

**Organiza • Organitza:**



**Interprunus**

24 Forum Internacional  
ETSEA-Universitat de Lleida - 27 abril 2023

**Patrocina:**



# Producción eficiente y sostenible de fruta de hueso combinando la innovación en material vegetal y en sistemas de formación

**Dr Ignasi Iglesias**

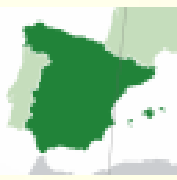
Technical & Development Manager  
Agromillora Group



Lleida, 27 abril 2023

[iiglesias@agromillora.com](mailto:iiglesias@agromillora.com)

# Surfaces and production of deciduous Fruit species in SPAIN 2020-2021



Species	Surface 2020 (ha)	Production 2020-2021 (t)
Apple	29,490	553,315
Pear	20,221	316,132
<b>Peach</b>	<b>72,058</b>	<b>1,226,084</b>
Cherry	27,911	98,393
Apricot	19,873	123,485
Plum	14,406	168,762
<b>TOTAL</b>	<b>183.959</b>	<b>2.486.170</b>

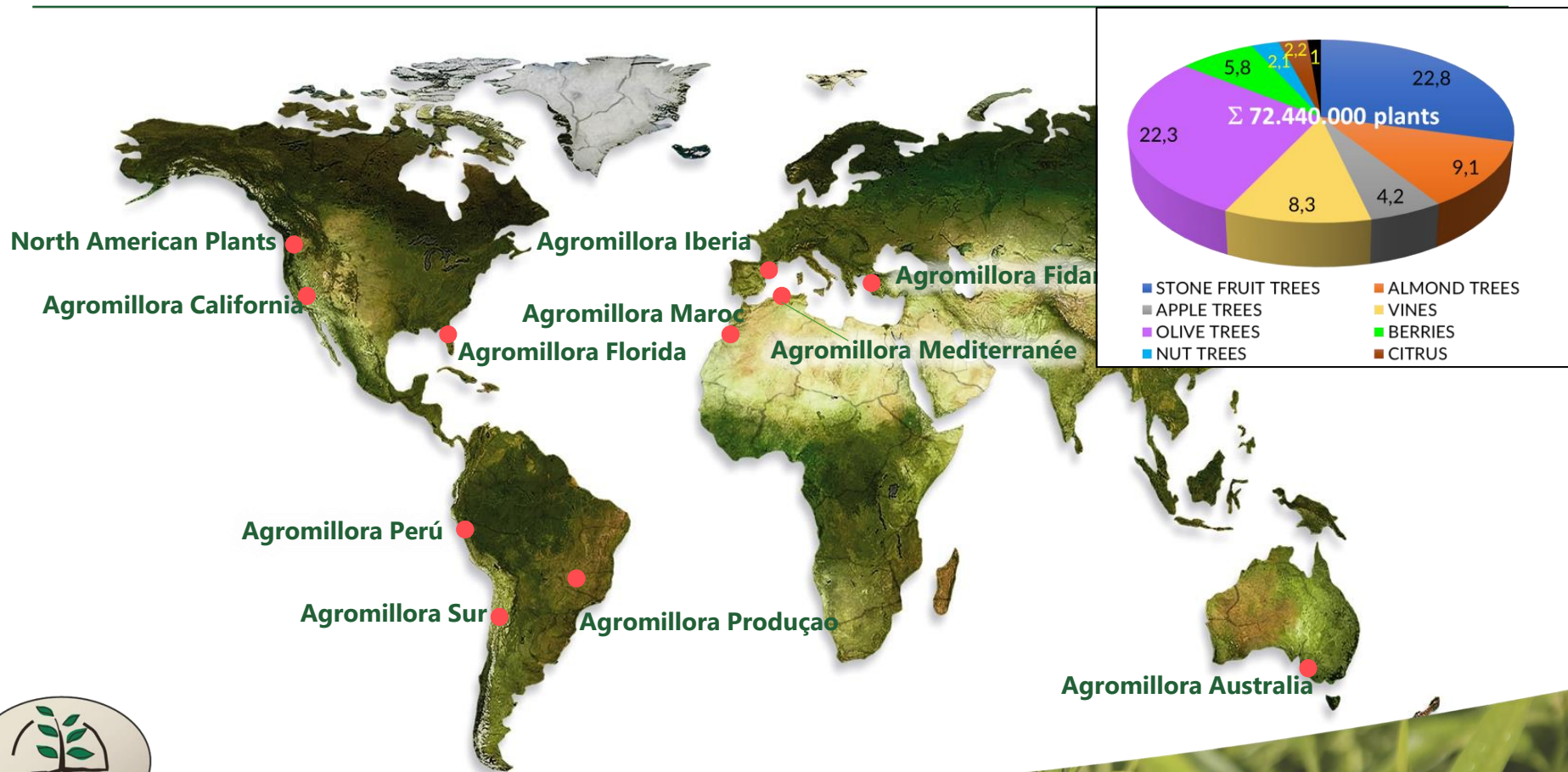
# CONTENIDO

- 1.- El contexto global y el Green Deal*
- 2.- Insumos y costes de producción*
- 3.- La intensificación sostenible*
- 4.- Del 3D al 2D en melocotonero: efecto en los costes y en la calidad del fruto*
- 5.- Los sistemas en eje, bi-eje y multi-eje*
- 6.- La producción del futuro*



**AGROMILLORA**  
It's in our nature

# Unique MULTINATIONAL Company in the nursery sector

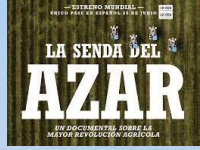




370.000 has



<https://youtu.be/unuJImvQnDU>





# Altissima densità o altissima sostenibilità?

Di **Salvatore Camposeo**

13 Gennaio 2020

Dipartimento di Scienze Agro-Ambientali e Territoriali  
Università degli Studi di Bari Aldo Moro

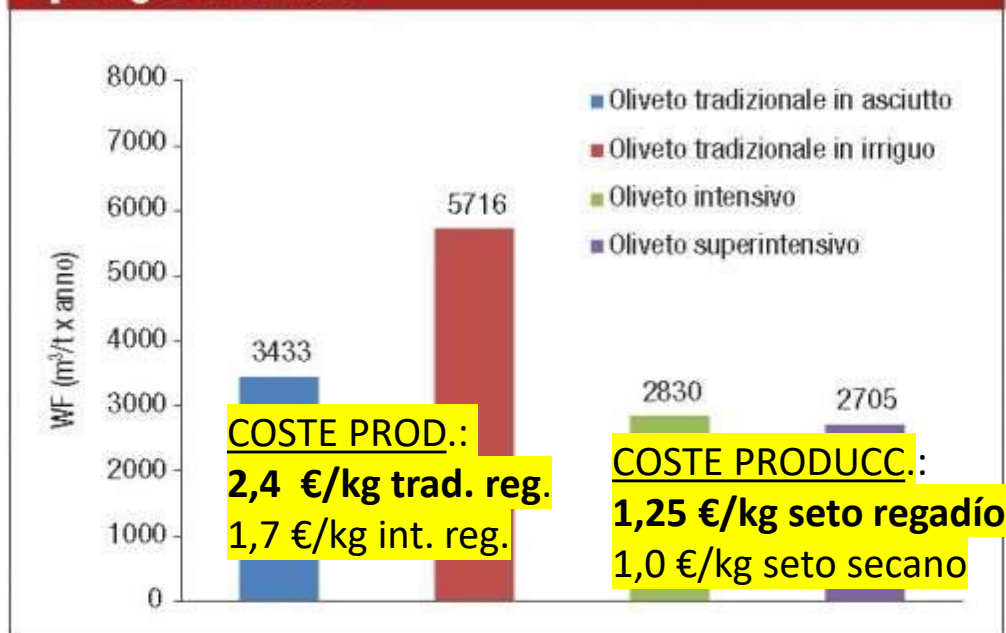
Olivo e Olio n. 1/2020



Prof. S. Camposeo



**Grafico 1 - Impronta dell'acqua (WF) per diverse tipologie di oliveto (per ton. d'olio)**



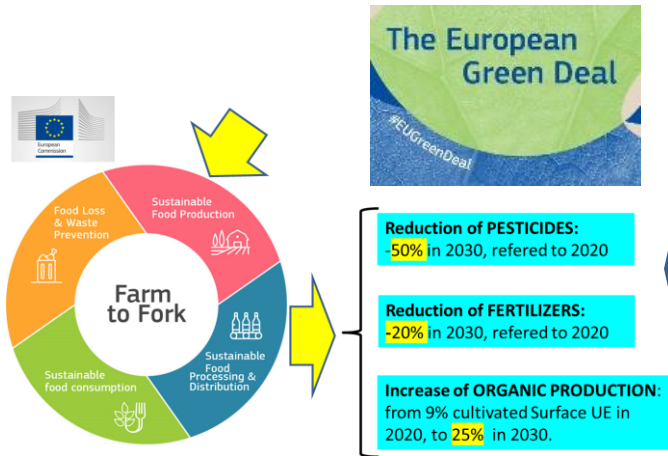
<https://olivoelilio.edagricole.it/oliveto-e-frantoio/oliveto-superintensivo-altissima-densita-sostenibilita/>

**Environmental sustainability by LCA analysis of different soil managements in a high-density olive orchard**

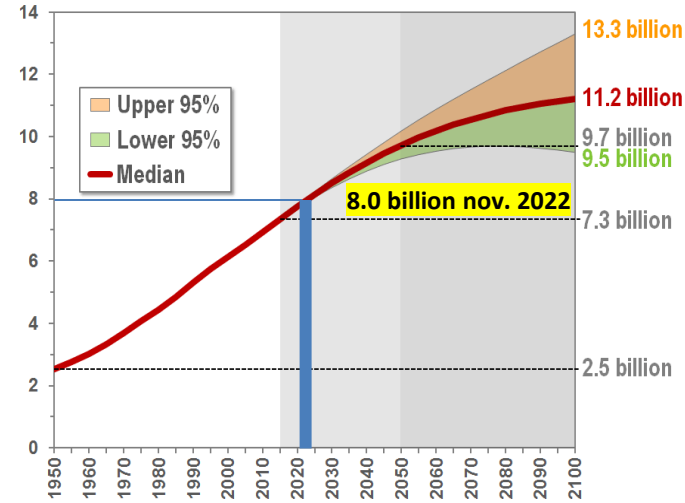
Giovanni Russo\*, Gaetano A. Vivaldi, Bernardo C. De Gennaro, Salvatore Camposeo

*Giovanni R., Vivaldi, G.A., DE GENNARO, B.C., Camposeo, S. 2015. Environmental sustainability of different soil management techniques in a high-density olive orchard. DOI:10.1016/j.jclepro.2014.06.064. pp.498-508. In JOURNAL OF CLEANER PRODUCTION - ISSN:0959-6526 vol. 107*

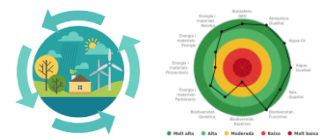
# GLOBAL CONTEXT FOR AN EFFICIENT PRODUCTION



## CLIMATE CHANGE



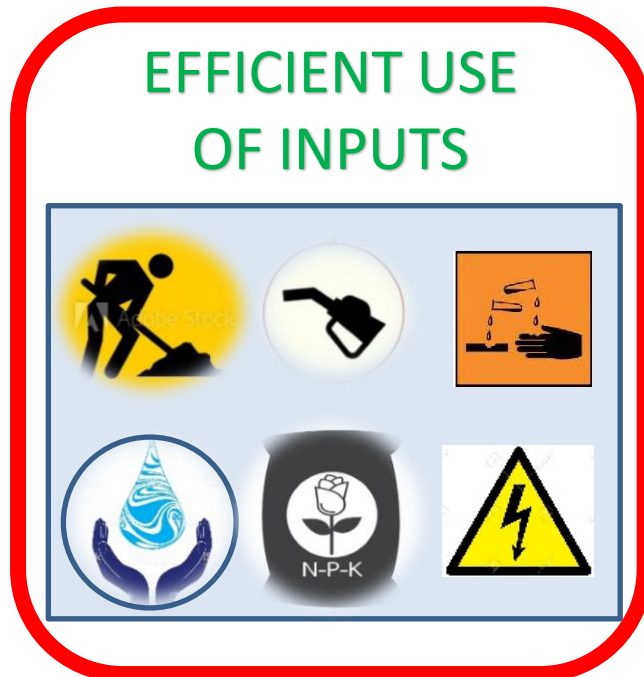
## ENVIRONMENTAL SUSTAINABILITY



## PROFIT GROWER SUSTAINABILITY



## SOCIAL SUSTAINABILITY



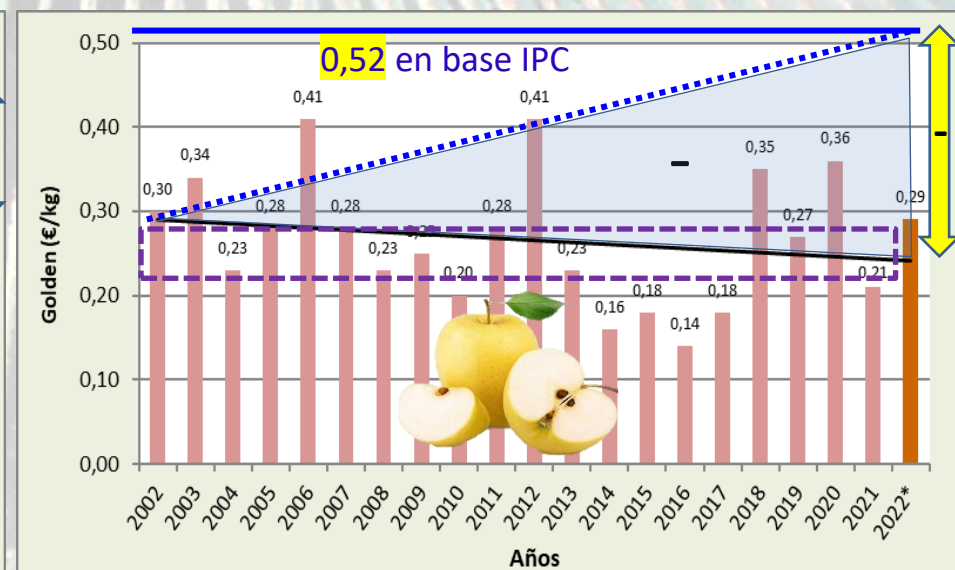
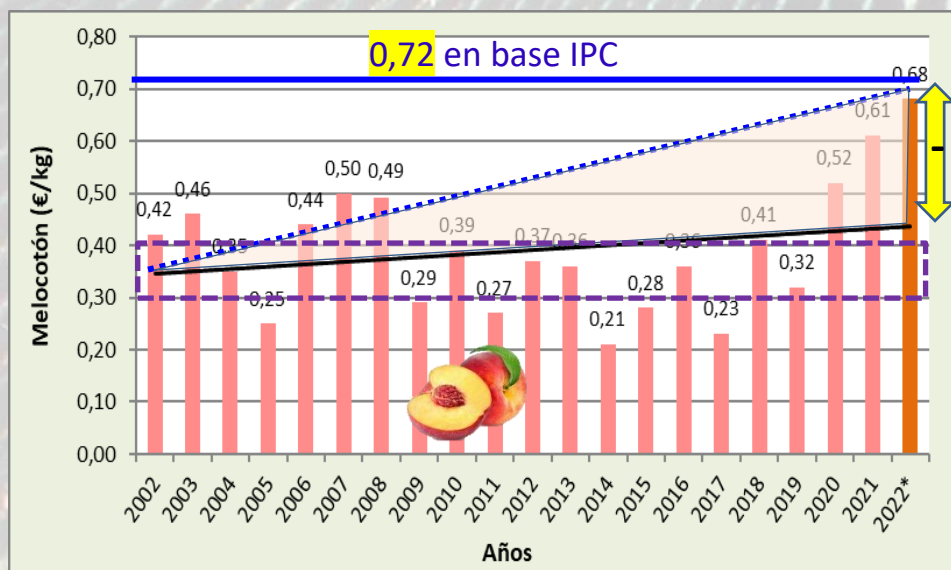
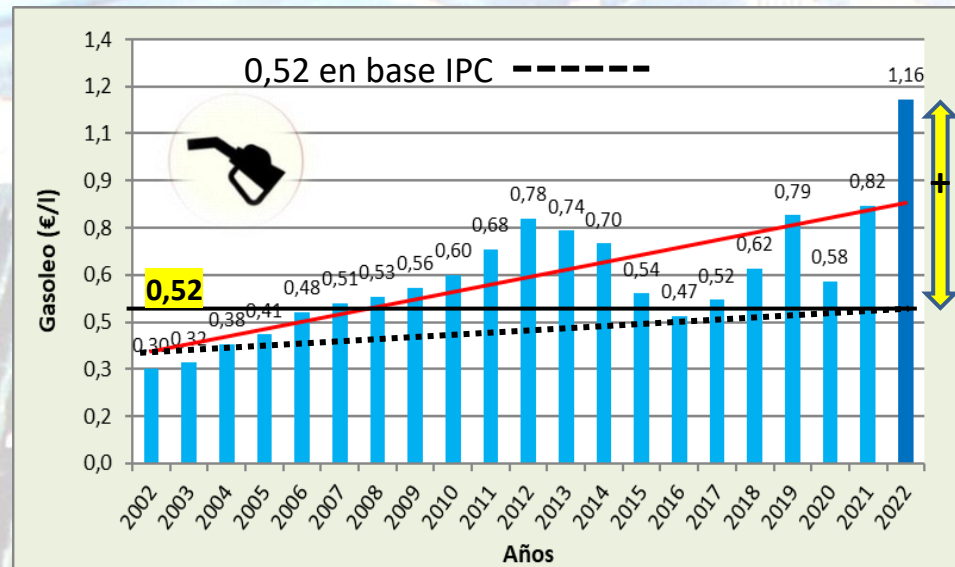
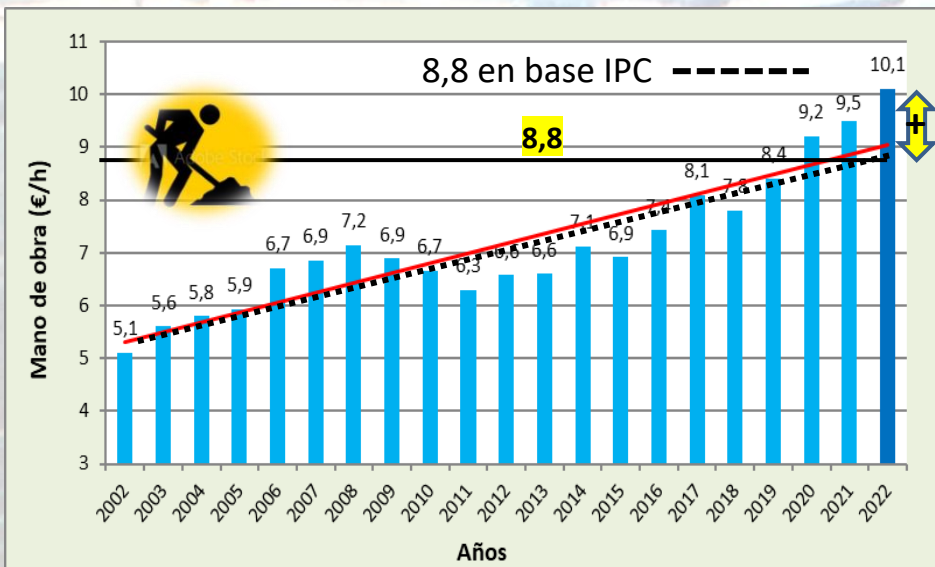
## FOOD PRODUCTION



