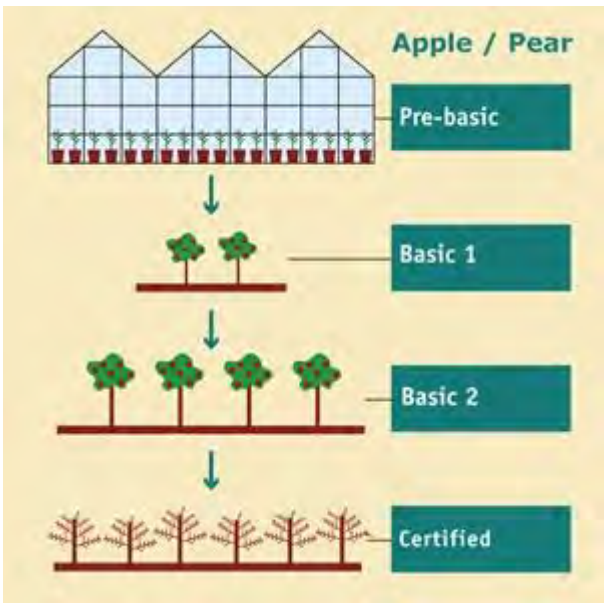
	• Better known releases: Kanzi & Greenstar • New release: Asfari, Kizuri, Zari, etc. • IP Management • Introduction of fruit into the market
Breeding process & General remarks	• 100% self-funded. • Breeding philosophy and process is prominently listed on their website. • Understands that successful products pay their salaries – a very strong business and product focus. If it doesn't make money, nobody makes money. • A very good picture of the “ideal” cultivar and what the customer wants. However, a new, high quality cultivar alone is not enough! Needs marketing drive. • Also, a very good idea of gaps in the market. • Aims for “star” cultivars but also some “bread and butter”. • Commercial breeding objectives – 20% disease resistance, 20% quality and 60% combination. • Very efficient breeding process. 30 -50 crosses; 35,000 pips/year, 10,000 remaining after infection screening, then sensory evaluation. • 30,000 apple seedlings screened (1 tree/genotype), 300 seedlings in 2nd screening (8 trees/genotype). Evaluation until year 6. • Grow seedlings out of juvenility during greenhouse phase and then graft to dwarfing rootstock (M27) for early fruiting. • Fund research at KU Leuven to develop markers to increase breeding efficiency. • Nico feels that commercial breeding programmes are outperforming public funded programmes. • There is room for a handful of apple breeding programmes in the world – that's all! • He believe there is a place for very well run, public funded breeding programmes since they can conduct some of the studies (inheritance, gene function etc.) that is too costly for private programmes with their strong focus on financial viability. • Need many partners to run a successful private breeding programme. • Degree of exclusivity varies between cultivars. • Low chill breeding – should take place in low chill areas – but market demand for such varieties is low.



Phase 1 apple seedlings at Better3Fruit. The precocity stems from growing the seedlings out of juvenility during a greenhouse phase and then grafting to M27 rootstock.

5. NAKTuinbouw and Vermeerderingstuinen.

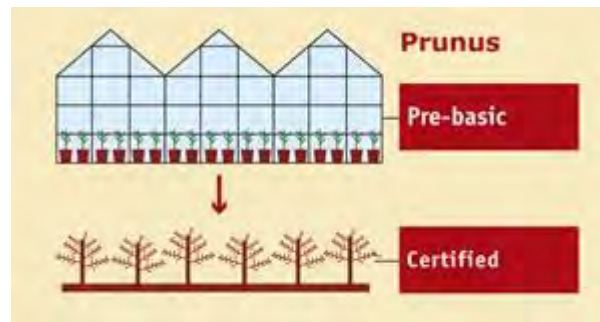
NAKTuinbouw	• http://www.naktuinbouw.com/ • Host: Hans Koning / Dr Frank Maas (R&D) • Founded in 2000 following merger between various Dutch plant inspection services. • Operational Departments: Inspections, Laboratories and Variety Testing. Mandate and role: • Inspect propagating material used for floricultural, vegetable and arboricultural crops. • Assess cultivars for distinctness, uniformity and stability for registration purposes and/or granting Plant Breeders' Rights. • Voluntary quality inspections for producers of propagating material (supplementing statutory inspections or place more stringent demands) to determine the health of propagating material and testing for varietal identity and trueness to type. • Inspection by NAKTuinbouw is obligatory for any company wanting to market and trade plant propagation material. • Conduct phytosanitary import and export inspections. Operation: • 300 employees (phyto inspections, cert. programme, lab & health tests, germinations tests, PBR research, R&D groups researching propagation techniques). • Can incorporate material from other similar entities. • Only work with cultivars with breeders rights – no “mafia” cultivars. • Find it difficult to import material to RSA. • Don't use tissue culture to propagate rootstocks due to epigenetic variation in progeny.
Vermeerderingstuinen	http://www.vermeerderingstuinen.nl Mandate and role: • Production of fruit and woody ornamental propagating material. • Produces virus-free scion wood, softwood cuttings, and bud wood, as well as young plants and rootstocks for further propagation. • Produces certified virus-free bud wood. • Produces virus-free basic material for establishment of mother blocks at nurseries. • Oversight by NAKTuinbouw. Operational: • Full cost recovery. • Produce 40-45 million rootstocks, 75% exported. • 8 million fruit trees, 75% certified, 25% free from virus (niche products).

