



CONTROLLED ATMOSPHERE RESEARCH FACILITY

Version 2024-01



UNIVERSITEIT
STELLENBOSCH
UNIVERSITY





How can Research Benefit your Business?

The goal of fruit research is to understand the behavior of fruit during storage and shelf life.

Although high-value fruit is highly profitable, the losses caused by post-harvest problems cannot be ignored.

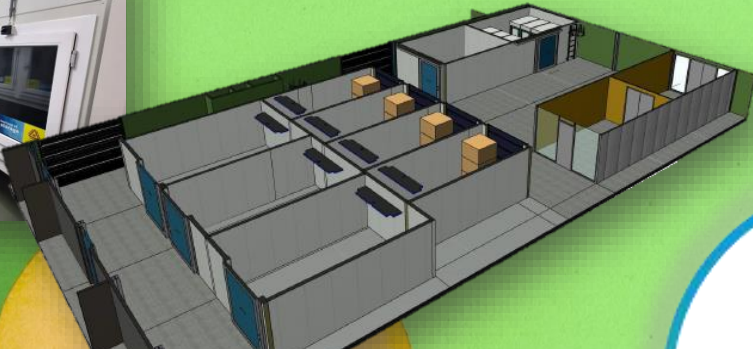
Conducting fruit research will help to identify quality loss problems, generate useful data during storage, upgrade CA conditions for fruits and develop protocols to maximize your profits in commercial applications.

CA Research Facility Options

Technical solutions for research at any level



Multi lab unit



Flex max unit



Respiration box/Container lab unit



CA Testing room



Flex mini unit

Flex Max Unit

Used by

FastPack
Growers at heart

Why Flex Max?

- Relatively large volume:
800kg of fruit per unit
- Suitable for Dynamic CA:
Active Control of Respiration (ACR)
- Easy access through flexible
sleeves for taking samples



Consists of

- MyFruit control cabinet & software
- 20x Flex Max Units
- 20x Temperature measuring
- 20x RH monitoring
- 20x Overpressure safety valve
- N₂ injection system
- CO₂ injection / adsorption
- Ethylene removal
- O₂ injection
- Digital pressure measurement
- ACR Dynamic storage

Total price 120K EUR

This price is based on installation in New Zealand in 2020.

Including: technical backup and training/guidance for one season



Flex max unit & Fruit sample sleeve



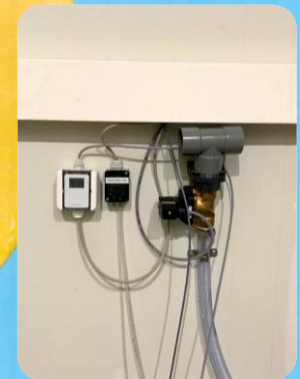
MyFruit control cabinet & Screen



N₂ injection system



**CO₂ & Ethylene
adsorption**



**Monitoring
Temperature & RH & Pressure**

R&D Center Randwijk NL

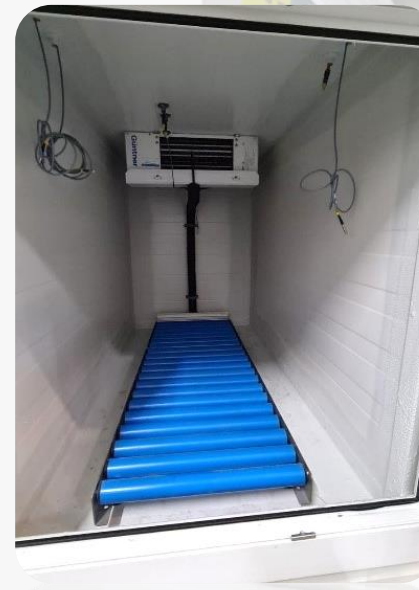
a. Multi-lab Unit

- 8x Multi-lab unit: 1-2m³/100-200kg of fruit per unit
- Small scale commercial room simulation
- Independent control:
 - Temperature (Glycol cooling system)
 - RH
 - Pressure
 - CO₂ & O₂ & Ethylene
 - Respiration (ACR)

Project Supported by NL
Government



8 lab units with individual cooling



Inside of CA container

Used by

 PRAKTIJKONDERZOEK
PLANT & OMGEVING
WAGENINGENUR

R&D Center Randwijk NL

b. CA Testing Room

- 1x Cold store (Cold stocking + testing)
- 4x CA room
- 3x Cooling room (High RH simulation, rootstock, plant growing test)
- Ripening & Degreening room
- Shelf-life room
- Office & machine room
- Central Glycol based cooling system



Inside CA room



CA rooms



Fruit weightloss control



Used by

Total price R&D Center Randwijk a + b: 850K EUR

This price is based on installation in the Netherlands 2022.
Including: technical backup and followup for one season.

Lab InHort Skierniewice

- 10x Respiration box: 1m³/ 150-200kg of fruit per unit
- Central CO₂/Glycol cooling system
- Refurbishment of 90 containers
- Independent control:
 - RH
 - Pressure
 - CO₂ & O₂ & Ethylene
 - Respiration (ACR)

Total price 800K EUR

This price is based on installation in Poland 2023.

Including: technical backup and followup for one season.