Increase of 30% in the next 30 years



# Evolution of prices\* of inputs, outputs and CPI (IPC) in the period 2002-2022

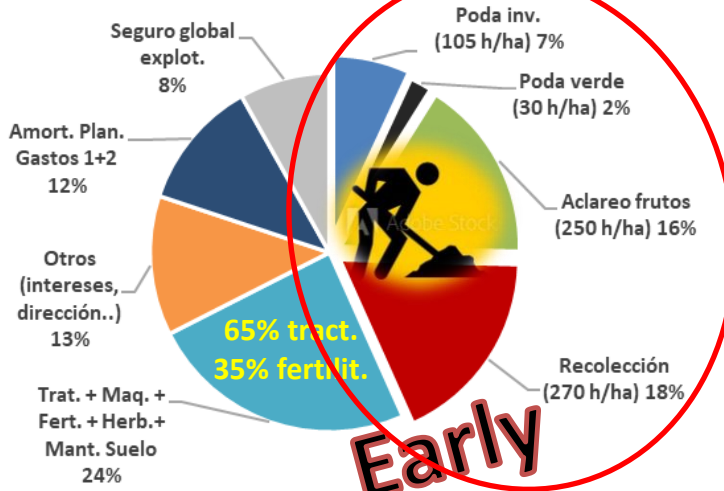


\* Constant prices



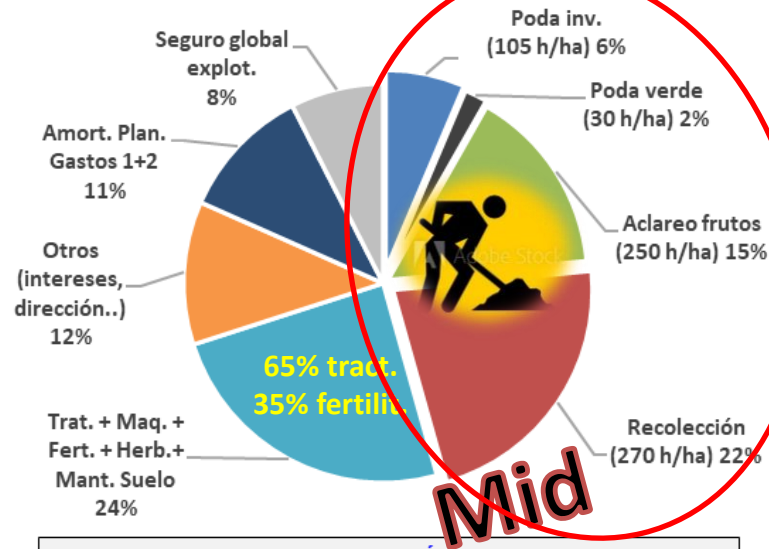


# Production costs peach 2022 & maturity time

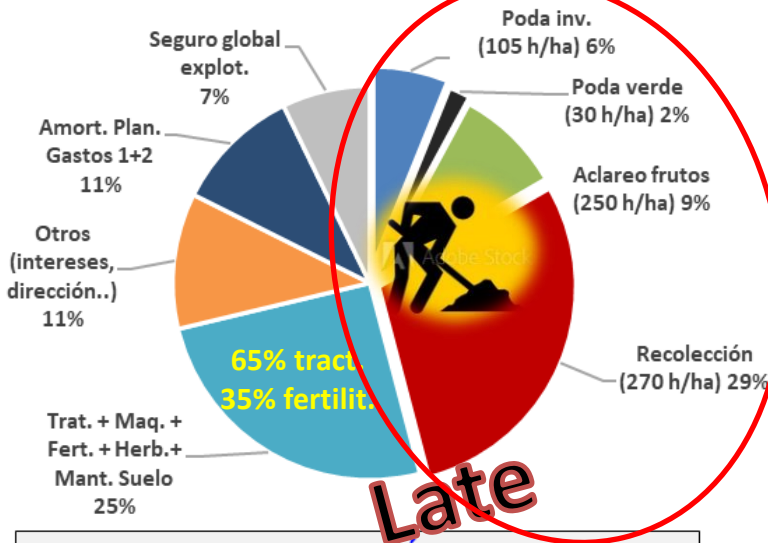


**COSTE TOTAL PROD. MELOCOTÓN PRECOZ 2022 = 0,53 €/kg**  
(30 tons/ha, 16.048 €/ha-año)

Considering mid blooming intensity varieties



**COSTE TOTAL PROD. MELOCOTÓN MEDIO 2022 = 0,43 €/kg**  
(17.200€/ha-año y 40 t./ha)



**COSTE TOTAL PRODUCCIÓN 2022 = 0,34 €/kg**  
(55 tons/ha, 17.248 €/ha-año)



# Los tres pilares para plantaciones eficientes y sostenibles

Variedad y  
portainjerto

Sistemas de formación  
y arquitectura de copa

Producción  
y tecnología



**1**

Mejora  
Genética

**2**

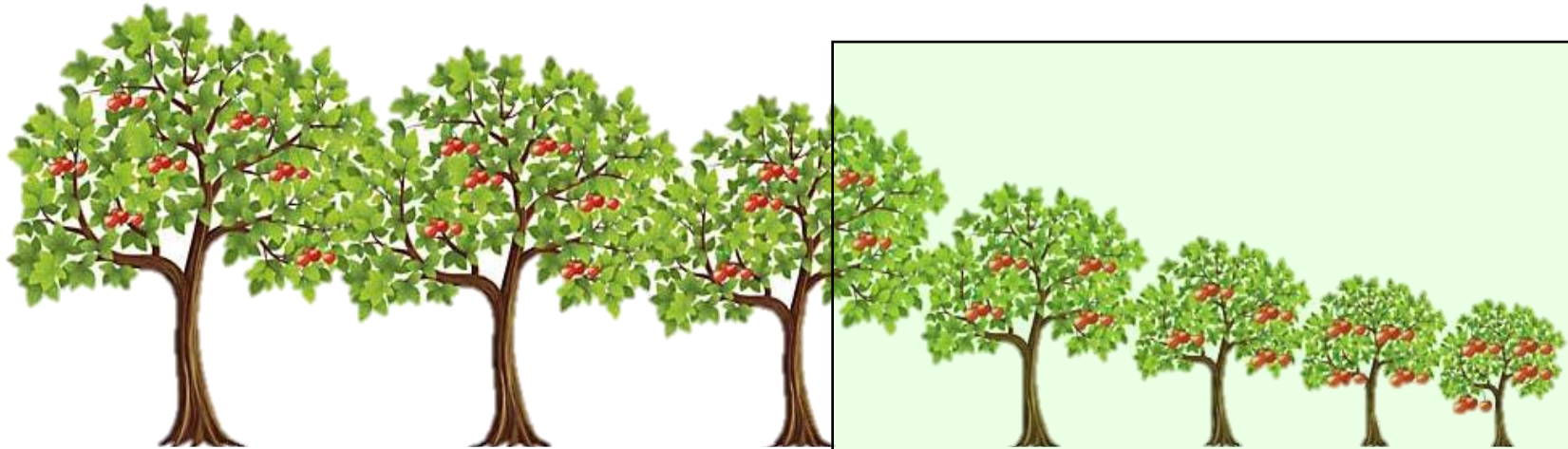
Modelos  
Agronómicos

**3**

Tecnología de  
producción



# VIGOUR CONTROLLING ROOTSTOCKS ARE REQUIRED TO DEVELOP PLANAR CANOPIES OF INTENSIVE ORCHARDS



SPECIES	Very high	High	High-mid	Mid	Mid-low	Low
<b>APPLE</b>	Franco, M-25	M-4, M-793, MM-111	M-7, MM-106 G-257, G-969	M-26 G-41, G-213	M-9 EMLA o NAKB G-11	M-27, B-9 G-65
<b>PEAR</b>	Kirschensaler, BP-3, OHF-93	OHF-87, BP-1	BA-29 Pyrod	M-A	M-H	M-C
<b>PEACH</b>	GF-677 Garnen Nemaguard Atlas	Montclar, GF-305 Cadaman Lovell, Kuban	Rootpac-P Tetra Penta	Adesoto-101 Isthara Controller-6	Rootpac-40 MP-29 Intensia	Rootpac-20 Pilowred
<b>CHERRY</b>	F-12/1, Colt Sta. Lucia (SL-64)	Adara, Maxma-14 Gisela 12, PI-KU 1	Gisela-6 Weiroot-158	Gisela 5 Clinton	Gisela-3, Lake Cass, Crawford	Clare Damil
<b>ABRICOT</b>	Franco albaicoquero	Mirobolan 29C	Montclar, GF-305 AP-65	Adesoto-101 Isthara		
<b>EUROPAN PLUM JAPANEES PLUM</b>	Marianna 2624 Marianna GF 8/1	Mirobolan 29C Adara	Rootpac-R Tetra Penta	Isthara Adesoto-101 Miral 3278- AD		Rootpac-20
<b>CITRUS</b>	C. Carrizo Citrumelo- 4475	Ma. Cleopatra Naranjo amargo	USDA-942 FA-5	FA-517 UFR-6	USDA-897	CIVAC-19

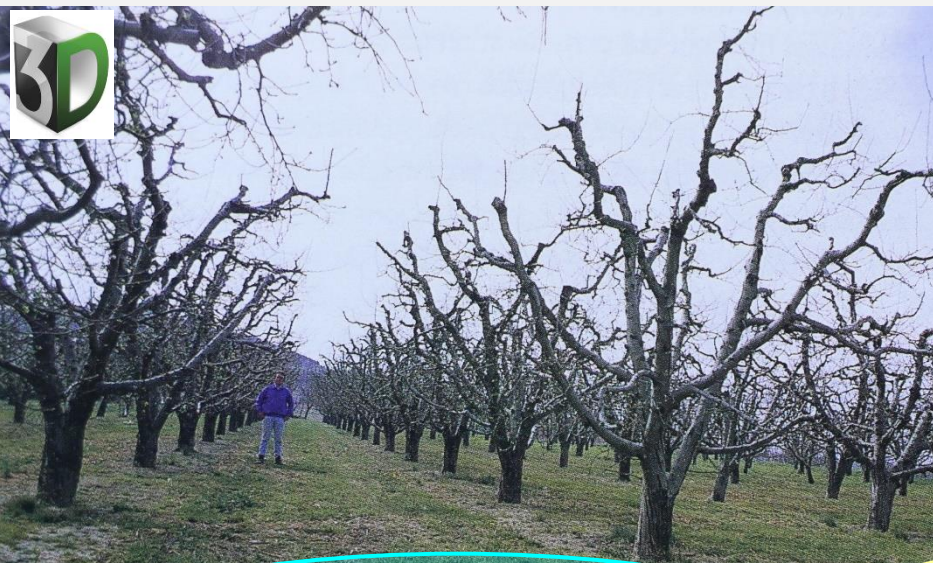


No Cultar + 1



11 Diciem. 2020

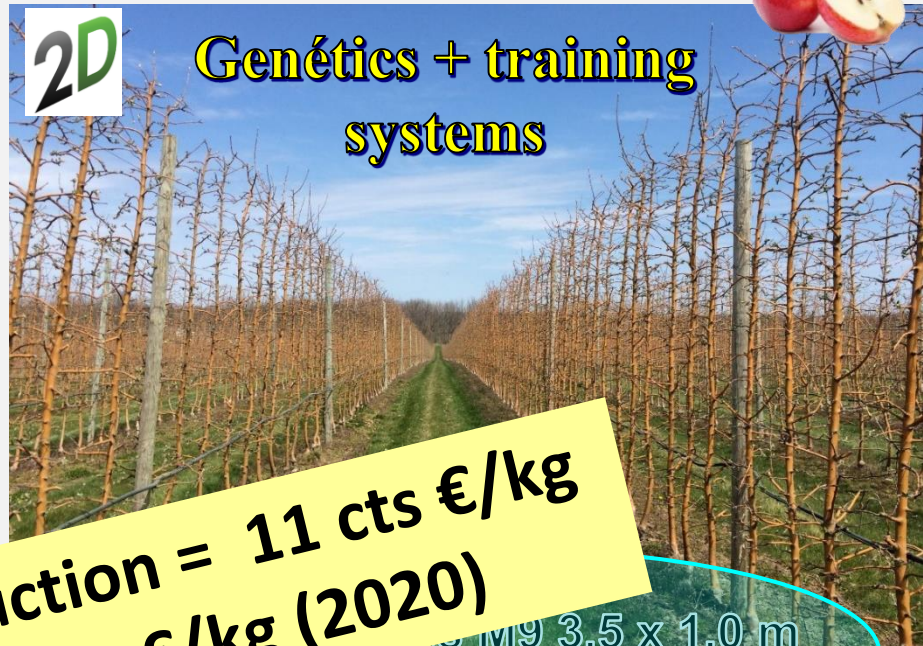
# SUSTAINABLE INTENSIFICATION IN APPLE



Gobelet MM-111 6 x 5  
(333 tre./ha)