	• 700,000 certified mother trees, 1 million basic rootstocks, 20 million units annually. • Stabilise unstable varieties. • Only 2 crops on one plot. Mother trees max 5 years old and then replaced. • No breeding, not a gene bank, does licence management. • Only 2% of volume new cultivars and going down. Focus on the 98% that sells. 20 new cultivars per year down from 50 in 90's (when for free). • IP owners could cut out Vermeerderingstuin, but find this too expensive.
Production systems	Extracted from http://www.vermeerderingstuinen.nl/ • Naktuinbouw produces virus-free material (virus-free pre-basic mother plants or nuclear stock). Kept in an aphid-free greenhouse. • Individual plants maintained in containers and never bear fruit. • Each plant undergoes periodic follow-up testing for infectious diseases. Apple and pear varieties Wood from nuclear plants used to grow virus-free basic mother trees (propagation stock 1). Basic mother trees raised under isolated conditions in the open air. Subjected to annual pomological assessments carried out by expert committee. Basic mother tree must pass 3 consecutive years before use in further propagation. Each tree is also subjected to assessment every year thereafter. NB. Stability of apple cultivar mutants is a major issue. An additional generation has been added, as is the case with rootstocks. Scion wood taken from 1st generation mother plants is used to raise virus-free basic mother trees (second generation). These trees are also subject to the same process of pomological assessment.  The diagram, titled 'Apple / Pear', illustrates the production system through four stages, each with a corresponding label in a green box: 'Pre-basic', 'Basic 1', 'Basic 2', and 'Certified'. The 'Pre-basic' stage shows small plants in a greenhouse. An arrow points down to 'Basic 1', which shows two trees on a bench. Another arrow points down to 'Basic 2', showing four trees on a bench. A final arrow points down to 'Certified', showing a row of trees in an open field.

Both 1st and 2nd generation basic mother trees used for raising **certified virus-free mother trees** (certified stock). These are used to produce certified virus-free propagating material supplied to fruit tree nurseries. Certified virus-free mother trees are kept free of flowers to minimise risks of infection and reinfection. To keep the extent of consequences resulting from any back mutations within acceptable limits, the number of production years is limited to between a maximum of 3 or 4 years. In the production of certified virus-free mother trees, some trees are also randomly grafted onto dwarfing rootstocks and planted out for parallel testing.

Cherry and plum varieties

For the propagation of Prunus varieties, certified virus-free mother

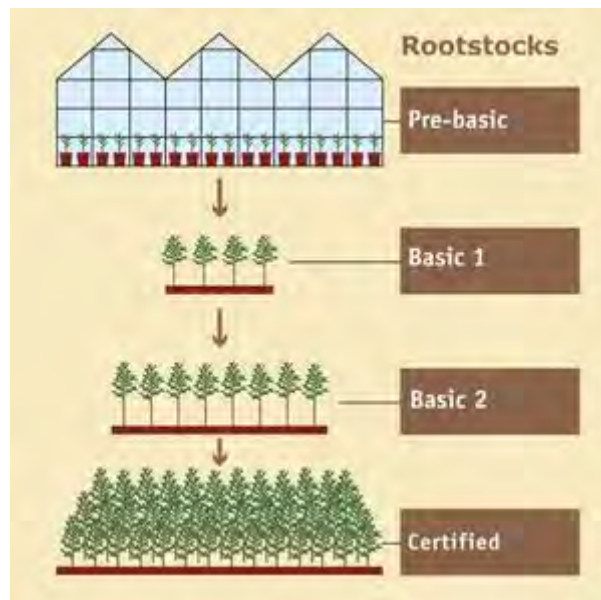


trees are raised directly from pre-basic mother trees. The chance of natural reinfection by pollen-transmitted viruses during flowering is too great. For identity (trueness to variety), parallel testing is conducted.

