

Travel Report: Visit to South Tyrol, Italy

November 2022



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1. Objectives of the visits:

- To visit the House of Apples, a hub that manages South Tyrolean apples, and SK Südtirol, the Variety Innovation Consortium;
- To visit Laimburg Research Centre and acquaint ourselves with their newest research results;
- To visit orchards in the Etsch Valley and learn what's new in the fields of tree training systems, rootstocks and cultivars;
- To attend Interpoma Trade Show and Congress and learn what's new in the world of apple production, storage and marketing;
- To build relationships with researchers, technical experts, and industry members in the EU.

2. Touring party members:

- Stephen Rabe (SR Consulting)
- Chris Berend (Caledon Valley Nursery)
- Wiehann Steyn (Hortgro)
- Marno van der Westhuizen (Hortgro)
- Karen Theron (Stellenbosch University)

3. Visits in South Tyrol:

A. The House of Apples

- SK Südtirol
- Orchard visits in the Etsch Valley and visit to Fruchthof Ueberetsch packhouse

14 and 16 November 2022 - Terlan

Hosts

- Markus Bradlwarter, Executive Director, SK Südtirol.
- Clemens Hafner, Variety Manager, SK Südtirol.
- Jürgen Christanell and Markus Ladurner, South Tyrolean Extension Service.

Reasons for Visit and Programme

- The House of Apples is a building that was started by VOG, the biggest marketing organization for apples in the EU, to act as a hub for all their expertise in cultivation, consultation, quality assurance and marketing.
- SK Südtirol is the Variety Innovation Consortium that was founded by the two marketing organizations in South Tyrol, VOG and VIP.
- Programme: On 14 November, we met with Markus Bradlwarter and Clemens Hafner at The House of Apples where they gave us an overview of South Tyrolean apple production and SK Südtirol's operations. Hereafter, Markus showed us some state-of-the-art orchards in Terlan.

On 16 November, we were joined by 2 Brazilian consultants and Andrew Mandemaker and Tom Frankcomb from Apple and Pear Australia. Clemens Hafner from SK and Jürgen Christanell and Markus Ladurner from South Tyrolean Extension Service showed us a trial site and commercial orchards with some of the newest varieties planted with different training systems. In the afternoon, we took a tour through one of VOG's co-operatives, Fruchthof Ueberetsch packhouse.

More information on the Companies

- SK Südtirol - <https://www.sk-suedtirol.it/sk/en>
- VOG - <https://www.vog.it/en>
- VIP - <https://www.vip.coop/en/business/home/55-0.html>

Observations

South Tyrolean Apple Production

- South Tyrol has 18400 ha of apples, more than 7000 apple growers and produce 10% of the entire EU apple harvest.
- The average size of a farm in the region is 2.5 hectare.
- South Tyrol has two marketing organizations, VOG and VIP.

	VOG Consortium of South Tyrolean Fruit Growers Co-operatives	VIP Vinschgau Valley Growers
Production area	Center of South Tyrol (Alt. 200 – 1000m)	Vinschgau Valley (Alt. 500 – 1000m)
Number of co-operatives	12	7
Number of fruit growers	5000	1750
Total production area (ha)	10900	6800

- Approximately 8% of the South Tyrolean growers are not members of VOG or VIP – they sell their fruit mainly at auctions.
- The House of Apples is 100% grower owned, with a $\frac{2}{3}$ and $\frac{1}{3}$ split between VOG and VIP, respectively.
- The renewal percentages (% of total production surface area) of their apple orchards in 2019, 2020 and 2021 were 4.5%, 6.5% and 5.8%, respectively.

South Tyrolean Orchards

- The average age of their apple trees is 12.5 years.
- 90% of the orchards has M.9 T337 as rootstock. Clemens mentioned that they are at a point to consider G.11 for more vigour.
- 70% of the planted area is under grey and black - the only colours allowed - shade nets, primarily for hail protection.
- There is between 60-70 ha guyot systems in South Tyrol.
 - They aim for 90% packouts with this system.
 - They prefer getting Bibaum® trees from the nursery and then training them to a guyot system in the orchard.