Used by

InHort
SKIERNIEWICE

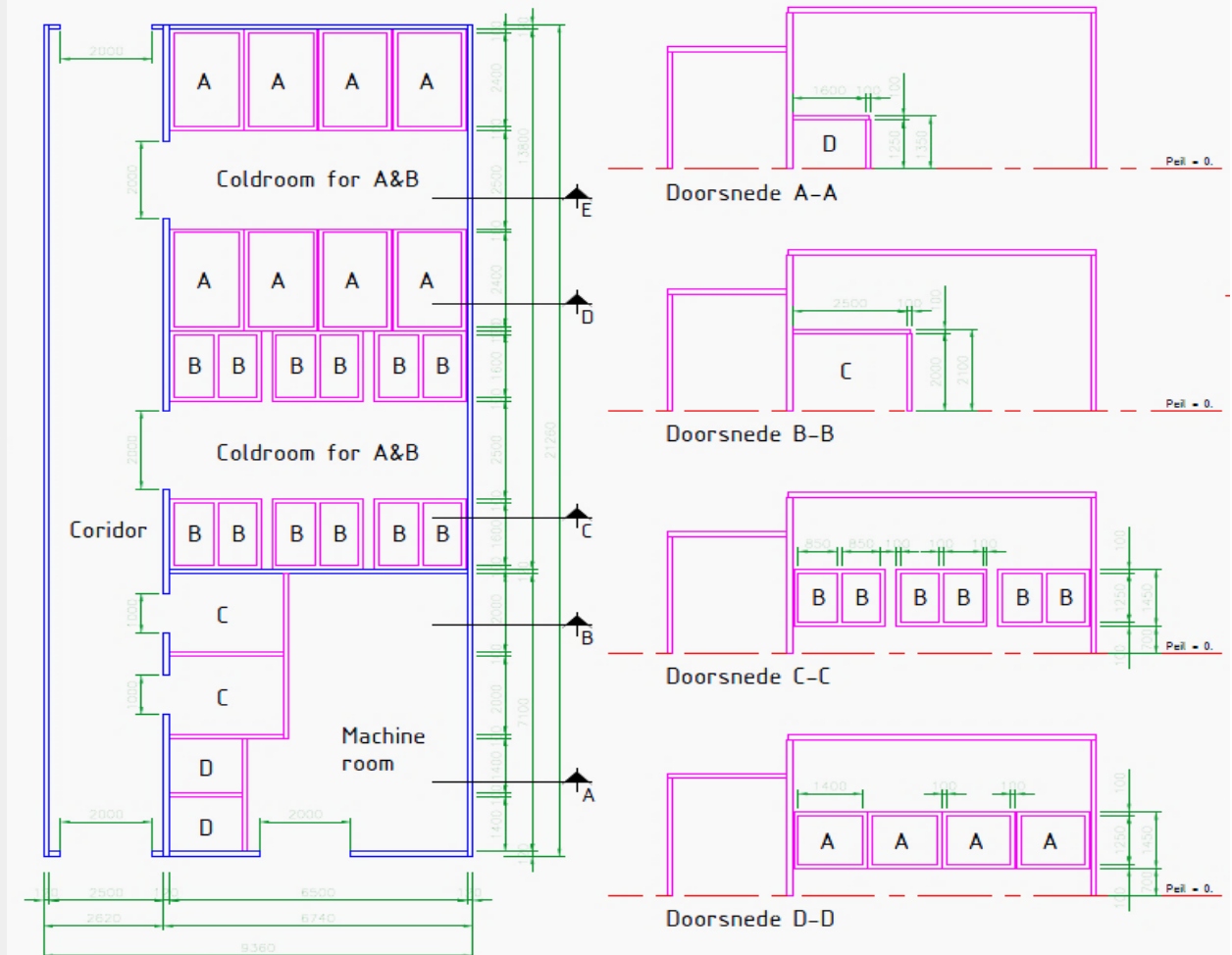
Lab Setup for potential client

- 8x CA big cabinets (A)
- 12x CA small cabinets (B)
- 2x Shelf-life room (C)
- 2x Ripening cabinet (D)
- Coldroom for A & B
- Machine room
- Independent control:
 - Temperature (CO2/Glycol cooling system)
 - RH & Temp.
 - Pressure
 - CO2 & O2 & Ethylene
 - Respiration (ACR)

Total price 850K EUR

This price is based on the offer for Israel in 2023.