Rootstocks

Rootstocks produced by same propagation method used for fruit varieties.

For rootstocks, however, VNL stops at the category virus-free basic mother trees (second generation) (propagation stock 2). Plants produced from 1st and 2nd-



generation basic mother beds are used by nurseries for planting mother beds categorised as certified virus-free.

Mother beds at the nurseries produce certified virus-free rootstocks used for budding or grafting with certified virus-free propagating material.

	Fruit trees produced from certified virus-free propagating material and certified virus-free rootstocks are eligible for certification as virus-free fruit plants.
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6. Nurseries

Vitroplant Italia	• http://www.vitroplant.it/index.php?lang=en • Host Dr Oriano Navacchi • Filial Vitroplant Tunisia. • Nursery and “<i>in vitro</i>” multiplication. 10 – 12 million plants propagated per year. • All nursery material micropropagated. • Makes kiwifruit, pear, grape, peach, apricot and micropropagated certified Virus-Free rootstocks. • Developing micropropagation techniques for rooting walnut, olive, almond and chestnut. • Healthy, virus-free base plants with confirmed genetic authenticity kept in screen-houses at CAV and regularly subjected to biological and molecular tests. • Vitroplant obtains starting material from CTV (Centro Tecnologia Vivaistica, Nursery Technology Centre) who establishes mother plants from the base material. • Control bodies follow every clonal line through electronic labelling. • Advantages of micropropagation: reproduction speed, health, quality and uniformity of plant material.
Boomkwekerij René Nicolai	• http://www.renenicolai.be/ • Host – Florent Geerdens • Produces about 1 million apple/pear/cherry per annum. • Focuses on 2 quality aspects: ○ Physical and technical ○ Physiological and health – certification compulsory. • Export internationally (80% - UK, Germany, Poland, Italy, 20% - France, Czech, Hungary, Russia, Ukraine). • No export to RSA – RSA quarantine too slow and not functioning well. • Don’t grow trees in fruit growing regions. • Always plant in virgin soil and never in soil previously planted to fruit. • Clean up material with heat treatment. • Foundation material kept at NAKTuinbouw. • Bud wood obtained from Cooperative bud wood park and also from Vermeerderingstuin. • Don’t cut bud wood in orchards. • Not using in vitro rootstocks due to juvenility issues and genetic deterioration. • Rootstock mother blocks kept for 10-15 years. • 95% bench grafting for making knipbome.

	• Access to club varieties have decreased the need to speculate.
Boomkwekerij Johan Nicolai	• http://www.johan-nicolai.com/en • Host - Johan Nicolai & Laurie Nicolai (daughter) • Zouk – sister company that does Breeding & Cultivar development and has own bud wood park. • 1.2 million trees per annum. Still much speculation • 30% of trees to China, rest EU. • Trees in bud wood park replaced every year. • Make 600-1,200 crosses per year. • Main focus to improve existing cultivars (e.g. red Golden). • RG1 Royal Gala 7-14 days earlier than Royal Beaut. 5 new cultivars in next 3/4 years. SAPO evaluating RG1 in SA. • Zouk9 rootstock 25% higher vigour than M9 and drought resistant. • Try to get away from “just another red”. • Strategy is to shift from free to own varieties. • Focus on: ○ Disease resistance/ tolerance ○ Pink colour (PL is only for lower latitudes) ○ Niche markets (red flesh) • Positioning of new cultivar the most difficult part • New trend - supermarkets buying cultivars. • Local production for local market. • Get rid of regions/ areas where the crop can't be grown adequately. • Believes that EU will disappear as market for RSA – believes RSA requires bigger, sweeter apples with good storability for African market. • Future is breeding for resistance. • Old breeding programmes are making too many crosses. • Breeders need to be very knowledgeable of markets and consumer needs. He sees a stronger focus on EU produce for EU markets! • Believe there's a need for smaller, but much more directed programmes – choose the right parent with a very clear goal in mind. Need to be nimble – focus on the next 5-6 years. • Fruit growing not a national industry any more. Bigger, multinational growers in future. Small growers will disappear. • Believe that big groups will fund their own R&D and the focus will be more narrow. • Hope that 1 EU certification standard will work. • Not sure that M9 will remain as dominant in EU. • Believes bud parks more important for nurseries than rootstocks. Cut buds from trees with fruit on – removes any trees from budpark that show reversion. • Aim for 89% class 1 trees. • Important is land selection, right size and quality rootstocks, quality bud wood (free from disease and viruses, standardization).
Boomkwekerij Fleuren	• https://www.fleuren.net/home • Host - Han Fleuren • 2.5 million trees p.a. • + / - 20 nursery sites.