- According to Clemens, it seems as if Fuji yields are more regular on this type of system, potentially due to better light interception and distribution.
- In terms of training systems, varieties like Redpop® show similar tonnages between the single leader and multi leader systems, but experience a smaller harvest distribution on multi leader trees with up to 90% of the apples being harvested in the first pick.
- They store WA 38 up to 14 months.
- Ipador (Giga®) doesn't receive any 1-MCP treatment as it stays firm.
- Pink Lady® has been the most lucrative cultivar in South Tyrol, but also has the highest tree costs. During the 2022 season, a Pink Lady® tree was almost 20 euro compared to between 6 and 7 euros per tree for other cultivars. The Guyot system is used for some newer Pink Lady® plantings since it decreases the tree cost per hectare and also allow growers to plant more hectares to Pink Lady® - there is a restriction on the number of trees that a single grower may plant.
- Labor is one of the biggest expenses, with skilled laborers receiving up to 12 euro per hour.



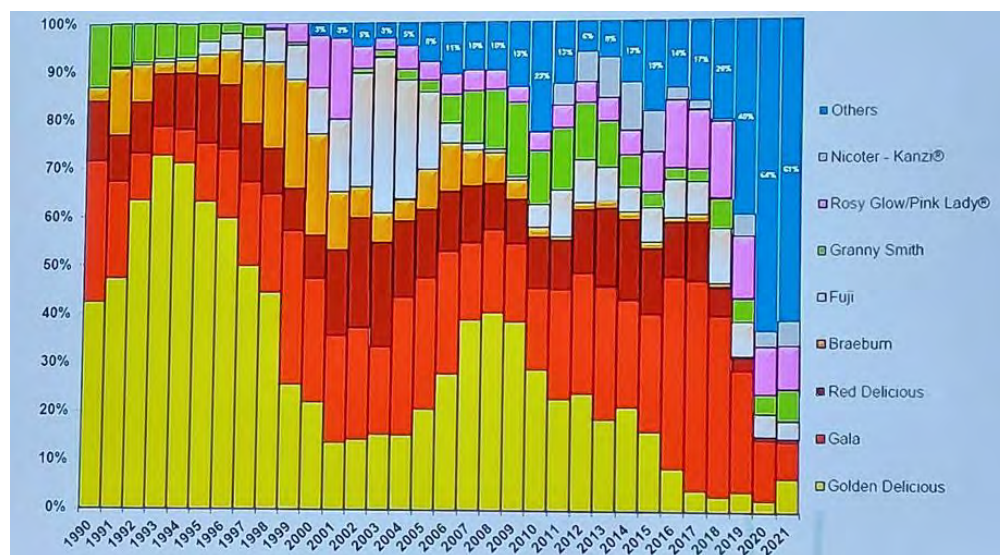
Wiehann at a high-density apple orchard in Terlan.



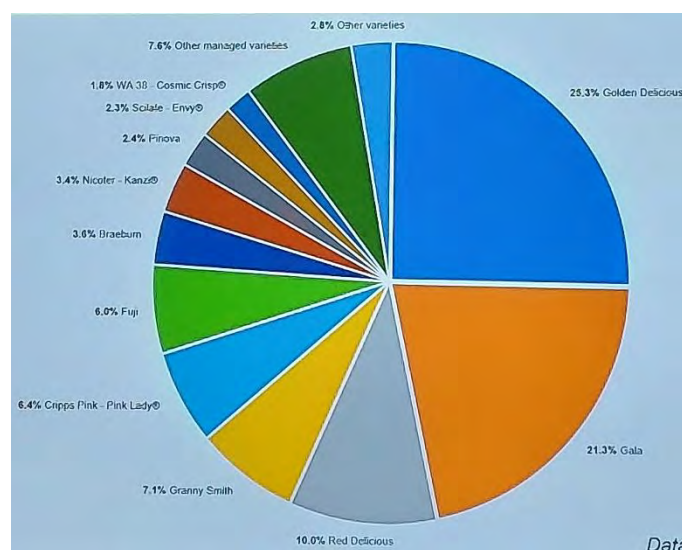
Jürgen Christanell and Markus Ladurner from South Tyrolean Extension Service showing us a multi-leader apple orchard in the Etch Valley.

Varietal Assortments

- Although good quality Golden Delicious apples are produced at the higher altitudes, they don't foresee an increase in hectares.
- Granny Smith apples is still a lucrative commodity for them and is grown not only as cross pollinator.
- Some of the managed varieties in the region include Kanzi® (Nicoter), Jazz® (Scifresh), Envy® (Scilate), Yello® (Shinano Gold), Crimson Snow® (MC 38), Joya® (CR Brisset), Cosmic Crisp® (WA 38), Giga® (Ipador), Redpop® (CIVM49), Kissabel® (R201) and SweetTango® (Minneiska).
- They have a strategic drive for future varieties to be own managed brands in order to control costs, royalties etc.