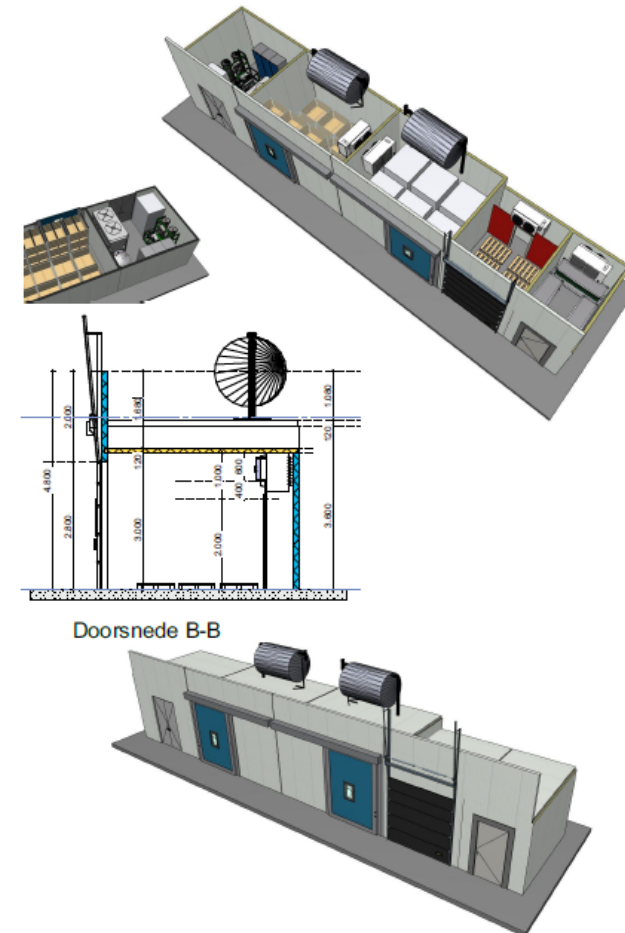
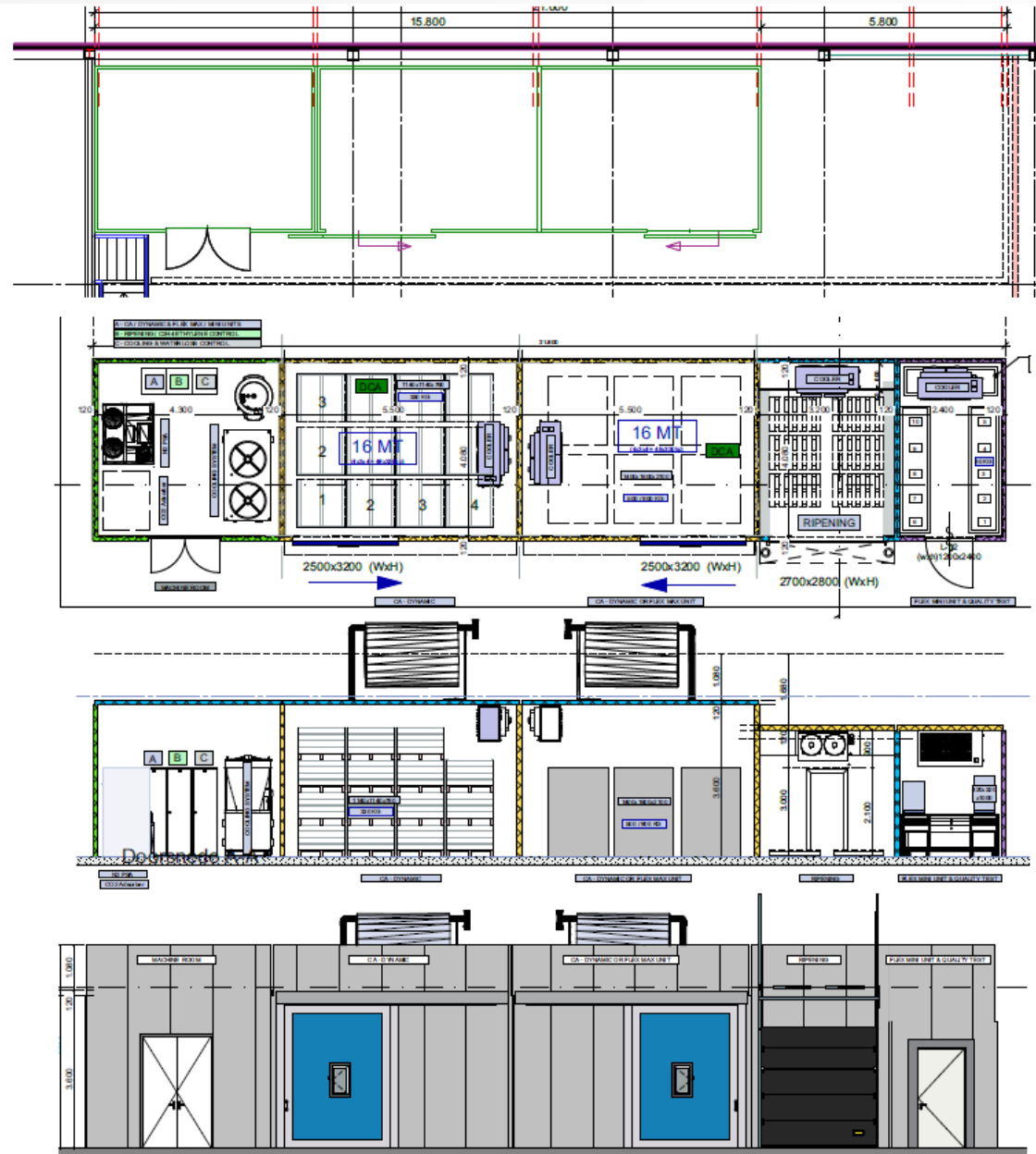
Including: installation, technical backup and followup for one season



R&D Center Design

Used by:

VAN CA technology
AMERONGEN



Doorsnede B-B

#Project Name Van Amerongen		Datum 01-03-2021 22-03-2021
Onderdeel CA + RIPENING + R&D		
Projectnummer Nr. project	Schaal 1:100	A3-V105

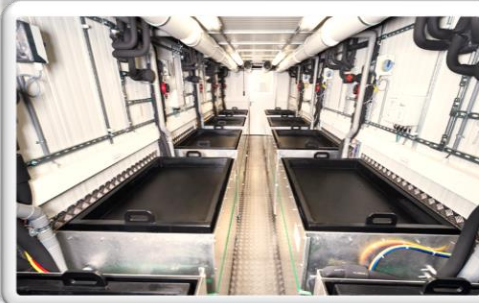
A FEW REPRESENTATIVE R&D Centers

❑ **Container lab unit**

Wageningen WFBF
University of Stellenbosch
ExperiCo
Pingnan Agri. Tourism Co. Ltd
Agriculture Victoria Tatura
InHort Research Institute of Horticulture

Location

The Netherlands
South Africa
South Africa
China
Australia
Poland



Test products:

Apple, Pear, Kiwi, Mango, Pomegranate,
Melon, Cherry, Blueberry, Vegetable, etc.

❑ **Flex mini unit**

University of Faisalabad
University of Talca
Akdeniz University

Location

Pakistan
Chile
Turkey



Test products:

Apple, Mango, Mandarine, Banana,
Pomegranate, Tomato, Figs, etc.

A FEW REPRESENTATIVE R&D Centers

❑ Multi-lab unit

University of Faisalabad
University of Talca
Akdeniz University
Wageningen PPO

Location

Pakistan
Chile
Turkey
The Netherlands

Test products:

Apple, Mango, Mandarine,
Banana, Pomegranate, etc.



❑ Flex Max unit

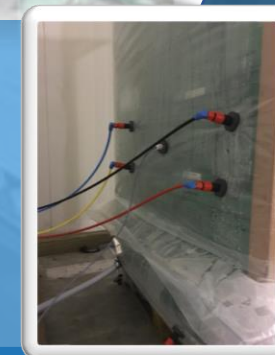
Eastpack
Van Amerongen
ExperiCo

Location

New Zealand
The Netherlands
South Africa

Test products:

Sungold kiwi, Apple, etc.



❑ CA Testing Room

Wageningen PPO
Van Amerongen

Location

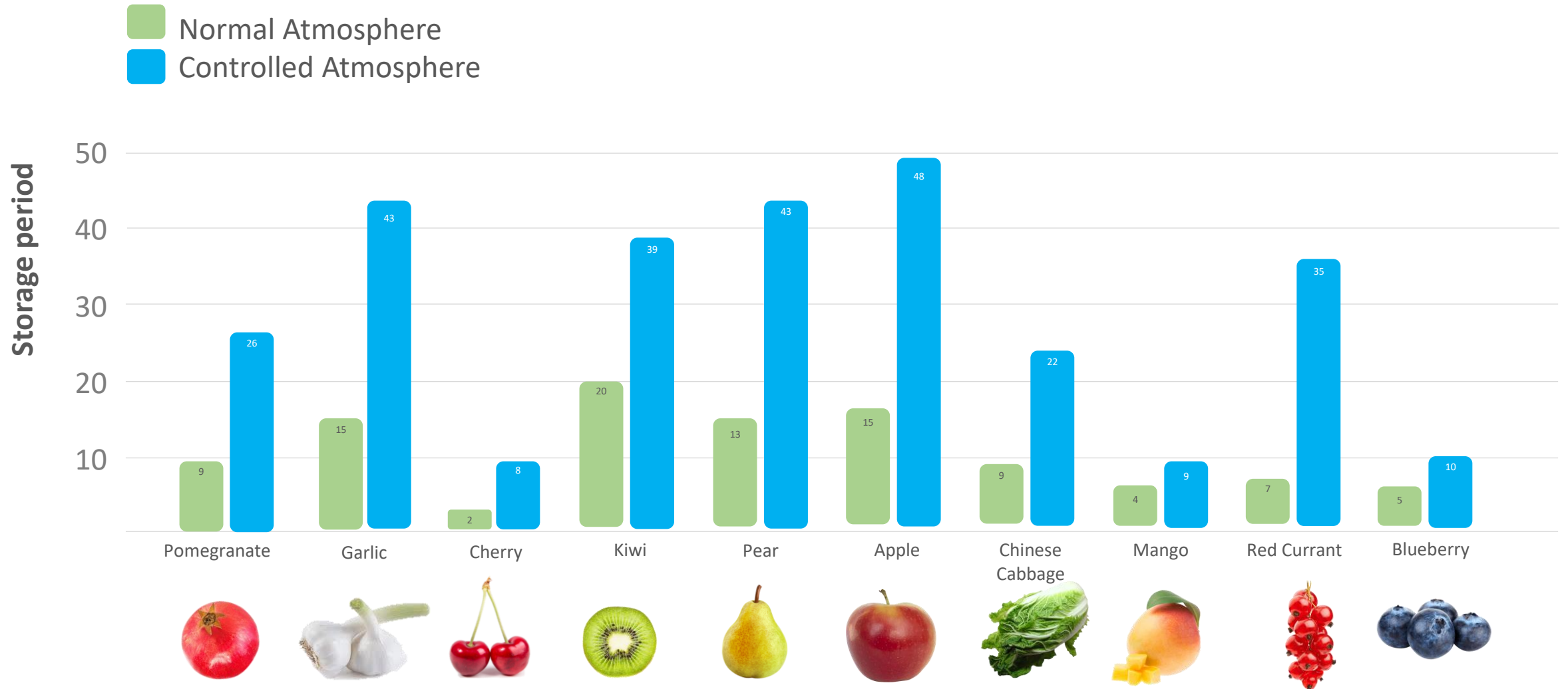
The Netherlands
The Netherlands

Test products:

Blueberry, Apple, Pear, Cherry,
Kiwi, etc.