Genetics + training systems



MM9 3,5 x 1,0 m  
(2,857 tre./ha)

**Σ Reduction cost of production = 11 cts €/kg  
(-40% cv 'Golden'): 27 cts €/kg (2020)**



125 kg/h

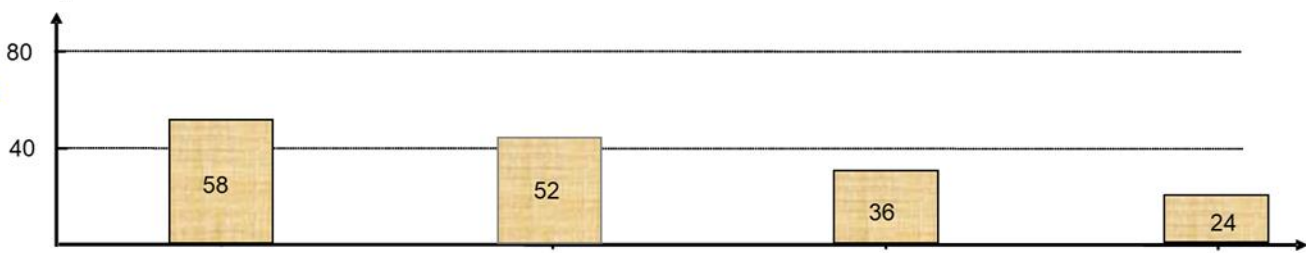


210 kg/h

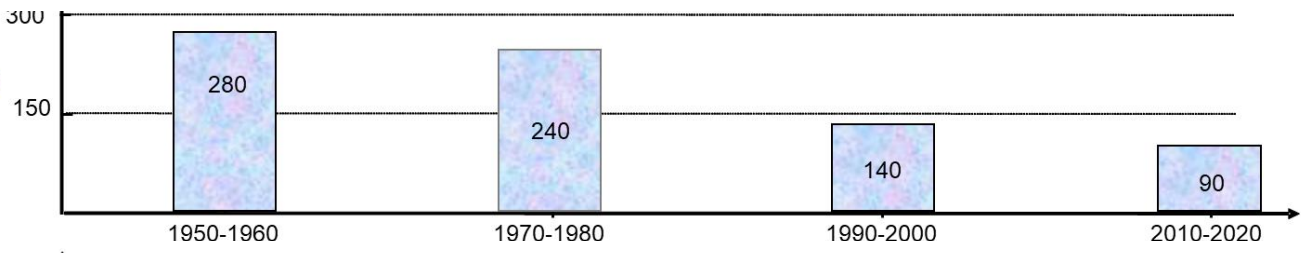
# Transition to small trees = sustainable intensification



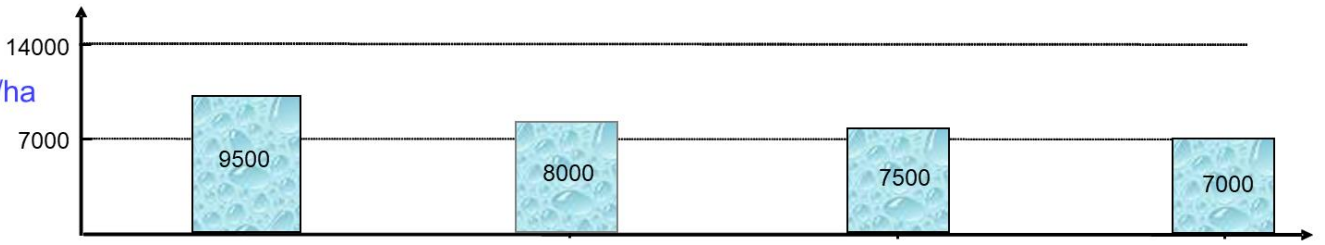
Deriva (%)



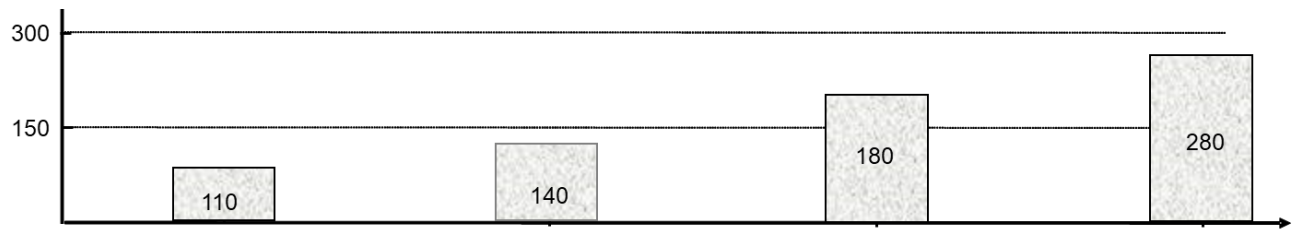
UF N/ha



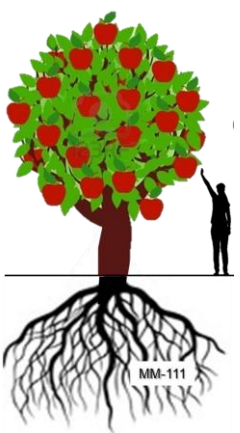
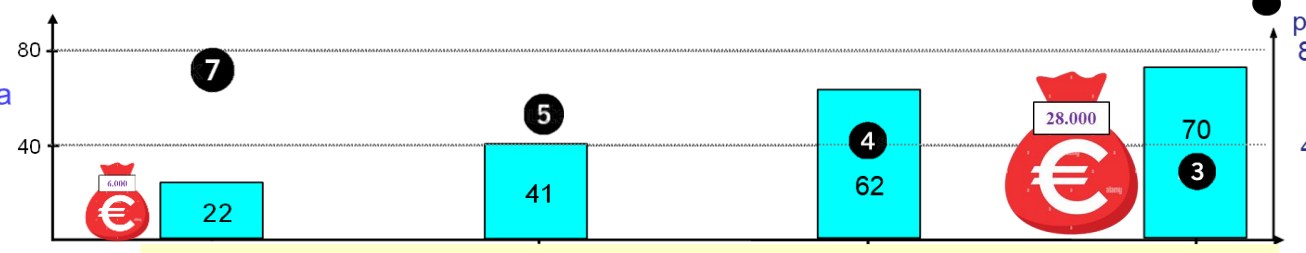
m<sup>3</sup>/ha



kg/h



t/ha



333 tre./ha



2,857 tre./ha

Iglesias, 2022

# VENTAJAS DE LA INTENSIFICACIÓN Y DE LAS COPAS BIDIMENSIONALES EN ESPECIES DE HUESO

- ✓ Más rápida entrada en producción.
- ✓ Mejor accesibilidad a la copa de personas máquinas y robots y mejor eficiencia de los mismos.
- ✓ Operaciones de poda y recolección más fáciles y más eficientes = menor coste de producción.
- ✓ Copa más eficiente para los tratamientos fitosanitarios y menor afección por Monilinia, etc..
- ✓ Mejor calidad y uniformidad de frutos.
- ✓ Mejor eficiencia en el uso del agua para protección antihelada.

## INCONVENIENTES

- ✓ Mayor inversión.
- ✓ Mayor tecnificación en el manejo del riego y la fertilización.



5 x 3 m

Canopy architecture affecting  
accessibility of labor and  
machines



4 x 2 m

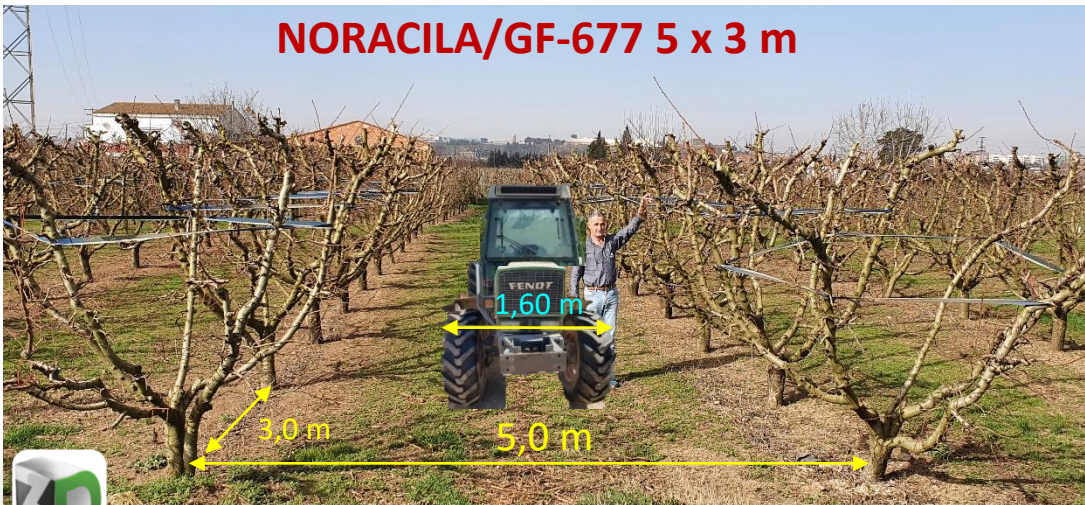
23 marzo.- 2021



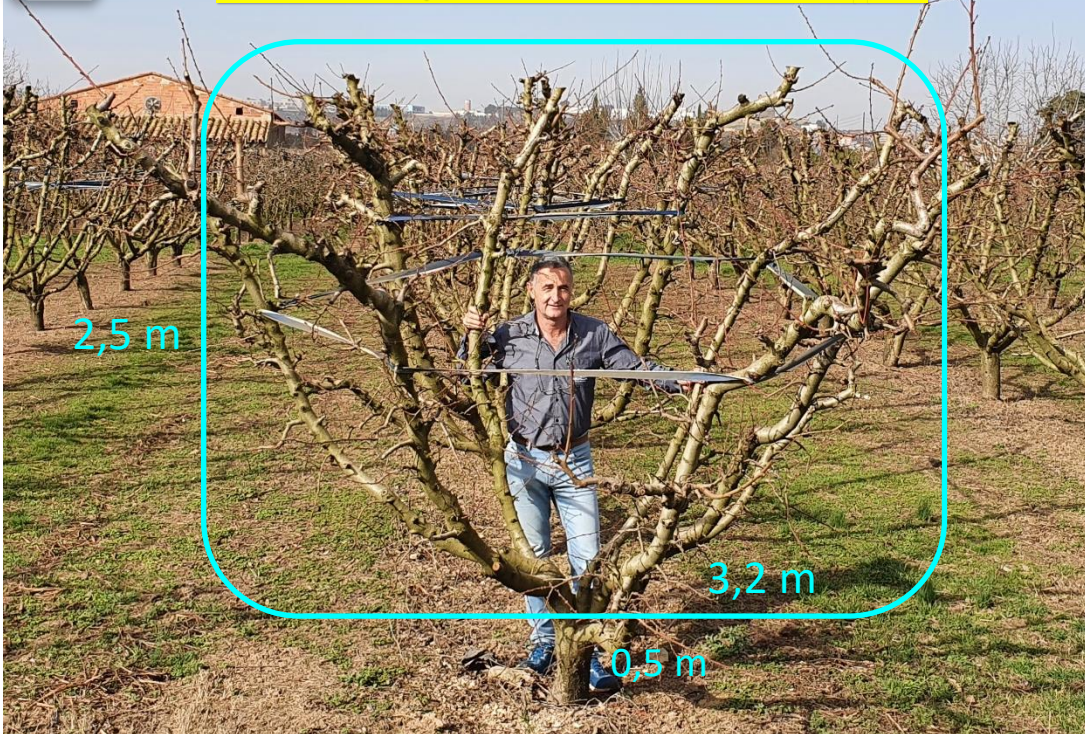
# ARQUITECTURA DEL ÁRBOL Y ACCESIBILIDAD A LA COPA



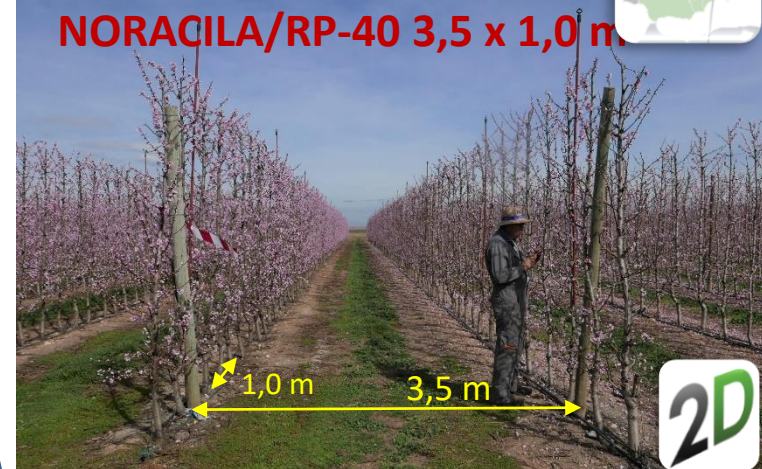
**NORACILA/GF-677 5 x 3 m**



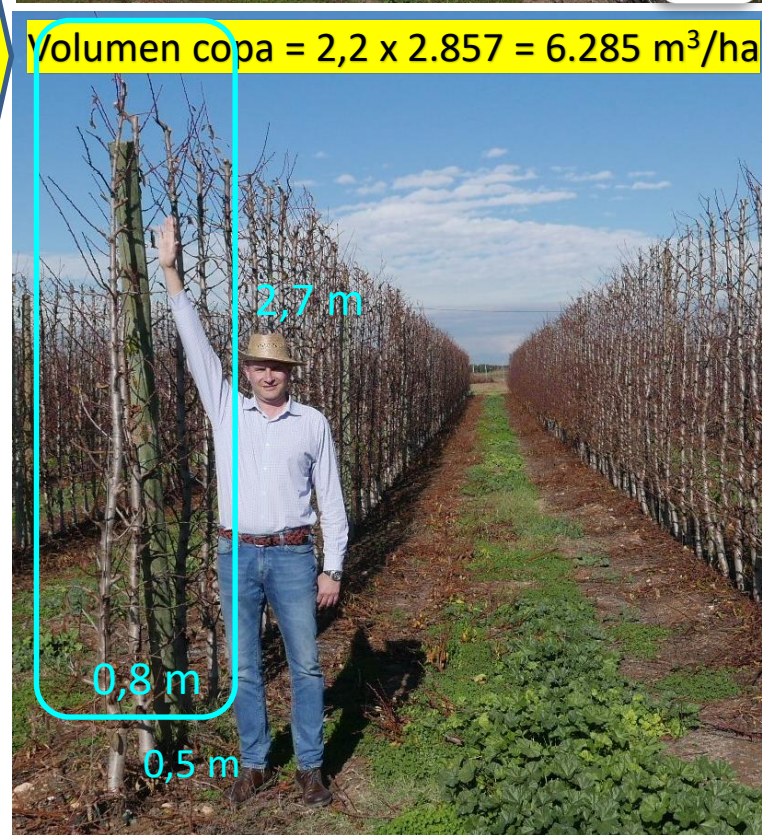
Volumen copa =  $24 \times 667 = 16.008 \text{ m}^3/\text{ha}$