Varietal assortment in new plantings over 21 years in South Tyrol.



Distribution of varieties over the cultivation area of South Tyrol in 2021.

Pack House

- They have strong drive for zero-plastic packaging. This is much easier achievable for them as most of their fruit reaches the market quickly without long term storage.
- From August 2023, marketing would be centrally managed by VOG.

Sales Markets

- 80-90% of apples produced in South Tyrol are sold in the EU.
- The message was clear that Europe is planning to produce apples for the EU and UK markets for 12 months of the year.

SK Südtirol

- The Variety Innovation Consortium was founded in 2002 and is responsible for:
 - Searching for and obtaining licenses for the testing, cultivation and marketing of new, promising varieties.
 - Test new varieties for their suitability under South Tyrolean conditions.
 - Manage new varieties.
- They have a worldwide network through their members' (VOG and VIP) involvement in the International Pome Fruit Alliance (IPA) and NovaMela.
- Testing of new varieties:
 - The growing region of South Tyrol enables SK to test a new variety's suitability under 3 different micro-climates.
 - They have a 3-phase testing process:
 - **Phase 1:** The first phase is done and fully funded by Laimburg Research Centre. Five trees of a variety are planted at two of Laimburg's research sites, situated at 220m and 700m above sea level. Tests are conducted over 4 – 6 years.
 - **Phase 2:** SK Südtirol conducts production, storage and consumer tests at minimum 3 different sites, located at 250m, 550m and 900m above sea level, with 50-100 trees in each.
 - **Phase 3:** Phase 3 is the pre-commercial phase where 1000 – 5000 trees are established on commercial farms to further the knowledge on the variety. The growers are responsible for the tree management cost, but receives the guaranteed revenue of whatever gets planted. Depending on the level of tree management, they could also qualify for a top-up on the yearly incentive. After phase 3, the Executive Board of SK Südtirol decides if the variety is accepted or rejected.
 - It was interesting to note that red colour of some Gala clones differed more between the low and high-altitude sites than between the clones themselves when planted at the same site.

• Necessary/ideal properties	Types of varieties for the future
• regular yields with high pack-out • resistant to diseases and pests • excellent taste • special pulp properties (textures) • excellent storage behavior	• red, orange and bright pink skinned varieties • snack varieties (small-sized varieties) • red-fleshed varieties • extra sweet varieties • varieties for allergy sufferers • varieties for diabetics

Properties and type of apples that SK Südtirol is looking for in future cultivars.

B. Laimburg Research Centre

15 November 2022 - Pfatten

Hosts

- Dr Walter Guerra, Head of Institute for Fruit Growing and Viticulture, Laimburg Research Centre.
- Christian Andergassen, Group Leader: Fruit Physiology, Institute for Fruit Growing and Viticulture, Laimburg Research Centre.
- Dr Irene Höller, Researcher, Laimburg Research Centre.
- Thomas Facchini and Dr Urban Spitaler, Researchers, Laimburg Research Centre.

Reasons for Visit and Programme

- Laimburg is a world-renowned research centre for agriculture in South Tyrol. As they are at the forefront of innovation, it was a good opportunity to visit them again and learn what's new in the fields of tree training systems, rootstocks, and cultivars; and build relationships for potential future collaborations.

More information on the institution

- Laimburg Research Centre - <https://www.laimburg.it/en/default.asp>

Observations

- Only $\pm$ a 1000 ha of the 18000 ha apples in South Tyrol are planted to the Bibaum® system due to added cost to make the trees.
- The organic matter in the region's soil varies between 2-4%, with a pH of $\pm$ 7.2.
- With resistance building against chemical use, Christian has planted a new trial where they will be looking at integrated and organic cultivation of Royal Gala, Rosy Glow and Ipador apples planted on G.11 and G.213 rootstocks.
- They've found promising results with a locally produced robot that can spray individual flowers with ATS for thinning.
- Brazilian consultant, Leandro Bortoluz, mentioned that under their circumstances, they find that G.213 and G.202 are considerably more productive than M.9 due in part to improved branching and filling of space in the upper canopy. He mentioned that grown gall is sometimes observed but managed by nurseries. He also indicated that they haven't experienced similar issues with G.213 graft unions cracking as has been observed and is being researched in South Tyrol.