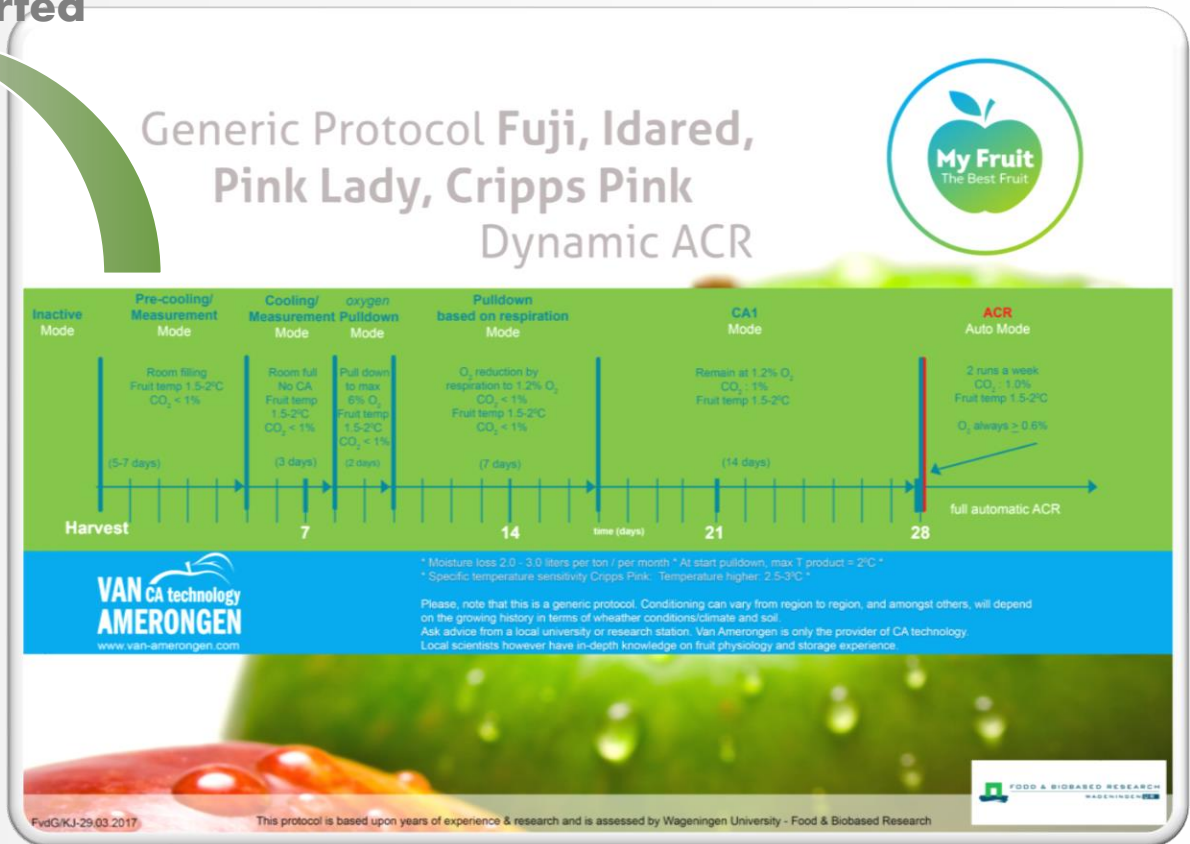


What CA can achieve



The Result of The Research is a CA Storage Protocol Suitable for Your Product

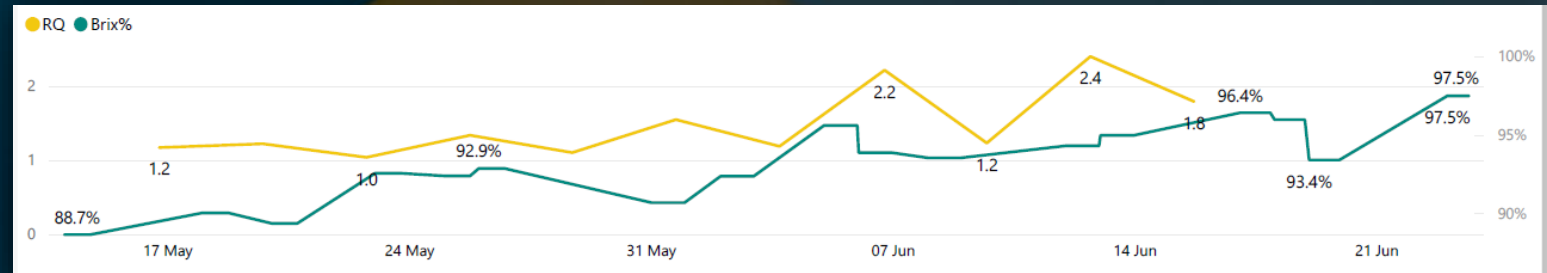
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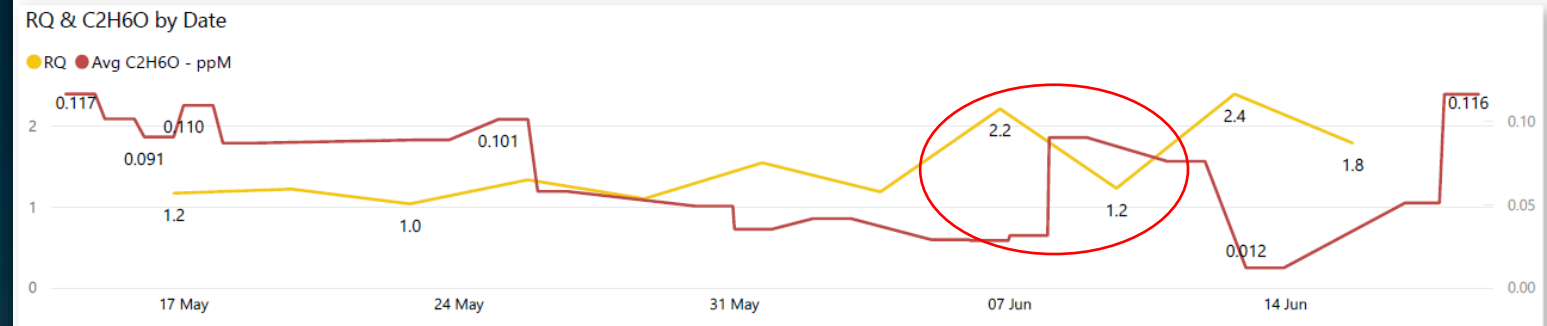
Data Logging During Testing