**NORACILA/RP-40 3,5 x 1,0 m**



Volumen copa =  $2,2 \times 2.857 = 6.285 \text{ m}^3/\text{ha}$



# CANOPY ACCESSIBILITY AND TREE ARCHITECTURE

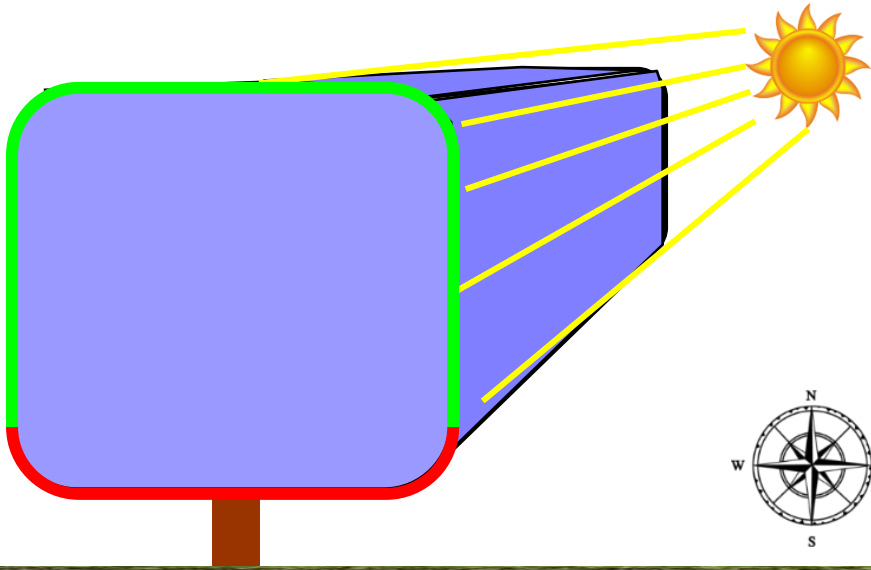


1

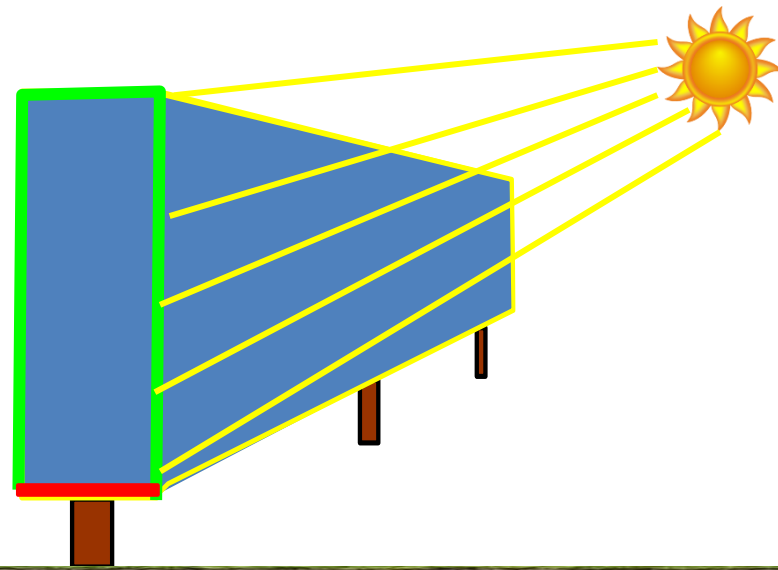


# Peripheral / Volumen canopy: comparing OPEN VASE and AXIS

✓  $\text{m}^2 \text{ canopy} / \text{m}^3 \text{ canopy} = 1,42$



✓  $\text{m}^2 \text{ canopy} / \text{m}^3 \text{ canopy} = 3,18$



**OPEN VASE**

**AXIS**

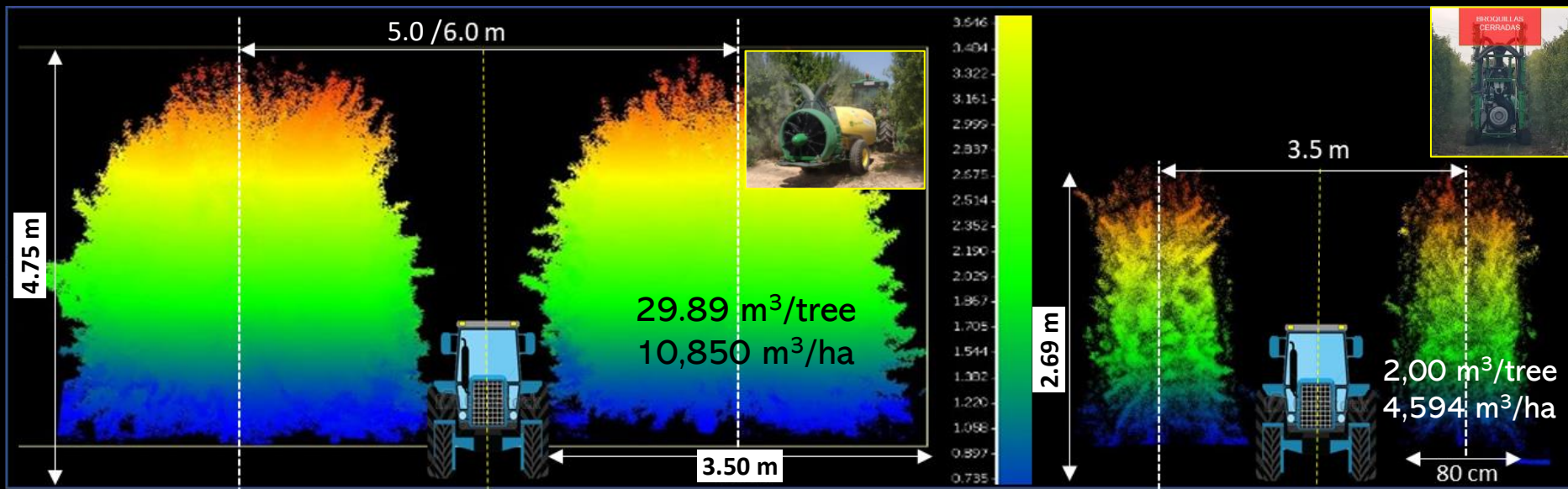


# Increasing treatments efficiency with planar canopies



**Cost of treatments 2D vs. 3D: -16 to -25% + better control of pest & diseases**

# EFFICIENCY OF TREATMENTS (2021 trial)

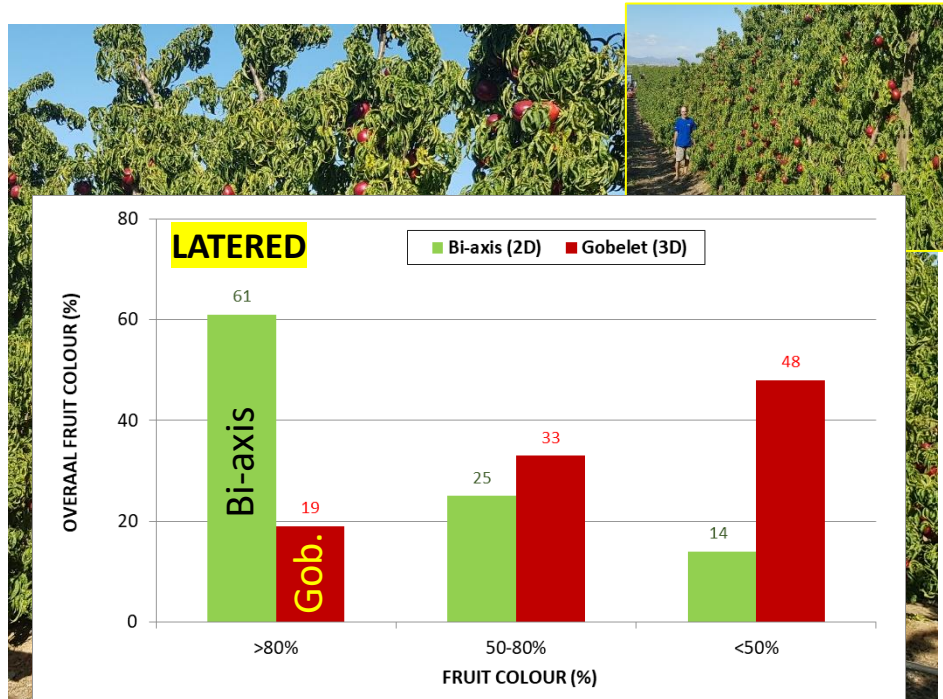
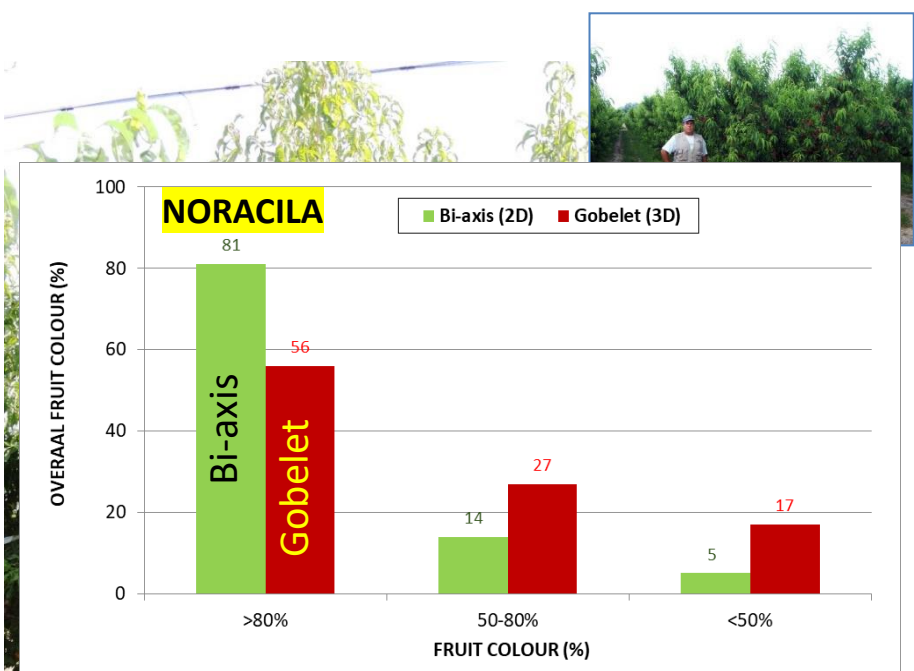


5<sup>th</sup> year of planting

FACTOR	INTENSIVE	SHD
Spacing (m) / density (tre./ha)	5.5 x 5 (363)	3.5 x 1.25 (2,285)
Canopy vol. (m <sup>3</sup> /ha)	10,850	5,720
Volum applied (l/ha)	1,130	745
Vol. applied (ml/m <sup>3</sup> canopy)	104	131
Leaf deposition (%)	69 %	76 %
Drift (%)	29.3 %	16.6 %
Cost treatments (€/ha-year)	1,014	716



# Effect of tree architecture on fruit colour: LATERED 3D < >2D



8 set.- 2020



Increasing pack-out 26%



Iglesias 2023

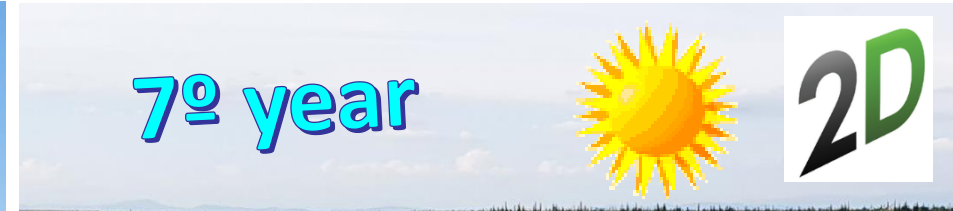
# LIGHT INTERCEPTION AND YIELD AFFECTED BY CANOPY ARCHITECTURE: 3D vs 2D