	• 50% apple (5% organic), 15% pear and 35% cherry. • 70% of trees exported. • 4 plum varieties, 10 pears, 24 cherry, 56 apple varieties and mutants • Co-founded Fleunerra Apple tree nursery in Serbia in 2015. • Innovations: Knipboom, 3K-tree, Minitree, Q-Eline rootstock. Words of Wisdom - Han Fleuren, director of Fleuren. • Adversity makes you stronger – believes that every company/ industry should have a “near-death” experience. Q-Eline resulted from a frost that killed almost all Fleuren’s pear trees. • Producers should move away from cost thinking to gain thinking. • There has to be a client focus – sign “smile” contracts that have both parties smiling. • His dream is to increase the per capita consumption of apples. • You can’t fight change. • Not everyone can be innovative – sitting on a new chair is already too much for most people. • Should focus on the consumer – “the right part of the value chain”. Han Fleuren will present two talks as keynote presenter at the 2017 HORTGRO Science Technical Symposium.
Verbeek Boomkwekerijen	• http://www.verbeek.nu/eng/index.htm • Host – Han Verbeek • 3 million trees p.a. • 200 ha nusery area, 30 ha stool beds (M9 T337) • 60% apple, 35% pear and 5% cherry. • Produce apple, pear and cherries in Serbia since 2014. >1 million trees in 2017. • W EU trees produced in The Netherlands, E EU and Asia trees produced in Serbia. • 600 000 – 800 000 trees export to China. Roots have to be washed, 6 weeks on boat, advance payment. • Knipboom costs 4 Euro. • 23-25 actions needed to produce a final tree • Nursery trees always produced in new soil. • Stool beds can last for 20-30 years. • Bench graft apple, bud Conference pear. • Plant trees using GPS. • Every plant staked with steel rod. Not fibreglass because of too much movement in wind. • Irrigation is often not needed – high water table and rain. • Weed control by automated rotovator. • Try to limit Cu sprays for defoliation. • Use 23 permanent labour and 100 seasonal labourers (Polish) • Wages @ €14.00 per hour



Dr Oriano Navacchi of Vitroplant explaining the virtues of a M9 rootstock plant produced through tissue culture.



Looks like there will be enough of them! A M9 liner bed at Verbeek Boomkwekerij.



Hugh Campbell checking out the cherries. Knipbome at Fleuren Boomkwekerij.

7. **PC Fruit – Proefcentrum Fruitteelt, Belgium** - <http://www.pcfruit.be/en>

Mandate, role and funding:

- NGO established in 1997 from merger of 3 research institutes and demonstration gardens.
- Major client is Belgium growers
- 60 ha field trials - 20 ha demo blocks, the rest used for science trials.
- 107 staff (7% PhD, 20% MSc, 38% technical)
- Funding: 19.8% product evaluation, 6.2% consultation, 8.8% provincial, 7.2% grower cooperations, 7.3% Flemish government for experimental farms, 14.6% fruit, 21% research projects for government – 10% must come from growers, 30-40% government funding.
- 870 members attend farmer days for free, receive journal.
- Provides an extension service to members.
- Operates centralised warning system – codling moth etc.

Research:

- Variety testing (closed, info not available to growers)
- If results positive, then wider dissemination of results.
- Member of EUFRIN – EU collaboration on thinning chemical, cultivar and rootstock evaluation.
- Rootstock evaluation
- Crop regulation (thinning, mechanical thinning, hail nets, fruit quality)
- Planting systems (mechanical pruning)
- Nutrition
- Replant

Apple and pear variety and rootstock testing – EUFRIN workgroup:

- 24 institutes in 15 countries participating.
- Jeff Vercammen is chair, Walter Guerra is secretary.
- Exchange info and expertise.
- Develop description list.
- Standard experimental contract.
- Level 1 evaluation
 - 99% pre-release cultivars
 - Only visit site with IP owner
 - Coops pay to receive the results, but only see the evaluation number, not cultivar name. Coop can then speak to the owner if the latter is willing.
 - 6 trees used & 5 trees in semi-organic planting.
 - Compare apple cultivars to GD and Jonagold.
 - Pears compared to Conference, use QA & interstem, assess GA effectiveness on fruit set.
 - Use the EUFRIN descriptor list.
 - Send report to breeder.
 - No chemical thinning, assess bearing habit, protect against frost, grub trees after 3-4 years.
- Level 2 evaluation
 - 40-200 trees
 - Depending on cultivar, evaluate thinning/set, under net, fruit quality, plant & training system, storage – the owner decides what to pay for.
 - No planting if no IP owner payment, no info.
 - Technical report presented.