- Laimburg Research Centre has developed “robot system” that indicate “terroir” suitability for Cripps' Pink clones. Growers can see on a map whether their sites are highly, moderate or poorly suited to planting a particular clone.
- South Tyrol's key insecticide against woolly apple aphid (WAA), spirotetramat (Movento®), is being banned from 2023 in the EU and their prediction is that in 3 years, they won't have any effective product left for treatment of WAA. Thomas has an ongoing project looking at potential alternative products.
- They're picking up pesticide residues in the Adige River that flows through South Tyrol – the water table is only 2m below ground. Laimburg has developed a bio-filter to purify left over spray solution – see pictures below. However, they are still dependent on chemical filters as glyphosate passes through the bio-filter.



The bio-filter developed by Laimburg Research Centre to filter the irrigation water.



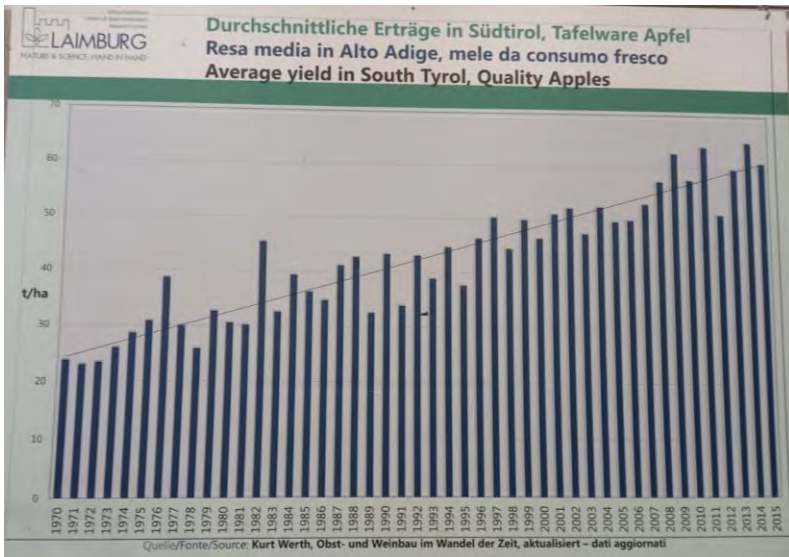
Difference in fruit colour of Galaval apples produced at $\pm 200\text{m}$ above sea level (left) and $\pm 700\text{m}$ above sea level (right).



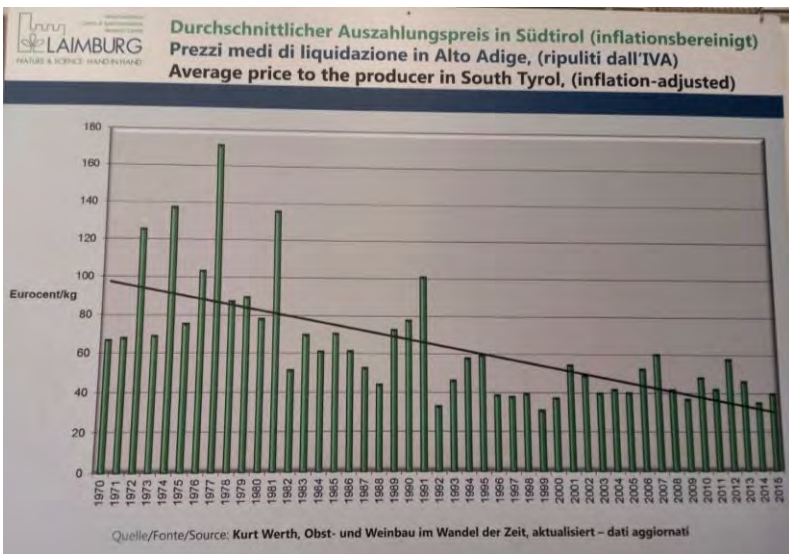
Two Brazilian consultants (left), Drs Walter Guerra and Irene Höller (middle), Chris Berends and M vd Westhuizen (right) standing at the apple replant trial site of Laimburg Research Centre.