Planted March 2011: 5 x 3 m

Planted March 2011: 3,5 x 1 m

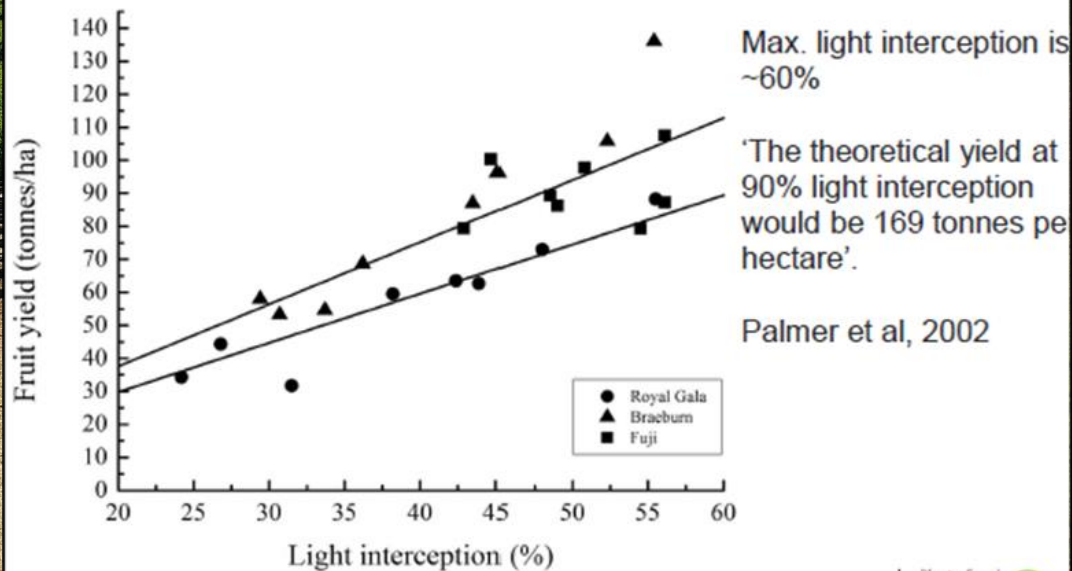


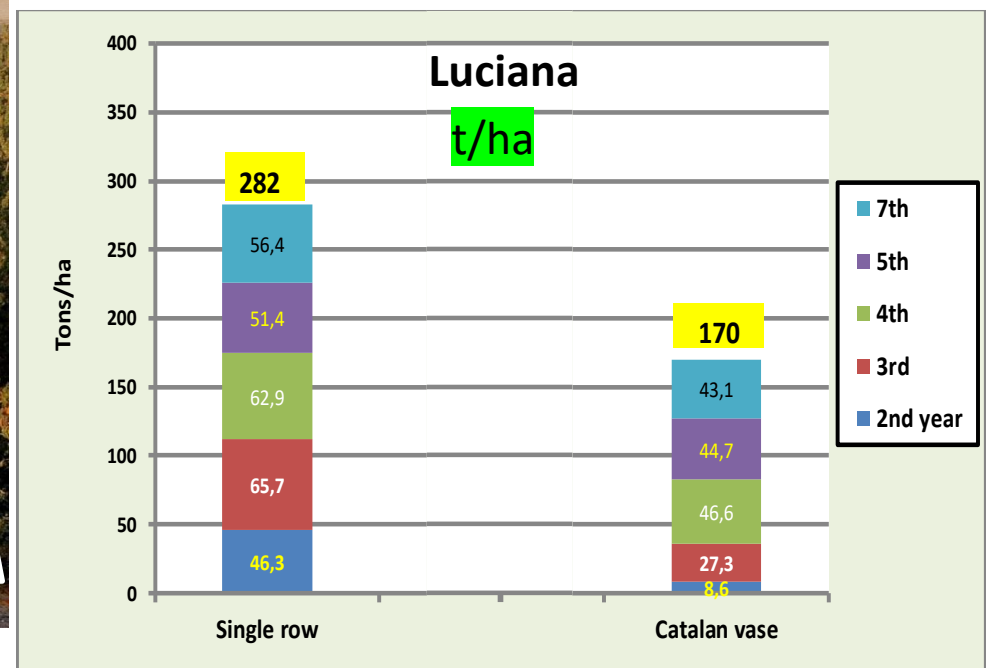
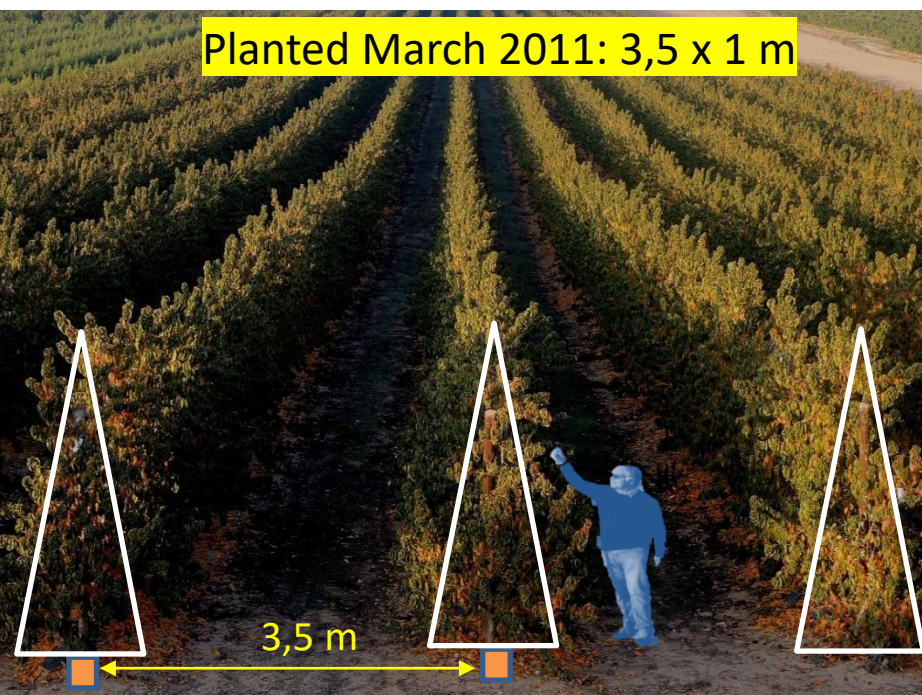
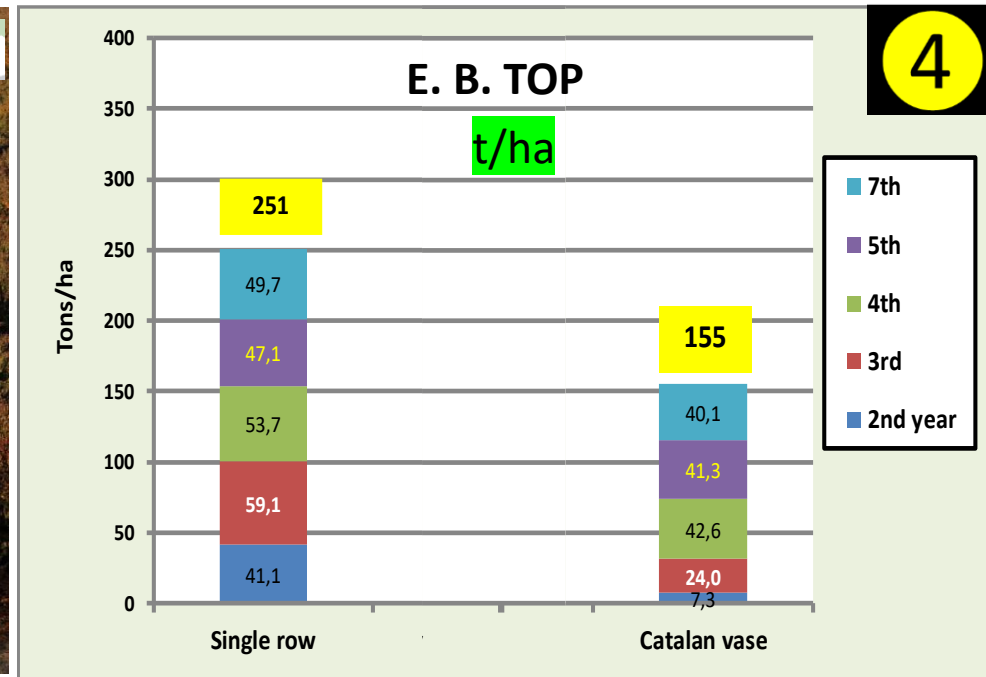
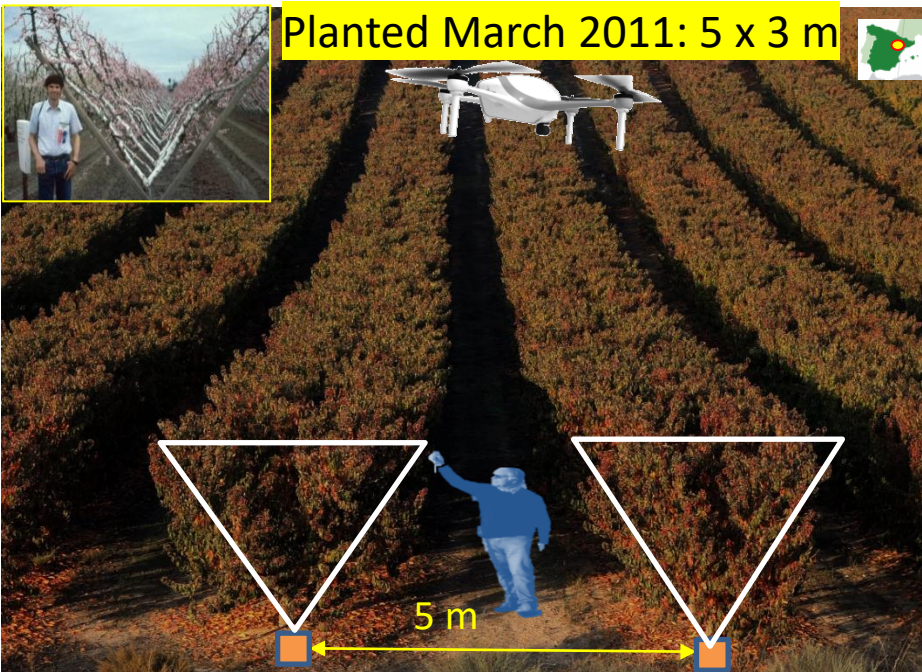
7<sup>o</sup> year



7<sup>o</sup> year

What is the physiological limit of apple orchard productivity ?



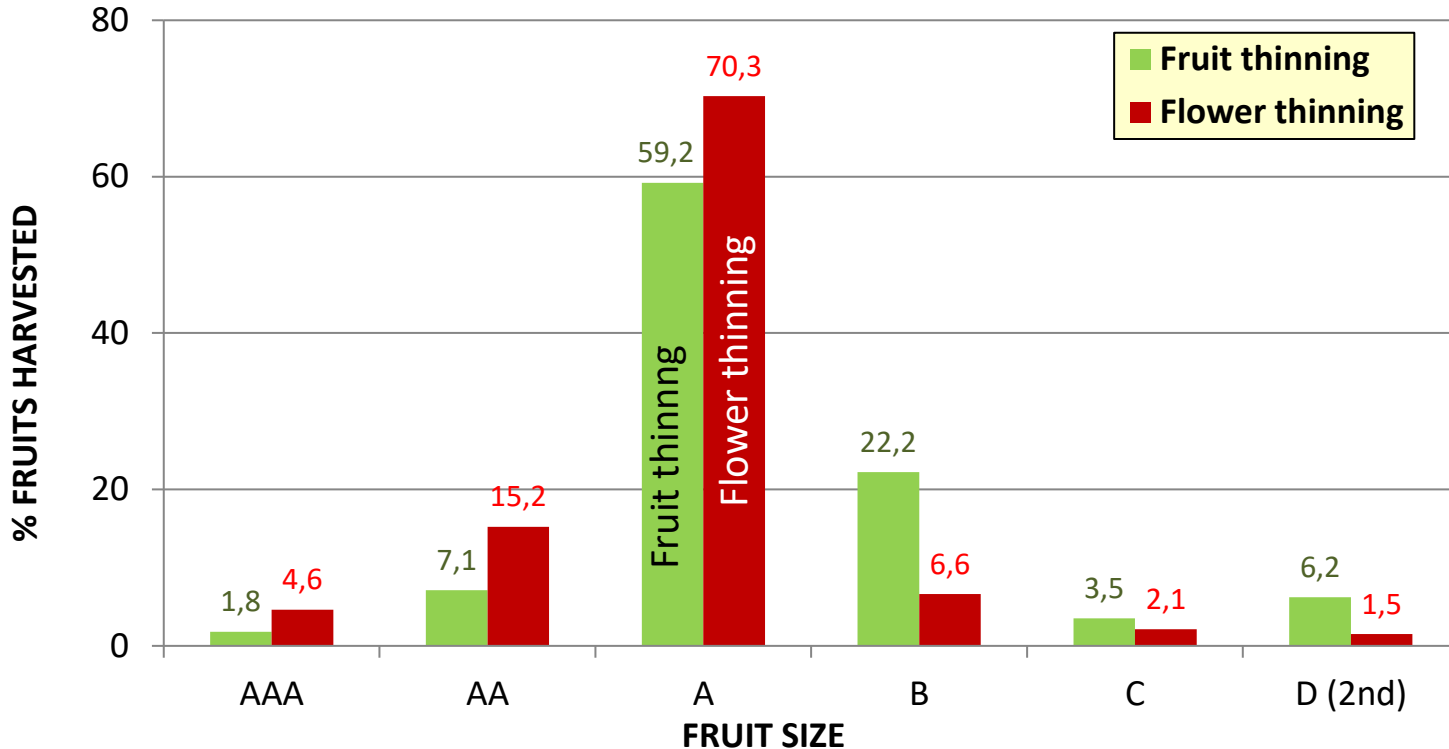




# MECHANICAL FLOWER THINNING



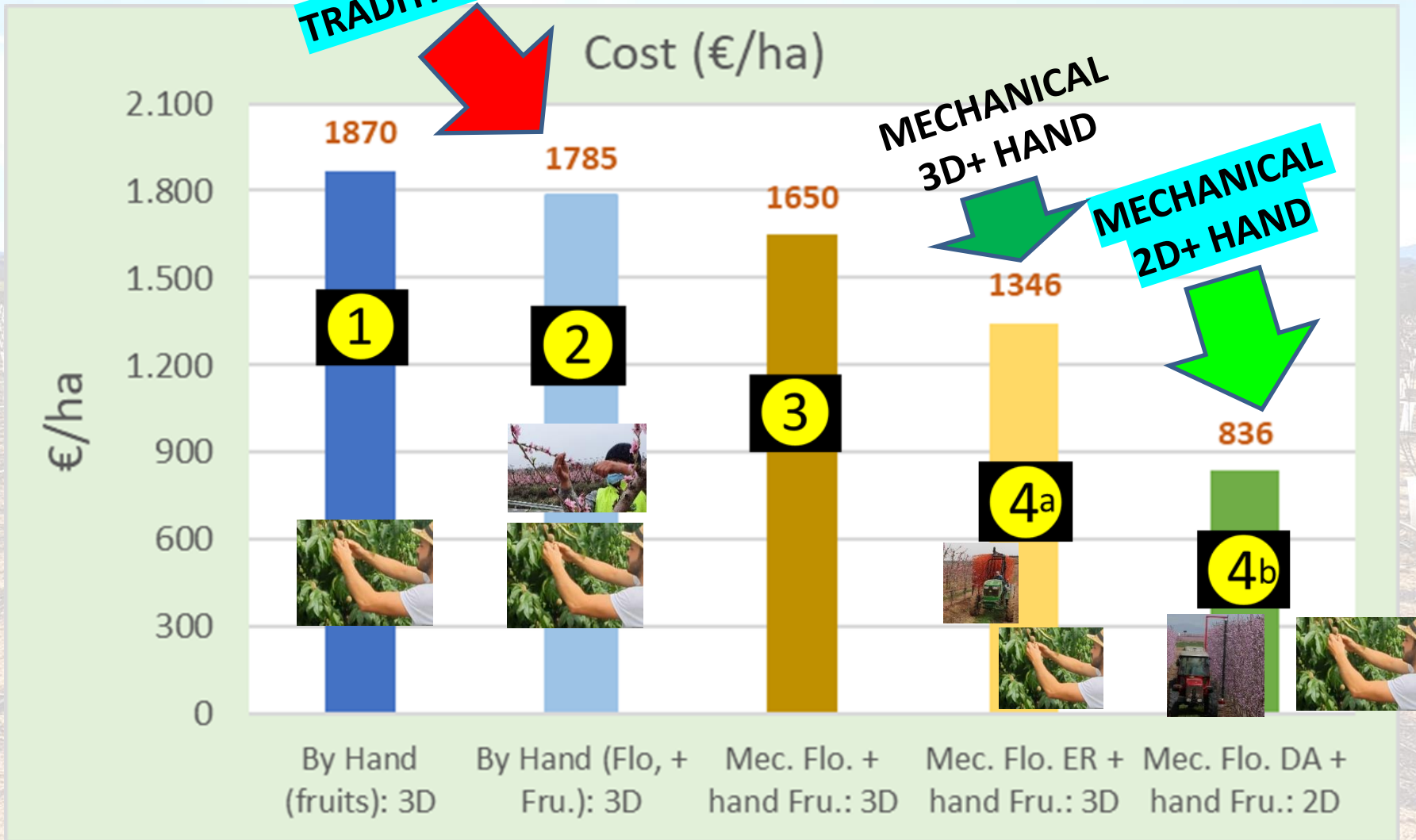
# The effect of thinning method on fruit size and quality of 'Alice' nectarine



SIZE	mm
AAAA	90 y +
AAA	80/90
AA	73/80
A	67/73
B	61/67
C	56/61
D	51/56

Method	Firmness (kg)	SSC (°Brix)	TA (g/L)	Weight (g)
Fruit thinning	4.8	11,1	8.7	126
Flower thinning	4.2	12,8	8.3	152

# THINNING: COMBINING MECHANICAL + BY HAND 2D



# Summer pruning 3 axis (8<sup>th</sup> July)



11 jul. 2022

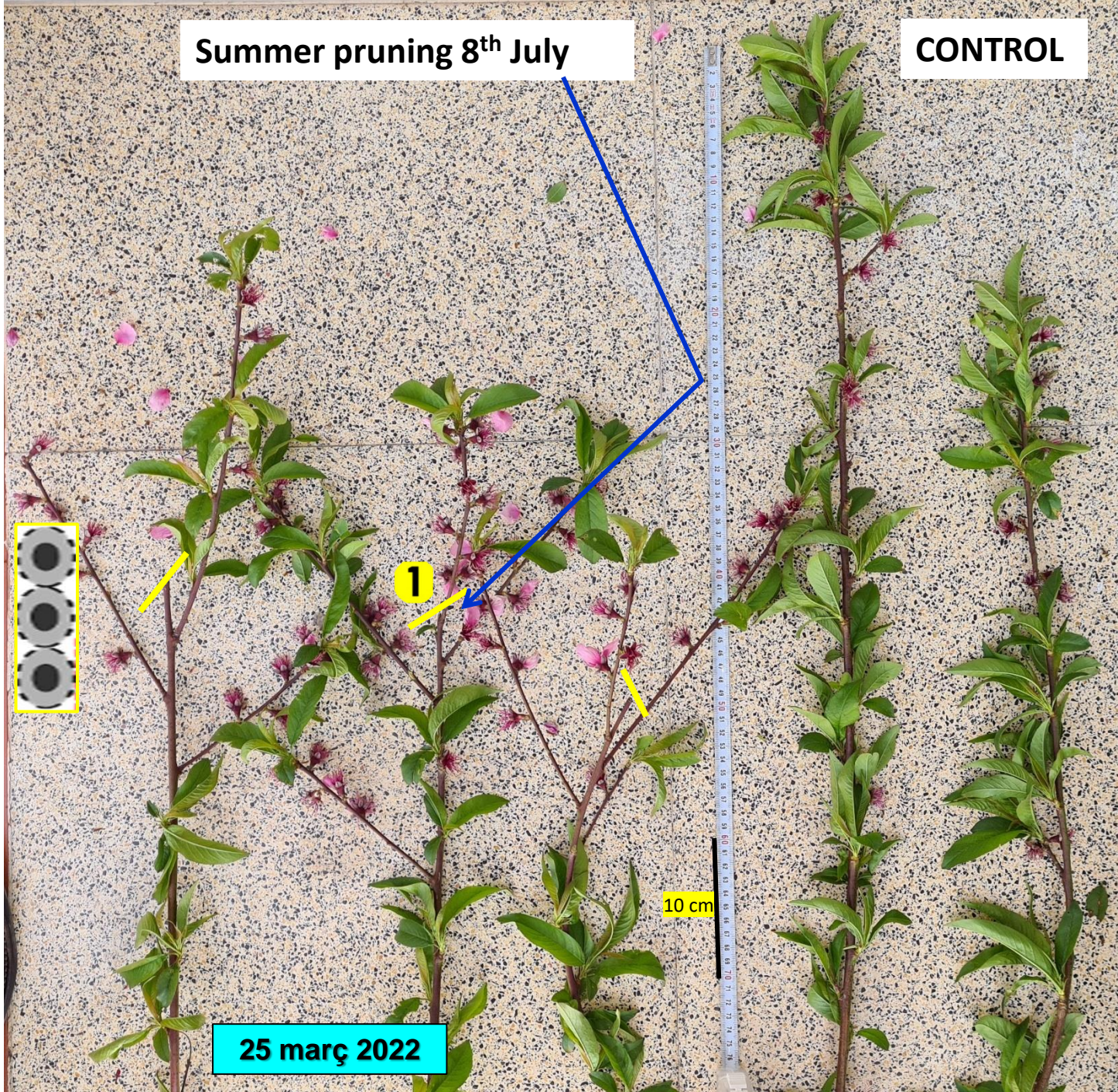


**Mid-late harvest**  
**Cultivars: LUCIUS**  
**after harvest**



8 juli. 2022

**1**



**Summer pruning 8<sup>th</sup> July**

**CONTROL**

**1**

10 cm

**25 març 2022**



**HARVEST**

**120 kg/h**



Vas + trineu



**225 kg/h**



Palmeta+carro

# COST OF PLANTING AND COST OF PRODUCTION 2021 (€/ha)

**8.000 €/ha**



- Dif. planting gobelet - axis or bi-axis:  
 $18,000 - 8,000 = \underline{10,000 \text{ €/ha}}$
- Amortization cost/year added:  
 $10,000/14 \text{ years} = \underline{714 \text{ €/year}}$
- Direct saving over anual cost: axis or bi-axis  
 $0.070 \text{ €/kg} \times 40,000 \text{ kg/ha} = \underline{2,820 \text{ €/year}}$
- Annual balance:  $2,820 - 714 = \underline{+2,106 \text{ €/ha}}$