8. **Fruitconsult at Randwijk Experimental Farm** - <http://www.fruitconsult.com/EN/>

Mandate, role and funding:

- Private advisory company for apple, pear and cherry.
- Major clients in The Netherlands, Belgium, Germany and Italy.
- Focus on fertilization, plant protection, and production.
- Runs Randwijk Experimental farm. 7.5 ha apples, 3 ha pears, 1 ha cherries.
- Farm is sponsored by various companies.
- Wageningen University also has space at Randwijk – more fundamental research.
- 15 staff (10 consultants, 5 involved with research at Experimental Farm)
- Funding: 50% ag companies, 25% nurseries, 25% directly by grower organisations & consultation.
- Evaluate cultivars. IP owner decides whether info should be published. Can publish results if IP owner publishes false data.
- Demo blocks (registration trials, thinning trials, etc.).
- 78 projects in 2016.
- Major risk is local industries declining further.



The sponsor board at Proeftuin Randwijk.

9. **Fruitmasters** - <https://www.fruitmasters.nl>

Mandate, role and funding:

- Started in 1904 as cherry auction.
- Involved in cultivars, research, sales, marketing etc.
- Marketing body for affiliated fruit growers.
- Apples, pears, cherries and soft fruit.
- At Geldermalsen head office, 17 ha storage space, 32 loading docks. Store 45,000 tons.
- 425 fruit growers, 5,500 ha, most fruit graded and packed at facility.
- 200 million Euro turnover.
- Focus on new cultivars. Partners with EFC.

- Own Kanzi brand. Runs the marketing. Grows 500 ha Kanzi.
- Operates 18 million of the 60 million tons of Kanzi globally. Aim is to grow Kanzi to 70 million.
- Marketing and development makes or break a cultivar.
- Miyo pear. Aim for 35 million tons. Placement/ marketing based on consumer research.
- Fruitmasters has own research team & research station.
- Big issue with stem canker in The Netherlands – therefore latent cankers a key research priority.
- 30 apple and 7 pear cultivars under evaluation.
- Randwijk independently testing 69 apple and 43 pear cultivars.
- Main criteria for evaluation: Uniqueness, climate suitable, consistent cropping, storable, disease resistant
- Mistakes made with Kanzi due to not having enough info at planting.
- To decrease Nectria infections, all cuts in nursery are made in summer.
- Wounds in stool beds source of infection.
- Bench grafts maybe lower risk of infection.
- Burn of leaves with Cu in the nursery.

10. Take home lessons

Lessons learnt	Recommendation and action
1. <u>Plant material.</u> • There is much more competition between nurseries in the northern hemisphere. Nurseries cannot afford to have poorer trees than their competition. • Nursery trees ALWAYS produced in virgin soil. • Strict control of plant material quality – bud material obtained from bud parks established far from orchards. • Cultivars are not allowed to carry fruit in bud parks except with cultivars like Gala that is not very stable and much care is taken to reduce disease and pest risk (will remove a Gala tree in budwood park if only one branch on tree shows reversion) • It is inconceivable to the Dutch and Flemish that one would cut bud wood from commercial orchards, due to the high risk of propagating and spreading disease. • Northern hemisphere nurseries benefit from	• Plant Improvement Organisations and nurseries need to review current practices. • Standardize on rootstocks. • SA should move to using budparks as budwood source.