Clients – interaction

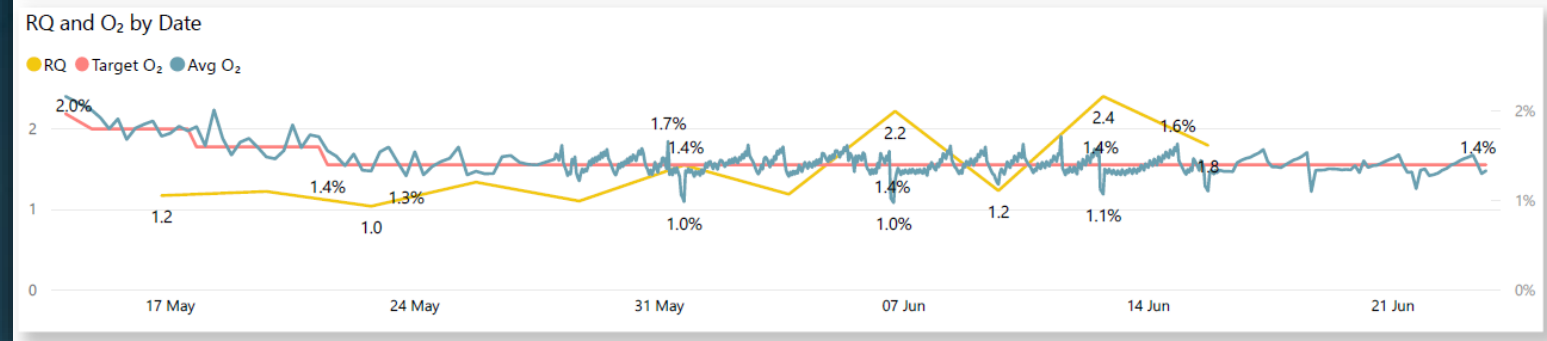
RQ & Brix



RQ & Ethanol Production



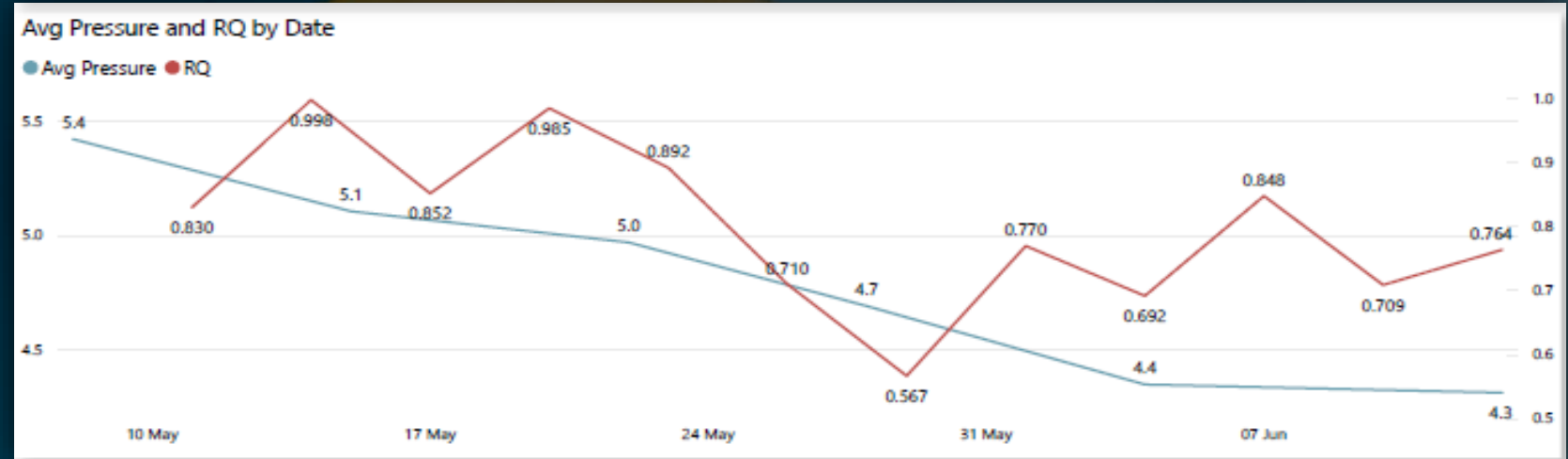
RQ & O₂ level



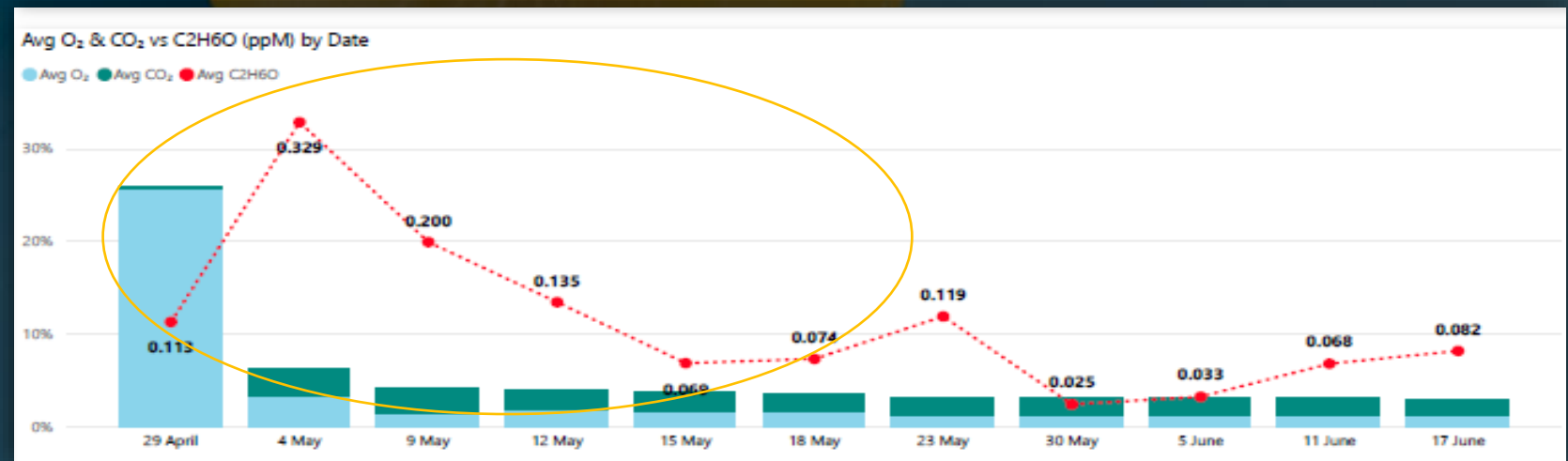
Data Logging During Testing

Clients – interaction

Firmness & RQ



O₂ & CO₂ level vs Ethanol Production





Blueberry storage information

The data mentioned below is only for reference. The optimal storage conditions depend on various factors, so there is no "one correct number" for everyone. Please feel free to post your questions below this message, so that other users, can share their experience and expertise.

Fruit information

Fruit type:	Blueberry
Binomial name:	Vaccinium sp.
Cultivar name:	'Bluecrop' 'Chandler' 'Aurora' 'Liberty' 'Duke' ...
Source fruit planting region:	The Netherlands, Argentina, Spain, Morocco, Chile, Poland (greenhouse and outdoors)

Harvest maturity indicators

Fully blue and firm

Recommended CA Storage Condition (Commercial)

* Suitable for cultivars grown in the Netherlands

Temperature:	0-1°C
RH:	90-95%
O ₂ :	3-4 %
CO ₂ :	9 %

Retail Outlet Display Considerations

Temperature:	< 5°C (reduce stem browning, shrivel, develop of decay)
RH:	Not wetted (prevent splitting)

Physiological Information:

Respiration Rate at 0°C:	3-5ml CO ₂ /kg/h
Ethylene production rate:	very low

Blueberry can be stored for 2-3 weeks in conventional cold regular atmosphere (RA) storage, but for up to 6 weeks under CA condition.