With out considering the increase of price due the superior quality  $\cong 10 \text{ cts/kg}$ )

# TRI-AXS SYSTEM: GF-677 3,5 x 2,5 m

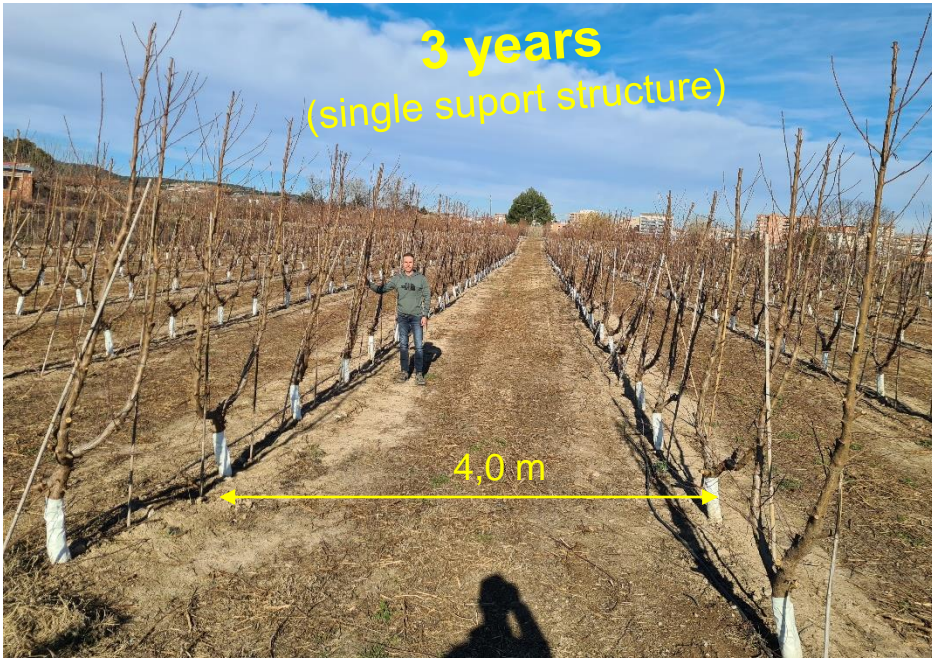


10 mar. 2023



# SEMI INTENSIVE BI-AXIS

LUCIANA / GF-677 (RR)



28 gen. 2023

# SUMMARY OF COSTS RELATED WITH TRAINING SYSTEM



SYSTEM	YIELD (kg/ha)	TOTAL <sup>+</sup> COST (€/ha)	OTHER (€/ha)	PESTICIDES + FERTILIZERS* (€/ha)	WINTER PRUNING* (€/ha)	THINNING * (€/ha)	HARVEST* (€/ha)	TOTAL VAR. COST * (€/ha)
OPEN VASE	40,000	14,700	5,407	3,528 (2,293 pest.) (1,235 fert.)	920	1,785	2,975 €/ha 333 h (120 kg/h)	9,293
2D/AXIS	52,000	12,614	4,674	2,810 (1,885 pest.) (1,025 fert.)	750	836	2,078 €/ha 231 h 225 kg/h	6,474
DIFFERENCE	13,000	2,086	-	718	170	949	897	2,819

Labour NE-Spain: 8.5 €/h

(+): including annual amortization difference  
OPEN VASE with AXIS = 714 €/ha

(\*): variable annual cost

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Current situation, trends and challenges for efficient and sustainable peach production

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<sup>a</sup> Agromillora Group, Plaça M. Raventós, 3, 08770 Sant Sadurní d'Noya, Spain

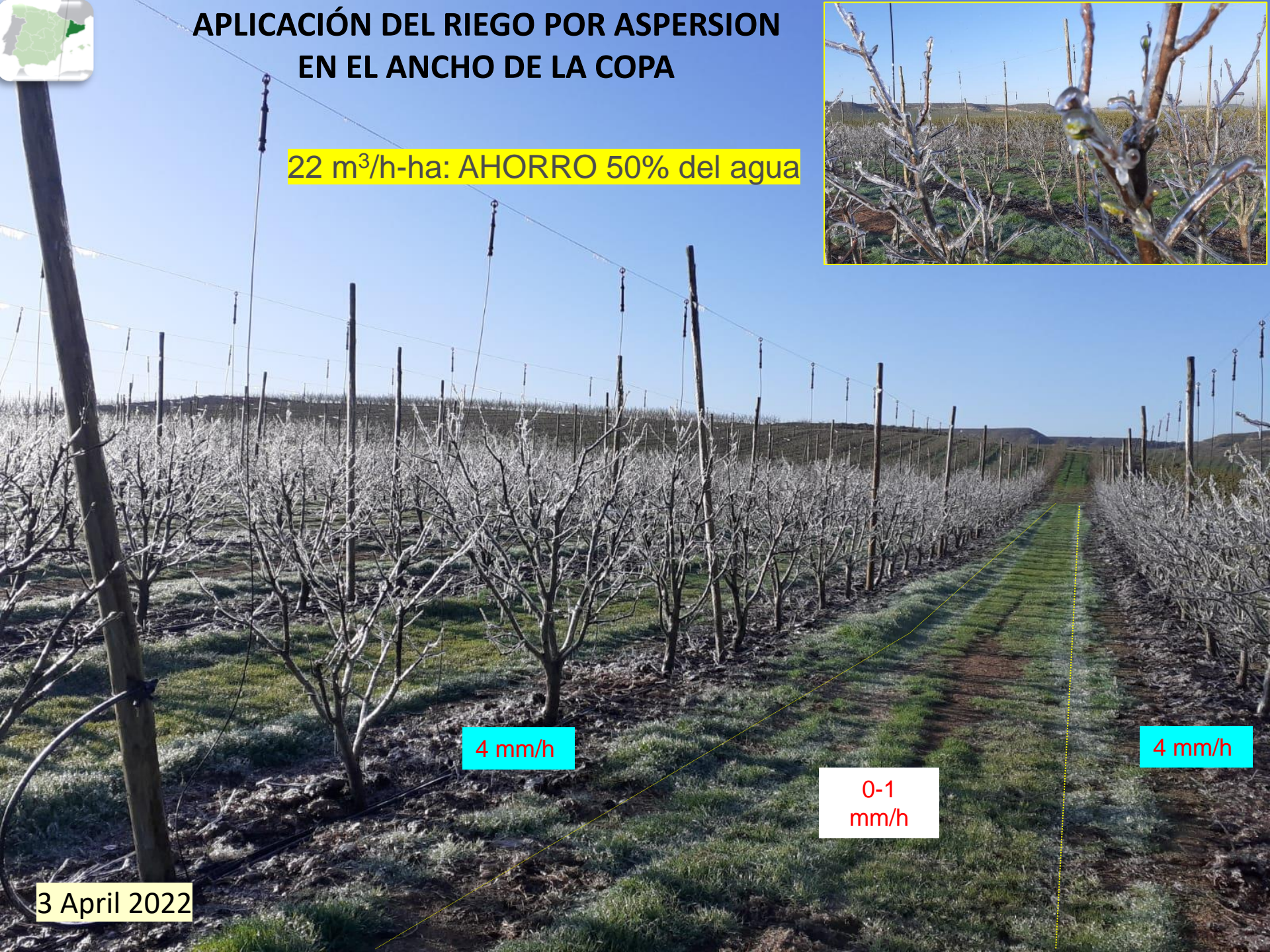
<sup>b</sup> Postharvest Programme, Institute of Agrifood Research and Technology (IRTA), Edifici Fruitcentre, PCITAI, 25003 Lleida, Spain





# APLICACIÓN DEL RIEGO POR ASPERSIÓN EN EL ANCHO DE LA COPA

22 m<sup>3</sup>/h-ha: AHORRO 50% del agua



4 mm/h

0-1  
mm/h

4 mm/h

3 April 2022

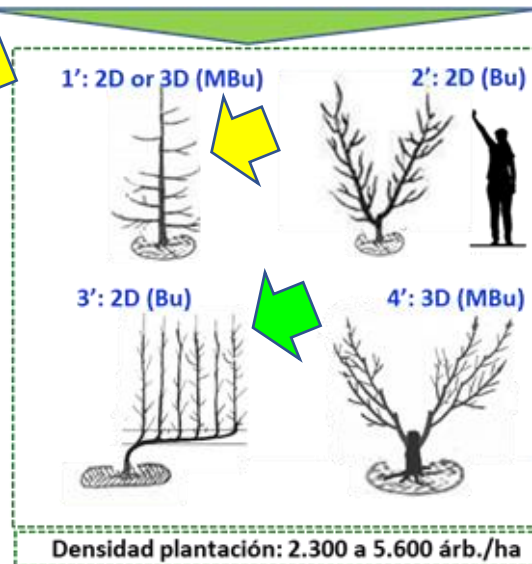
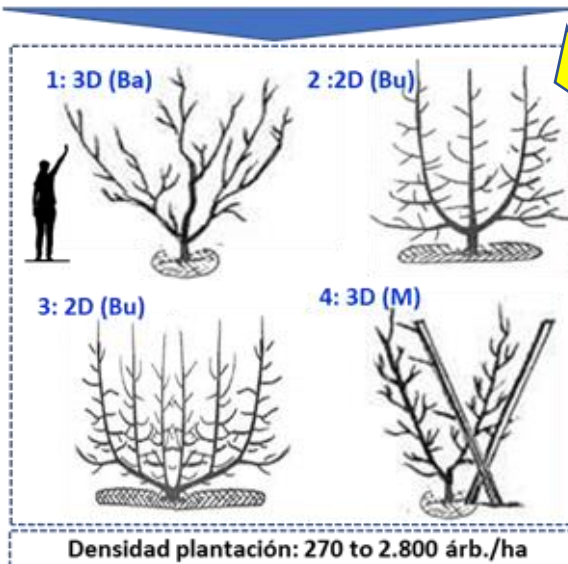
# Porta-injertos y sistemas de formación



120-110%	110-100%	100-80%	80-60%	60-40%	<40%
<b>Muy vigoroso</b>	<b>Estándar</b>	<b>Estándar medio</b>	<b>Medio</b>	<b>Semi-enanizante</b>	<b>Enanizante</b>
INRA® GF-677 Garnen (GN-15) Guardian® Nemaguard Atlas Viking	Montclar® INRA® GF-305 Cadaman® (Avimag) Lovell Krysmk®86 (Kuban-86)	Rootpac®R Tetra Penta	Adesoto-101 Isthara® Controller®6	Rootpac®40 MP-29 Controller®5 Intensia® Pilowred®	Rootpac®20

1. VASO Y VASO ESPAÑOL
2. TRES EJES
3. TATURA o "ANGLED CANOPY"
4. MULTIEJE (1 y 2 brazos)

- 1'. EJE CENTRAL
- 2'. BI-EJE
- 3'. MULTIEJE (1 brazo)
- 4'. VASO ESPAÑOL PEATONAL



Potencial para mecanización: Bajo/Ba, Medio/M, Bueno/Bu.