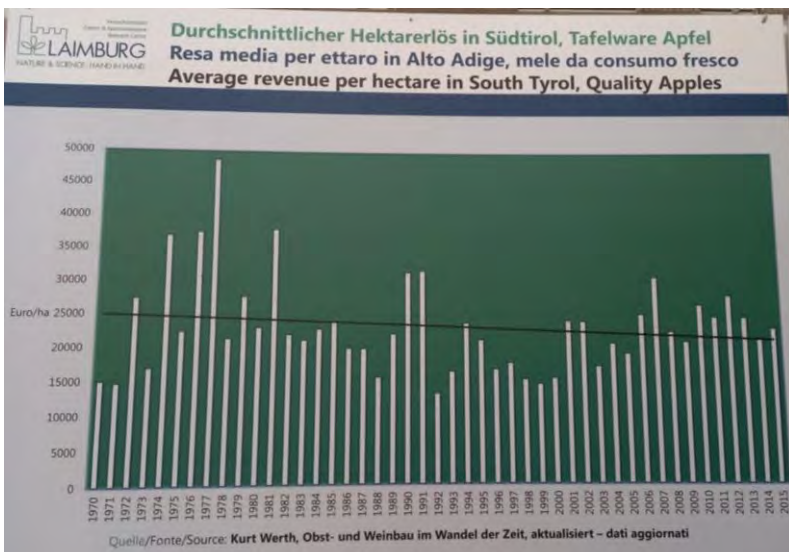
FrudiStor, the fruit disorder identification app that was developed by Laimburg Research Centre and collaborators.



Average yield of quality apples in South Tyrol from 1970 to 2015.



Average price to the producer in South Tyrol (inflation-adjusted) from 1970 – 2015.



Average revenue per hectare for quality apples in South Tyrol from 1970 – 2015.

C. Interpoma Tradeshow and Congress

17 - 18 November 2022 - Bolzano

Where	Fiera Bolzano Exhibition Center
Trade Show Exhibits and Attendees	490 Exhibitors and more than 16 000 attendees.
Congress Delegates	800 Delegates
Programme	Day 1: New Dynamics in the US Apple Industry • Walter Guerra – Welcome. • Gerhard Dischgans – Introduction: Rise and fall of Red Delicious. • Tim Welsh – Change or be changed. • Susan Brown – Apple breeding and marketing in the US. • Tom Barnes – USA apple retail and consumer dynamics. • Stefano Musacchi – Innovations through R&D and Extension. • Round table and questions from the floor. Day 2: Robotic Harvest • Walter Guerra – Welcome. • Luigi Manfrini – Introduction: History of apple robotic harvesting. • Peter Ferguson – Moving past the promo videos. • Elia Bruni – ADAM, a robot for precision crop management in apple orchards. • Avi Kahani – The 21st century orchard management solution. • Chao Chen – Monash apple retrieving system. • Han Smits – Precision fruit farming on tree level using autonomous robot harvesting. • Hunter Jay – Navigating the next agricultural revolution. • Yaniv Maor – Next generation fruit harvesting. • Round table and questions from the floor.
Noteworthy presentations	Day 1: New Dynamics in the US Apple Industry Change or be changed: The future of American farming is now – Tim Welsh (General Manager of Colombia Fruit Packers). - Tim emphasized the 2 biggest threats for US apple production, climate and labor.

- Climate: The past 2 years have been the most extreme weather years in the USA in recent history, with very high and low temperatures, less rain and more hail events.
- Labor:
 - Labor is becoming more and more scarce. They make use of a programme called H2A, which allows them to temporarily recruit workers from other countries, but this is very expensive. During the 2022 season, an unskilled laborer in Washington was paid 17.41\$/h and the predicted wage for 2023 is more than 19\$/h.
 - Over all the orchards that Tim oversees, labor makes up 62% of all the expenses which equates to ±18 000€/ha.

Apple Breeding and Marketing in the US – Susan Brown (Apple breeder at Cornell University).

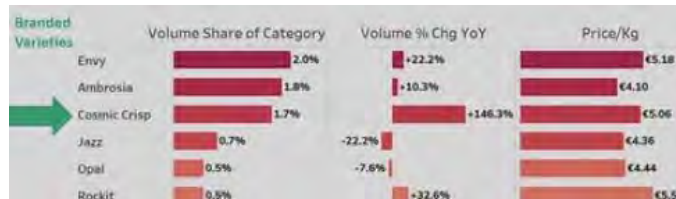
- It was interesting to note that over the last 10 years, Italy has had 15 new diseases on apples reported for the 1st time.