economy of scale and can specialize. Life is made easier by M9 being by far the predominant apple rootstock – this is why our industry should standardise on rootstocks.	
2. <u>Breeding</u> • The breeders that we met have a very good handle on what the market requires and what they need to breed. • These private programmes are studies in efficiency. Crosses are directed at very clear targets (ideal cultivars), the juvenility period is reduced in the greenhouse, seedling numbers are reduced by strict screening and selection is then sped up by grafting to precocious rootstocks. • There is a clear focus on developing improved cultivars as products – in this sense, the programmes are comparable to Ford, Volkswagen and Mercedes developing new models. It's about producing a product that the client will want.	• If industry invests in breeding, the goals should be very clear, very specific and the project managed and evaluated on an outcome basis – where the outcome is provision of cultivars that can be recommended for planting after stringent independent evaluation.
3. <u>Tissue culture</u> • For stone fruit, tissue culture is the norm in Europe and potted cultivation of nursery trees is gaining ground. Together these practices ease the propagation of difficult-to-root material and decrease disease risk. • Most M9 liners in Europe are still produced in layer beds – this won't change soon although interest in more difficult to root Geneva rootstocks may require other means of propagation. • Poor performance in past trials gave a bad name to tissue culture production of apple trees. However, with lower hormone levels being used and tissue culture used for rootstock production rather than to	• Investigate feasibility of tissue culture for producing healthy trees and rootstock on demand. • Evaluate the overall benefit of moving nursery practice to planting trees in pots versus open beds.

establish mother blocks for liner production, there seems to be some scope for apple rootstock production through tissue culture. • There is potential in South Africa for a nursery specializing in tissue culture rootstock production for various industries.	
4. <u>Applied</u> research & the Canopy Systems Symposium • Very little applied research is done at University. • Applied research is mostly done by private (part grower, part agri business owned) companies. • Much less technical support is available compared to South Africa. • Whole tree physiology as a research field has lost track globally. This is probably because it is difficult to publish a lot of articles every year in this more applied field. Employers of researchers certainly find fields such as molecular biology, proteomics, and metabolomics much more rewarding.	• Cherish, jealously guard and keep on developing strong technical people. • Have human capacity strategy in place. • We should develop and retain access to those few key people who are equally at home in front of a scientific audience and in an orchard – they are becoming a very scarce resource.

Appendices 1

Contacts:

Congress www.orchardsystems2016.org/

Prof Luca Corelli Grappadelli, Department of Agricultural Science, University
of Bologna

Nurseries and breeders

- **Vitroplant Italia tissue culture lab and nursery**, www.vitroplant.it/index.php?lang=en
Dr Oriano Navacchi
- **Better3Fruit**, <http://www.better3fruit.com/>
Nicolas Stevens
- **Boomkwekerij René Nicolai**, www.renenicolai.be/
Florent Geerdens
- **Boomkwekerij Johan Nicolai**, www.johan-nicolai.com/en
Johan Nicolai
- **Fleuren Boomkwekerij**, www.fleuren.net
Han Fleuren
- **Verbeek Boomkwekerijen**, www.verbeek.nu
Han Verbeek

Plant improvement organisations

- **NAKTuinbouw**, www.naktuinbouw.eu
Hans Konings
- **Vermeerderingstuinen**, www.vermeerderingstuinen.nl
Gerard Jongedijk
Dr Frank Maas – R&D

Research stations

- **PCFruit**, www.pcfruit.be/en
Dr Jeff Vercammen
Dr Tom Deckers
- **Fruitconsult & Proeftuin Randwijk**, <http://www.fruitconsult.com/EN/> &
<http://proeftuinrandwijk.nl/nl/>

Pieter van der Steeg, Fruitconsult,

Fruit marketing

- **Fruitmasters**, www.fruitmasters.nl

Henk Nooteboom

Appendices 2

The final tour itinerary was as follows:

Sunday 28 August

Arrival into Bologna

Monday 29 August until Friday 2 September

XI International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems Bologna, Italy.

Friday 2 September

Vitroplant Italia tissue culture lab and nursery, Cesena, Italy.

Saturday 3 September

Arrival into Brussels, Belgium

Overnight in Leuven

Monday 5 September

10:00 Better3Fruit, Rillaar, Belgium

14:00 Boomkwekerij René Nicolai, Alken, Belgium

Overnight in Leuven

Tuesday 6 September

10:00 Boomkwekerij Johan Nicolai, St.-Truiden, Belgium

14:00 PCFruit, St.-Truiden, Belgium

Overnight in Leuven

Wednesday 7 September

10:00 NAKTuinbouw and Vermeerderingstuinen in Horst, The Netherlands

Travel to

Overnight in

Thursday 8 September

10:00 Proeftuin Randwijk, Randwijk, The Netherlands

14:00 Fleuren Boomkwekerij, Baarlo, The Netherlands

Overnight in

Friday 9 September

10:00 Verbeek Boomkwekerijen, Steenbergen, The Netherlands

Overnight in Brussels

Saturday 10 September

Departure to South Africa