# PORTAINJERTOS PARA EL CONTROL DEL VIGOR



PRUNUS ROOTSTOCKS

**ROOTPAC®**



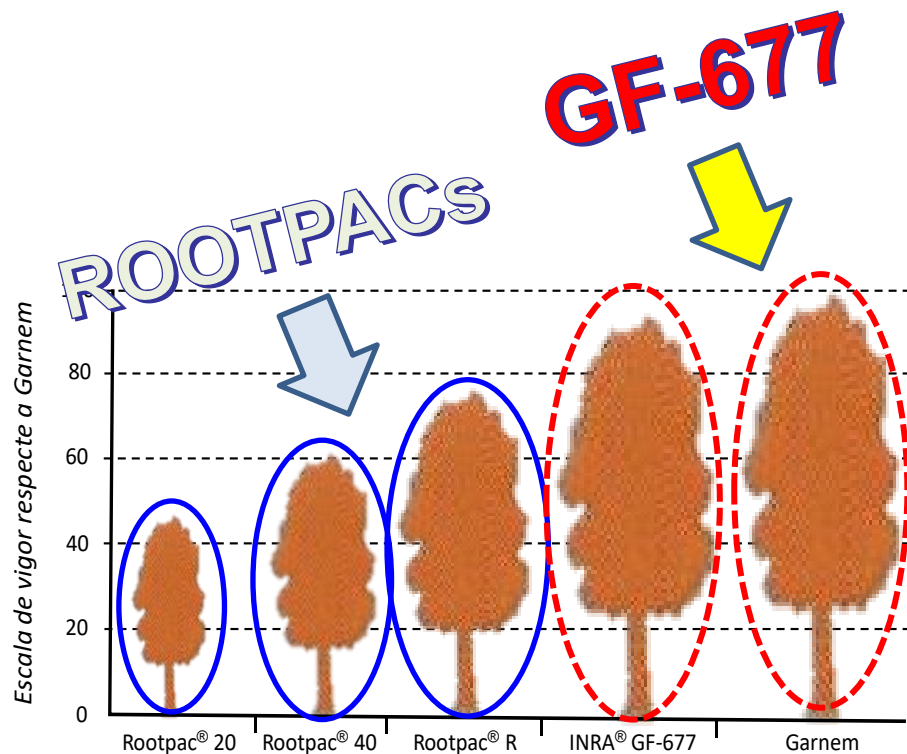
ROOTPAC 20



ROOTPAC 40



ROOTPAC R



**TRIPLE EJE NECTADIVA / GF-677 4 x 2,5 m**

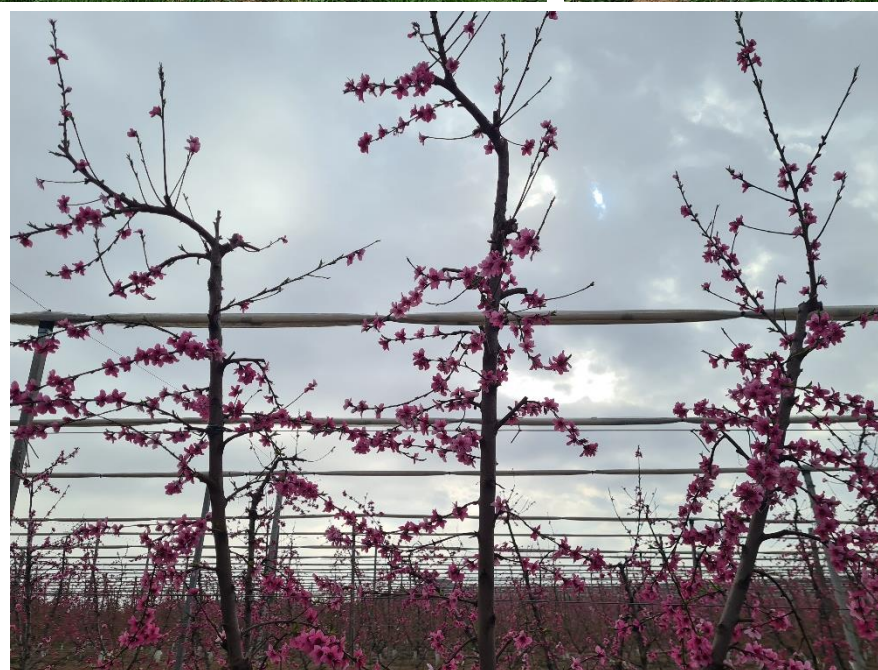


**4 març.- 2019**

# NECTADIVA/GARNEM: DOBLE EIX 4,0 x 1,2 m



18 mar. 2023



# PORTAINJERTOS PARA EL CONTROL DEL VIGOR

## RootPAC® R

PRUNUS ROOTSTOCKS  
**ROOTPAC®**



ROOTPAC 20

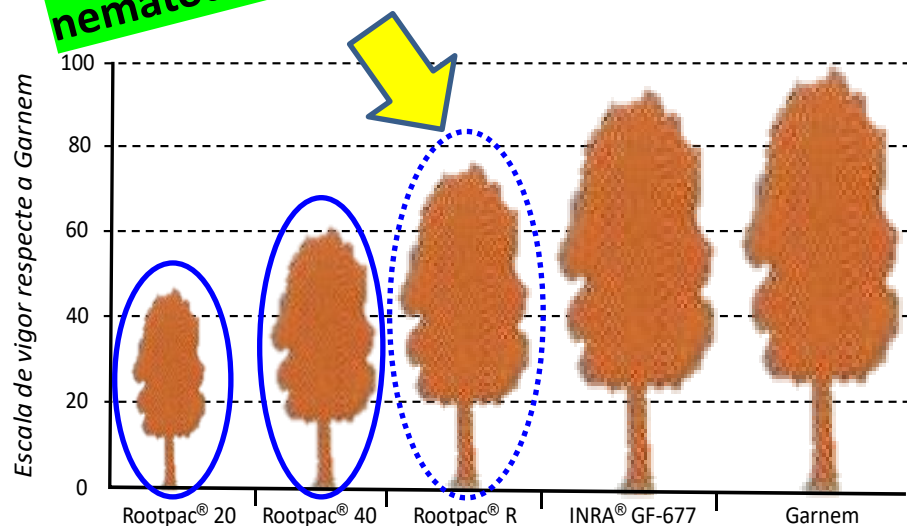


ROOTPAC 40



ROOTPAC R

Replantación + inmune  
nematodos + tole. Armillaria







**12<sup>th</sup> year**



**16-mar.-2023**





7<sup>th</sup> year



± Armillaria



31 agost.- 22

# FILOÉ / RP-R 3,5 x 1,2 m Bi-eje



**70,5 t/ha**



**2-agos.-2022**

# AXIAL SYSTEM: **BOREAL/RR 3,8 x 1 m, 33-36 t/ha**



**6 years**



Postes + alambres + anclajes = 600 €/ha  
Cañas = 250 €/ha  
Colocación = 120 €/ha  
**TOTAL = 970 €/ha**



**± Pedestrian**



**26-Gen.-2023**

# PORTAINJERTOS PARA EL CONTROL DEL VIGOR

PRUNUS ROOTSTOCKS  
**ROOTPAC®**



ROOTPAC 20



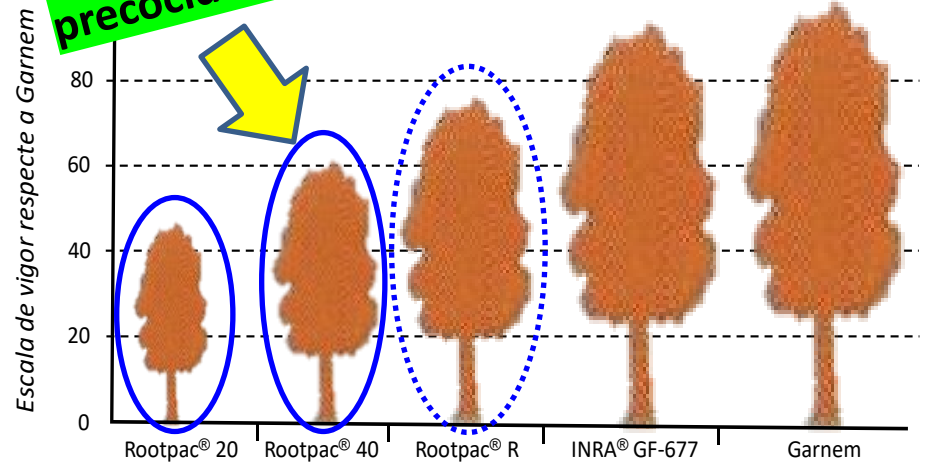
ROOTPAC 40



ROOTPAC R

## RootPAC® 40

Alta eficiencia productiva,  
precocidad y calidad de fruto





15 ANYS

#103

**Dossier Tècnic**

Innovació i transferència de coneixement

avril 2020

Novetats en portaempelts de presseguer

Jó al tractar-se de portaempelts devaria l'usuari

Scientia Horticulturae 262 (2020) 109035

Contents lists available at ScienceDirect

Scientia Horticulturae

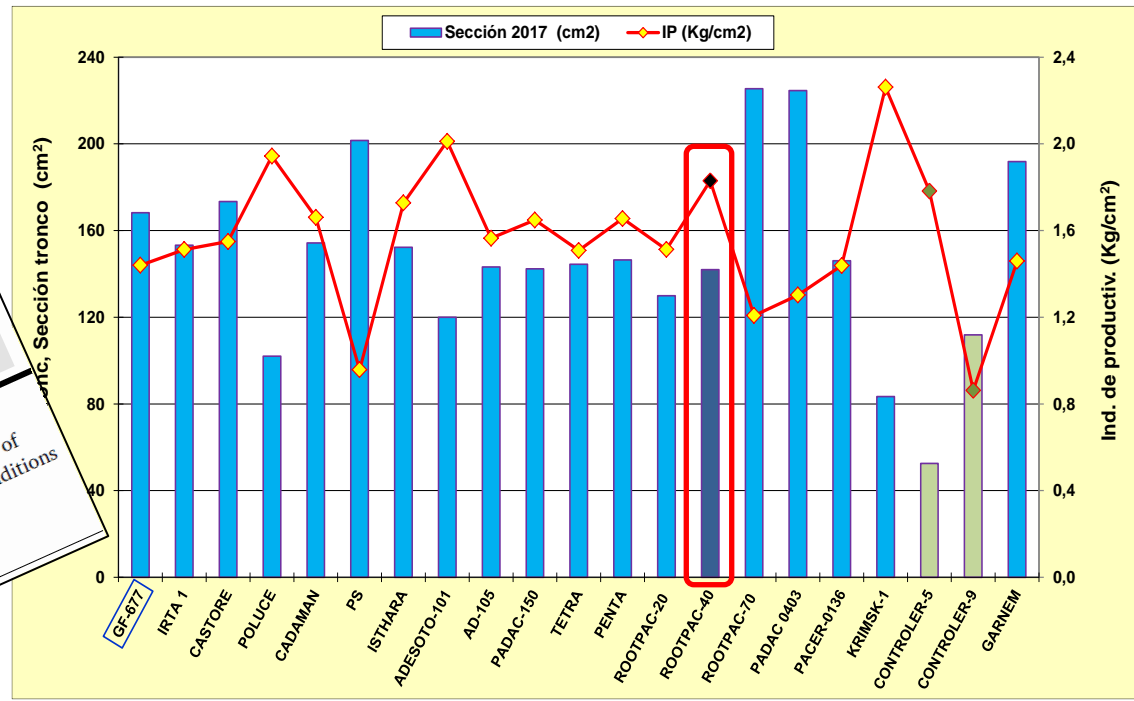
Journal homepage: [www.elsevier.com/locate/scihorti](http://www.elsevier.com/locate/scihorti)

Long-term agronomical performance and iron chlorosis susceptibility of several *Prunus* rootstocks grown under loamy and calcareous soil conditions

Gemma Reig<sup>a,\*</sup>, Xavier Garanto<sup>a</sup>, Neus Mas<sup>a</sup>, Ignasi Iglesias<sup>b</sup>

<sup>a</sup>IRTA Pradomare, PCITAL, Park of Gardens, Pradomare Building, 25003, Llíuda, Spain

<sup>b</sup>Agronomers Group, PL Masnou Rovells, 3-5, 08770, St. Sadurn d'Noya, Spain



Scientia Horticulturae 262 (2020) 109035

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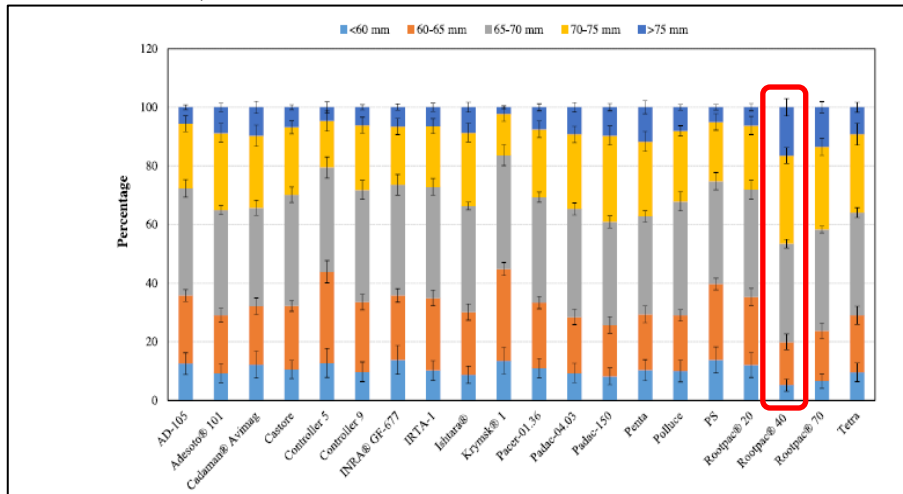
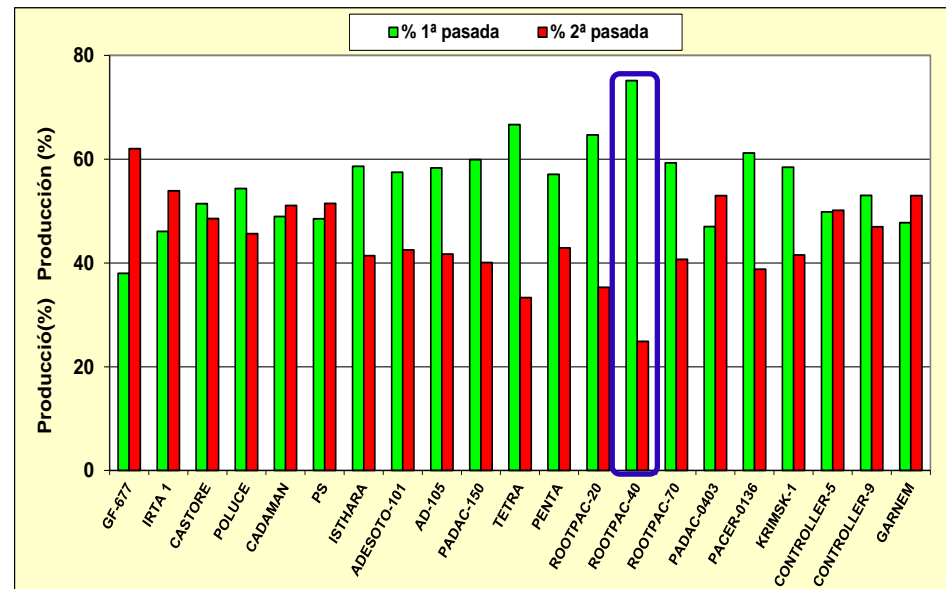
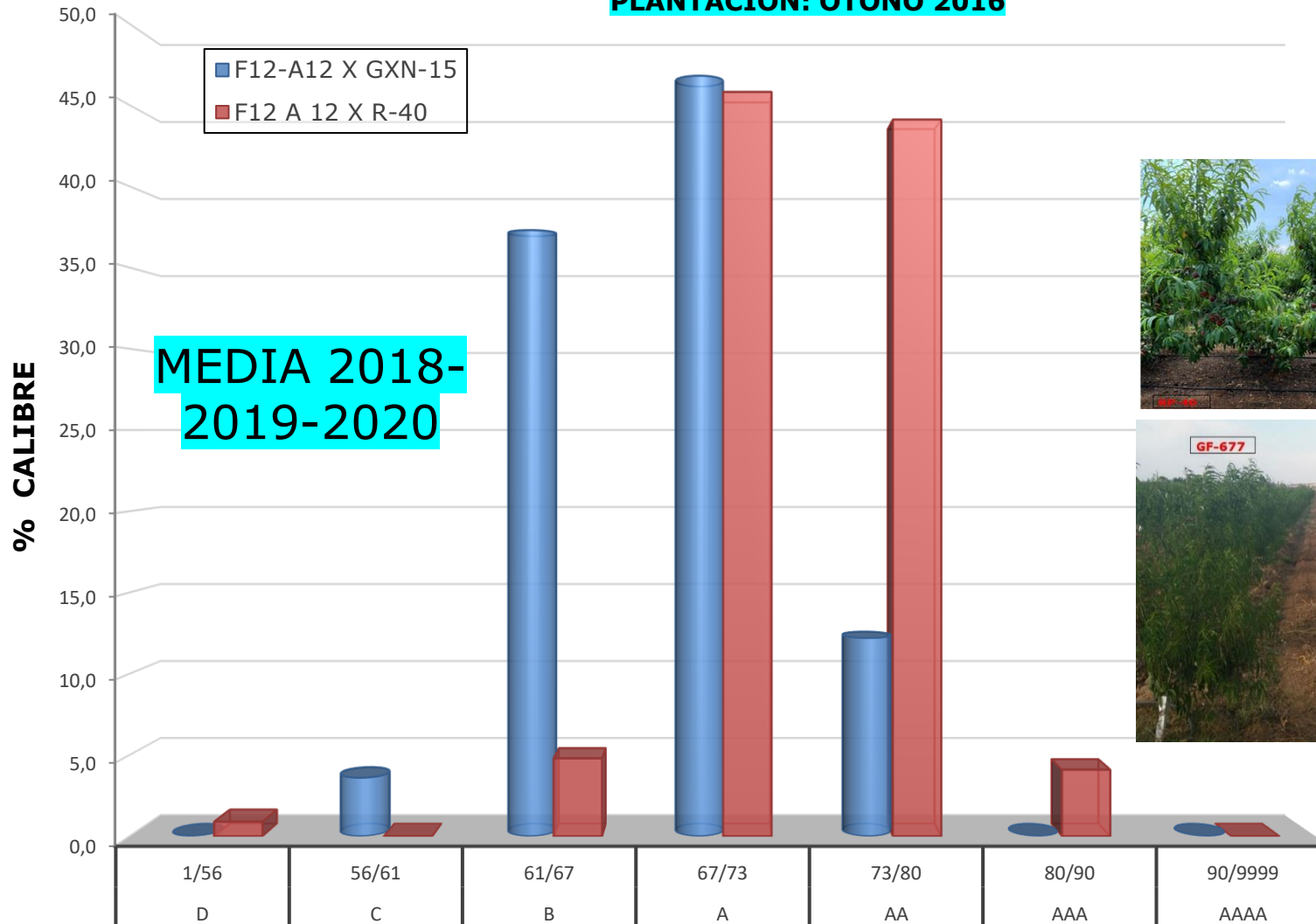


Fig. 4. Mean fruit size distribution (from 3<sup>rd</sup> leaf to 11<sup>th</sup> leaf) of fruits from 'Big Top' nectarine cultivar grafted on 20 *Prunus* rootstocks. Vertical bars indicate standard error.