- Breeding for quality, distinctiveness and consistency in quality
- Absence of lenticel and cuticle issues, balancing skin thickness and storage
- Reduced storage disorders and maintenance of quality in storage.
- Breeding for resistance to pathogens
- Breeding for climate change, but how do you breed for uncertainty (drought then floods)?
- Reducing the 100% red mentality among some large buyers

The objectives of Susan's breeding programme:

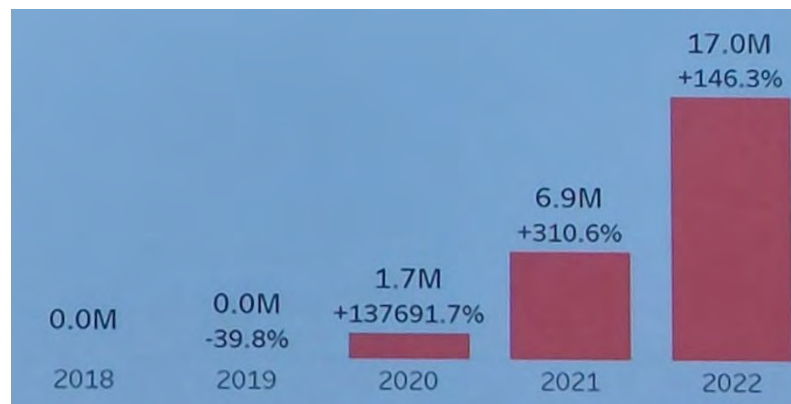
- Arctic apples
 - The 1st transgenic apple that was designed not too brown after being cut.
 - Arctic Golden Delicious, Granny Smith and Fuji have already been approved and Royal Gala will most probably be next.
 - Washington State has approximately 860 ha of these apples.
- Cosmic Crisp® (WA 38)
 - The goals for the breeding programme were long storing and good red colour, quality and consistency.
 - The programme had 10.5 million dollars allocated for marketing funds and 620 000 dollars for research on fruit set, post-harvest and a disorders guide.

- o Cosmic Crisp® is the number 3 branded variety in the USA, after only being 3 years on the market.



The branded volume per cultivar in 2022 in the USA. (Slide from Tom Barnes' talk)

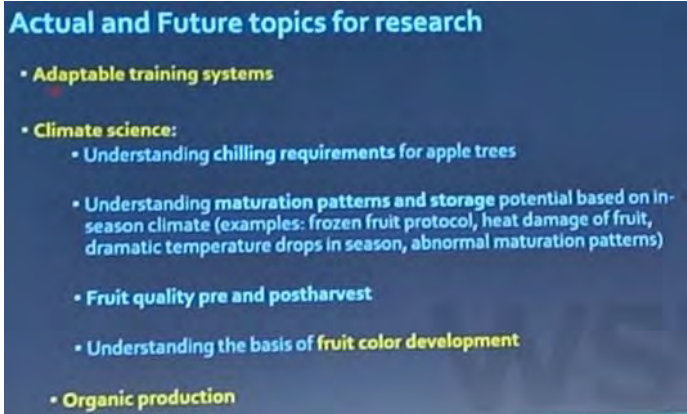
- o With the high cost to establish this cultivar in the market and the steep increase in volumes seen below, their main concern is whether the cultivar will be able to maintain a premium price.



The rapid increase in volume (kg produced) of Cosmic Crisp® over 3 years in the USA. (Slide from Tom Barnes' talk)

Tom Barnes – USA apple retail and consumer dynamics.

- Interesting observations on the future of new apple varieties. He mentioned that a decade or two ago, a new generation of cultivars came onto the market. These new varieties, like Cripps Pink and Fuji, were "special" compared to the old varieties like Golden Delicious and Red Delicious which then dominated. However, the market is currently being flooded by new cultivars that are all "special". It follows that if all new varieties are special, none of them really stand out and warrants a premium price compared to their competitors.