Note:

CA storage condition for other blueberry cultivars:

Imported blueberries	10% O ₂ + 10% CO ₂ (Frank, 2019-2020)
Centurion & Maru	2.5% O ₂ + 15% CO ₂ (Schotsmans et al., 2007)

Popular blueberry cultivars in NL (Commercial & Literature)

Chandler

Taste:	sweet aroma; one of the varieties with the best taste.
Cultivation:	outdoors
Availability:	June-September
CA condition:	3% O ₂ + 5-10% CO ₂ , 16 weeks (Ioana et. al., 2017)
Source of the fruits:	Arges, Romania

Aurora

Taste:	acidic
Cultivation:	outdoors
Availability:	June-September
Size:	medium to large,
CA condition:	13% O ₂ + 5-6% CO ₂ , >5 weeks (Jessica & Juan, 2016)

Liberty

Taste:	sweet, yet acidic
Cultivation:	outdoors
Availability:	June-September
Appearance:	Medium to large light blue fruit,
Size:	10-20mm
SSC (sugar):	7-16 °Brix
Storage period:	5-6 weeks
CA storage:	This variety can reach 95-96% of the export quality (other varieties are 70-75%)

Duke

Taste:	sweet, yet acidic
Cultivation:	greenhouse
Availability:	April-June
Size:	8-20mm (A AA AAA level)
SSC (sugar):	9-15°Brix
Storage period:	6 weeks

Duke is the standard product for long-distance transportation.

CA condition:	18 % O ₂ + 6-12 % CO ₂ (Harb & Jamil, 2004)
Respiration rate	(18% O ₂ +12% CO ₂): 12.1 ml CO ₂ /kg*h
Respiration rate (non-CA):	10.6 ml CO ₂ /kg*h

*If you want to know exactly what the best storage condition for your fruit is, please always get advice from an expert. Van Amerongen do not accept any liability for these recommendations.

Need advice or curious about which solutions are available for you?

Contact us now and we will be happy to help you! info@van-amerongen.com or +31 344 670 570





Onion storage information

The data mentioned below is only for reference. The optimal storage conditions depend on various factors, so there is no 'one correct number' for everyone.

Fruit information

Product type:	Onion
Binomial name:	<i>Allium cepa</i> L.
Cultivar name:	'Hyred' (red), 'Hercules' (yellow), 'Sierra Blanca' (white), 'Sherpa', 'Exhibition' (salad)
Source fruit planting region:	South-Estonia, Mexico, Germany

Quality parameters/maturity indices at commercial harvest

'Hercules' (yellow) in South-Estonia	
Dry matter:	10.93 % (Pöldma et. al., 2012)
SSC:	11.50 °Brix
Pungency:	7.13 µmol of pyruvic acid/g
Harvest standard:	70-80% of onions tops down
'Hyred' (red) in South-Estonia	
Dry matter:	11.40 %
SSC:	12.2 °Brix
Pungency:	7.83 µmol of pyruvic acid/g
Harvest standard:	70-80% of onions tops down
'Exhibition' (salad) in South-Estonia	
Dry matter:	5.45 %
SSC:	6.88 °Brix
Pungency:	3.46 µmol of pyruvic acid/g
'Sierra Blanca' (white) in Mexico	
Total carbohydrate content:	2.54 % (I.J. Rios-Gonzalez et. al., 2018)
Pungency:	1.27 µmol of pyruvic acid/g
'Sherpa' (yellow) in Germany	
Dry matter:	12 % (Praeger et. al., 2003)
SSC:	7.4 °Brix

Pretreatment

Pungent onion
Curing: field curing when temperatures are at least 24°C or forced air-curing by 12 hours exposure at 30 to 45°C.
Salad onion
Drying for 10 days at 25-30°C, then curing.

Recommended CA Storage Condition

* Suitable for cultivars 'Hercules' (yellow) & 'Hyred' (red) in South-Estonia	
Temperature:	2±1 °C
RH:	65-75 %
O2:	1-3 %
CO2:	5 %
Storage period:	5-6 months
* Suitable for cultivars 'Exhibition' (salad) in South-Estonia	
Temperature:	2±1 °C
RH:	65-75 %
O2:	1-3 %
CO2:	5 %
Storage period:	8 months
* Suitable for cultivars 'Sierra Blanca' white onion in Mexico	
Temperature:	2.5 °C
RH:	60-75 %
O2:	1 %
CO2:	1 %
Storage period:	7 months
* Suitable for cultivars 'Sherpa' (yellow) in Germany	
Temperature:	2 °C (Ernst et.al., 2003)
RH:	60-75 %
O2:	0.5-1 %
CO2:	N.A.
Storage period:	9 months + 3 weeks shelf-life Lower weight loss, much lower sprouting & rooting rate and higher firmness in CA than in RA (regular atmosphere)

Physiological Information:

Respiration Rate at 2°C:	Around 7 ml CO2/kg/h
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Note:

Longer storage periods lead to quality loss mainly because of rot and sprouting or rooting. Stored bulbs show increasing percentage of visible roots and rots with increasing air humidity:

*If you want to know exactly what the best storage condition for your fruit is, please always get advice from an expert. Van Amerongen does not accept any liability for these recommendations.

Need advice or curious about which solutions are available for you?

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FRUIT STORAGE



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The next level of CA storage

CA EQUIPMENT



RESEARCH
CONTROL



CA CONDITIONS



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COOLING CONTROL



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