	Stefano Musacchi – Innovations through R&D and Extension. - Stefano again mentioned the endowment fund established by Washington fruit growers to replenish dwindling applied research capacity by appointing 5 up-and-coming researchers in strategic fields. One of these researchers, Prof Lee Kalcsits, presented at the 2022 Hortgro symposium and will visit South Africa on a 5-month sabbatical during summer 2024.  Stefano listed key future research fields, which quite interestingly, from a South African perspective, included dormancy, red colour development, and the effect of climate on pre- and postharvest fruit quality.
	Day 2: Robotic Harvest - Day 2 consisted of 20-minute presentations by commercial companies that specialize in robotic harvesting, followed by a panel discussion. This was an informative way of introducing the companies as it allowed everyone to market their product, while also giving different viewpoints on the challenges the technology is facing. - Although significant advances have been made in robotic harvesting, it was evident that there is still research to be done before it can become a viable practice. - The main challenges that stood out from the presentations were: - o Feasibility - o The terrain/slope of an orchard

- The architecture of trees
 - The robotic harvesters work well on two dimensional trees, but are less effective on more complex canopies.
 - Picking fruit on complex branches is still easier for humans as our hands have 27 degrees of freedom in terms of moveability, while the best robotic arm at the moment only has 16.
- Harvesting rate, handling of fruit after it's been removed from the tree, number of fruit that's dropped while picking etc.

- Examples of different robotic harvesters:



ADAM, a robot for precision management (harvest and spray) Robotic harvester from Advanced. Farm in the USA. They are the current leaders in the industry of robotic harvesting with a picking rate of 1500 apples per hour.



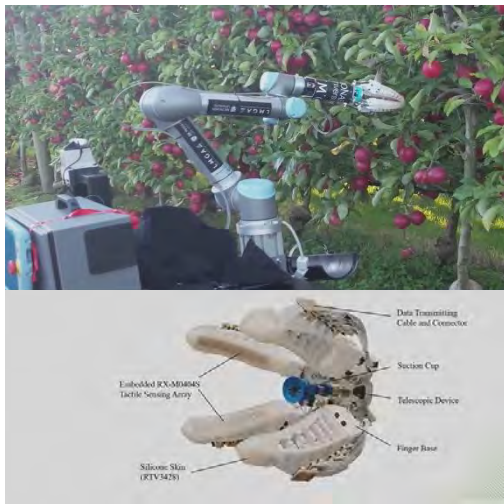
Robotic harvester from FFRobotics Ltd in Israel.



Robotic harvester from Ripe Robotics in Australia.



Robotic harvester from Munckhof in the Netherlands.



The Monash robotic apple-picker from Monash University in Australia. This robot has the most promising harvesting arm, with 16° of freedom.



Harvesting drones from Tevel in Israel. Although it still has challenges, this flying robotic harvester showed the most promise in terms of height of operation, accessibility in orchards, dual sided harvesting etc.

Some other functions of the drones that Tevel is working on:



Artificial Pollination



Spraying



Stem Clipping



Pruning (will be interesting...)

4. Appendix 1: Contacts

1. SK Südtirol

- Markus Bradlwarter, Executive Director.
- Clemens Hafner, Variety Manager.

2. South Tyrolean Extension Service

- Jürgen Christanell, Technical Advisor.
- Markus Ladurner, Technical Advisor.

3. Apple and Pear Australia

- Andrew Mandemaker, Head of Group Quality and Innovation.
- Tom Frankcomb, Variety Development Manager.

4. Laimburg Research Centre

- Dr. Walter Guerra, Head of Institute for Fruit Growing and Viticulture, Laimburg Research Centre.
- Christian Andergassen, Group Leader: Fruit Physiology, Institute for Fruit Growing and Viticulture, Laimburg Research Centre.
- Dr. Irene Höller, Researcher, Laimburg Research Centre.
- Dr. Urban Spitaler, Researcher, Laimburg Research Centre.

5. Appendix 2: Itinerary

ITINERARY FOR TRIP TO ITALY

- 13 NOV:** Arrive in Bolzano.
- 14 NOV:** Morning: Visit The House of Apples and SK Südtirol (Clemens Hafner).
Afternoon: Visit orchards on the Etsch Valley (Markus Bradlwarter).
- 15 NOV:** Visit Laimburg Research Centre (Dr. Walter Guerra).
- 16 NOV:** Visit orchards (Jürgen Christanell and Markus Ladurner) and trial sites (Clemens Hafner) in the Etsch Valley.
- 17 - 18 NOV:** Attend Interpoma Tradeshow and Congress.
- 19 NOV:** Return to Cape Town.