# COMPARATIVA CALIBRES PAMELA RP-40/GARNEM

PLANTACIÓN: OTOÑO 2016



Datos COOP. Carlet

# The effect of rootstock on harvest date in early areas and varieties



**RP-40**



**Fotos: PSB**



**Garnem**



**MURCIA, 30 abril 2021**



**NORACILA / ROOTPAC-40 (3,7x1,1m.: 2.547 ar./ha).  
3er verd (test abril 2011) = 24,1 kg/arbore = 61,3 ton / ha**

**26 juny 2013**



**3<sup>rd</sup> year**



NORACILA / ROOTPAC 40 (3,7x1,1m.: 2.547 ar./ha)  
8 verds (test abril 2011)

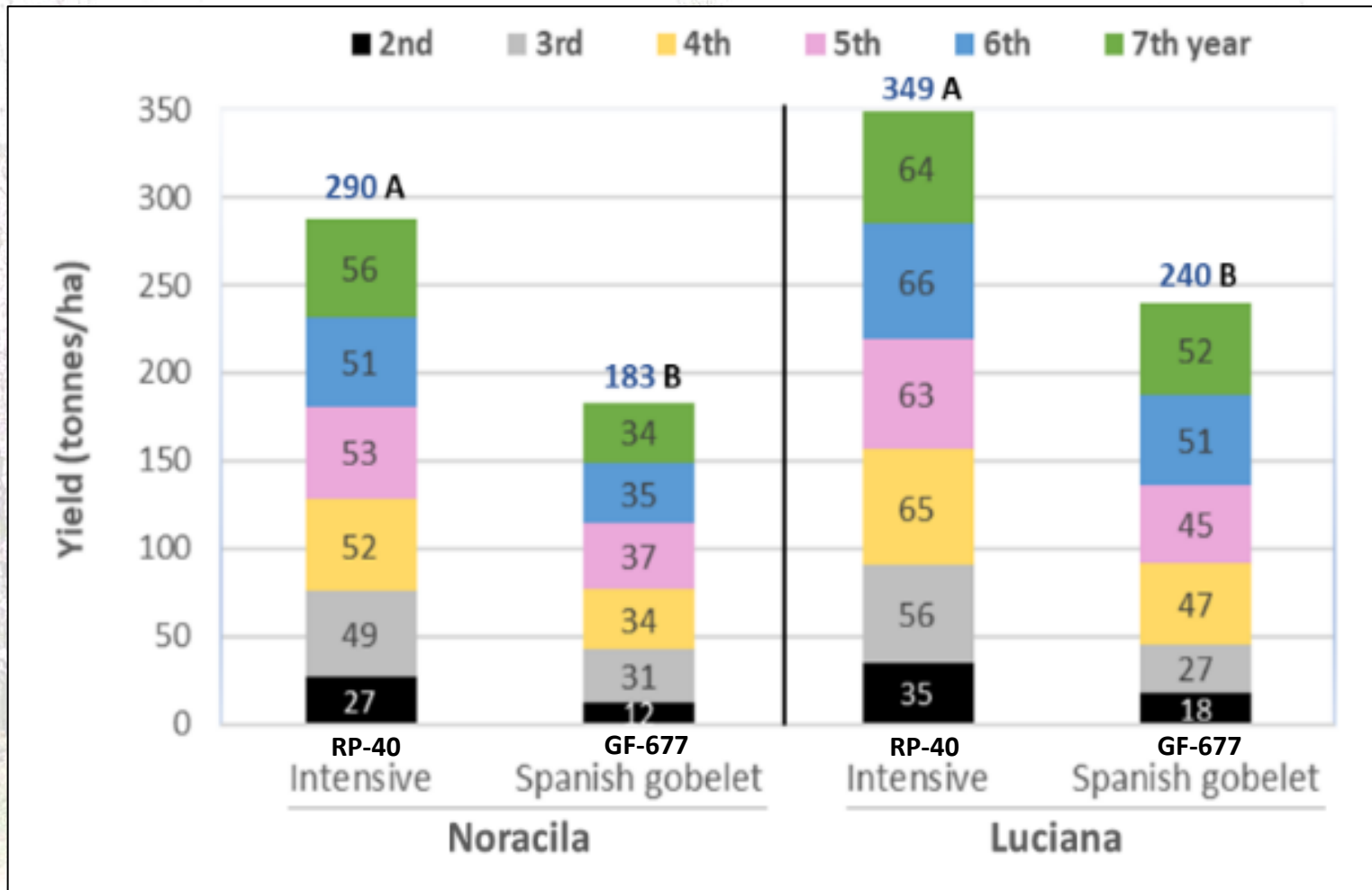
8º año



4 mar. 2019



# The effect of training system and rootstock (RP-40 and GF-677) on annual and cumulative yield of two nectarine cultivars

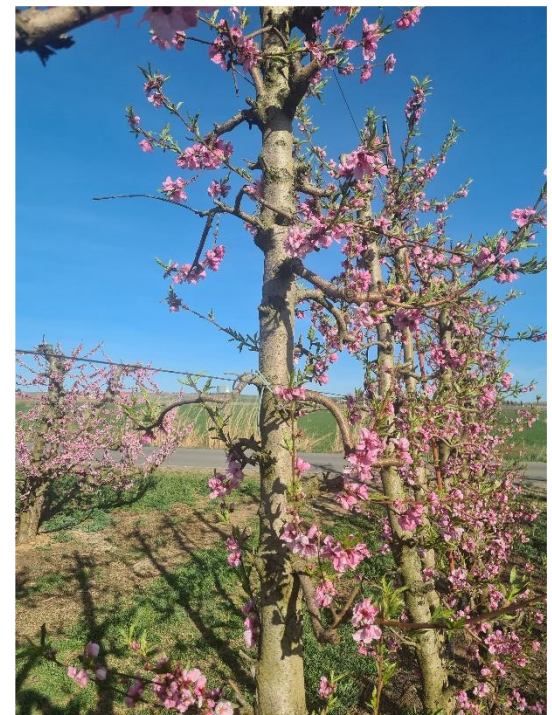


NORACILA / ROOTPAC 40 (3,7x1,1m.: 2.547 ar./ha)

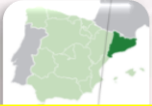
12 any verds (test abril 2011)



16 mar. 2023



## 2b.- AXIAL SYSTEM: EARLY/RP-40 3,8 x 1 m: 30-32 t/ha



3 years



26-Gen.-2023

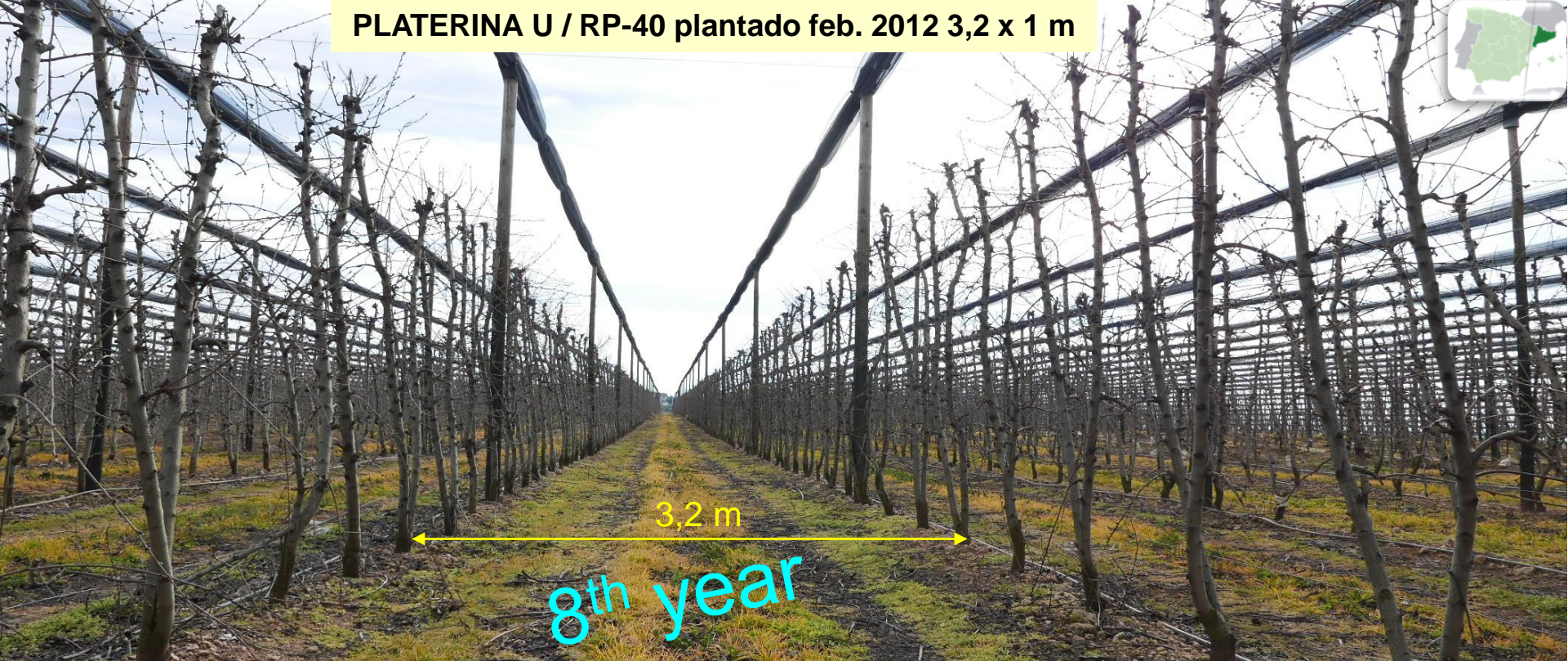


Postes + alambres + anclajes = 600 €/ha  
Cañas = 250 €/ha  
Colocación = 120 €/ha  
**TOTAL = 970 €/ha**

# FILOÉ / RP-40 3,5 x 1,2 m Bi-eje



PLATERINA U / RP-40 plantado feb. 2012 3,2 x 1 m



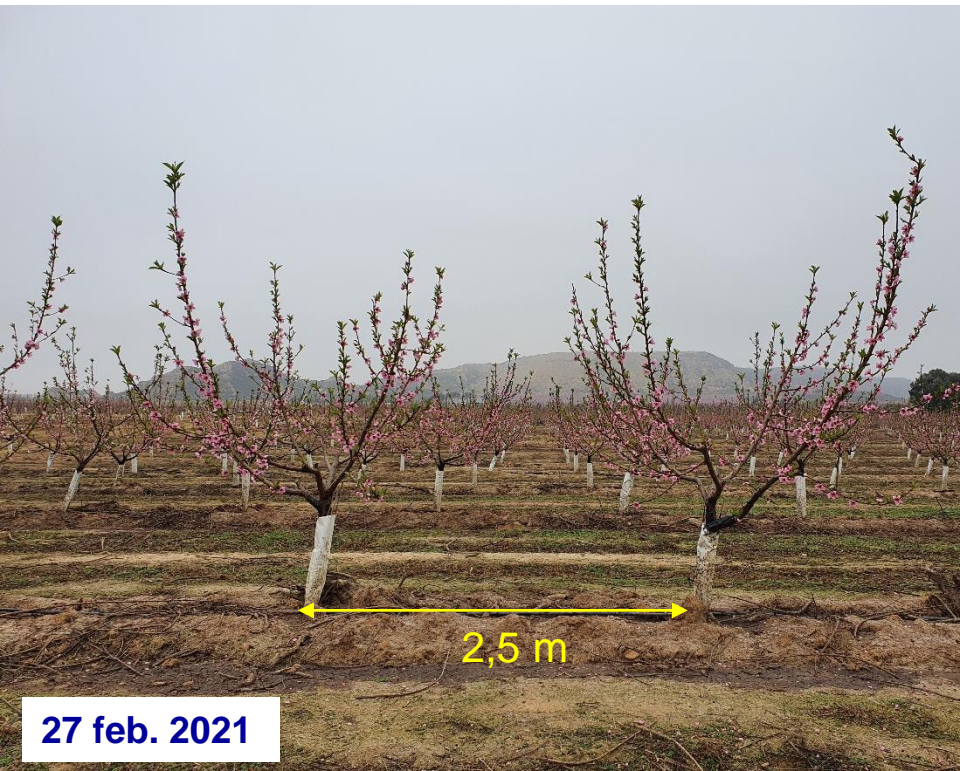


**BOREAL / ROOTPAC 40 (4,5 x 2,5 m)**  
**Starting 3rd year (plant. Feb. 2019)**

**3 años**



4,5 m



2,5 m

**27 feb. 2021**



**Pedestrian**



**BOREAL / ROOTPAC 40 (4,5 x 2,5 m)**  
**4th year (plant. Feb. 2019) = 38 t/ha**



**Pedestrian**



**4th year**



**65**

**7 jun. 2022**

OMEGA/RP-40 4,5 x 2,5 m 3 years

3 años



Pedestrian



27 gen. 2023



# PORTAINJERTOS PARA EL CONTROL DEL VIGOR

PRUNUS ROOTSTOCKS

**ROOTPAC®**



**ROOTPAC 20**



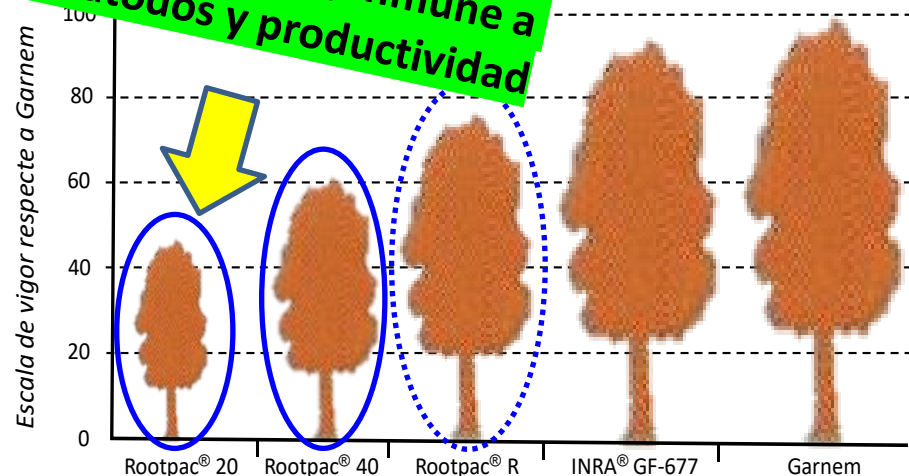
**ROOTPAC 40**



**ROOTPAC R**

## RootPAC® 20

Control del vigor, inmune a nematodos y productividad





8º año

16 mar. 2023



**LEONIDAS/RP-20: DOBLE EJE, 4 verds (plant. febrer 2017) 3,8 x 1,2 m**

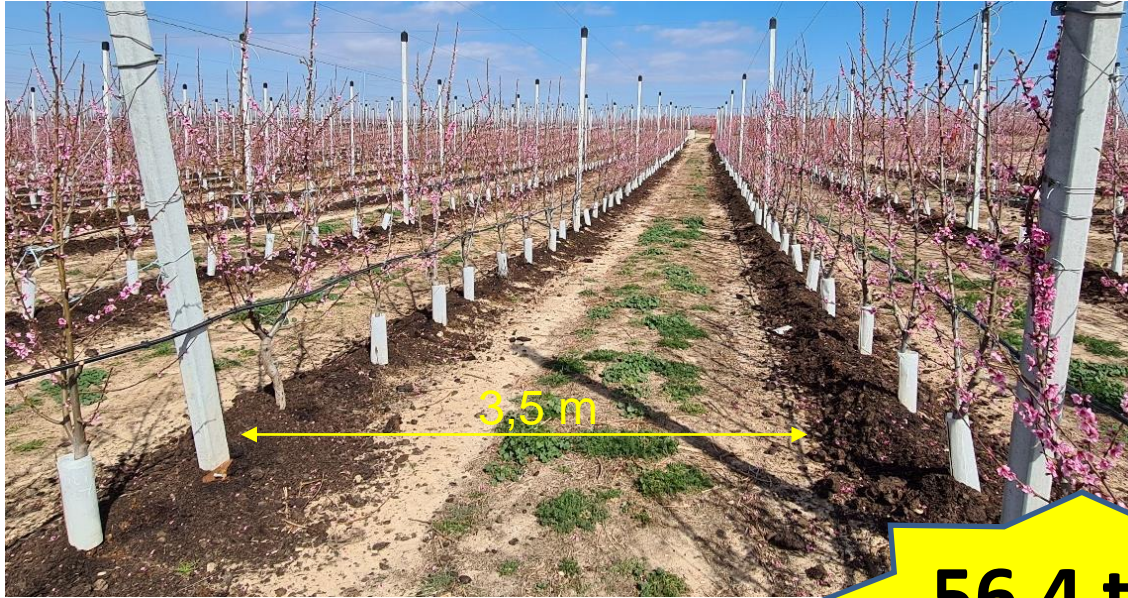


**5º año 33 t/ha**

**28 may.- 2021**



# FILOÉ / RP-20 3,5 x 1,2 m



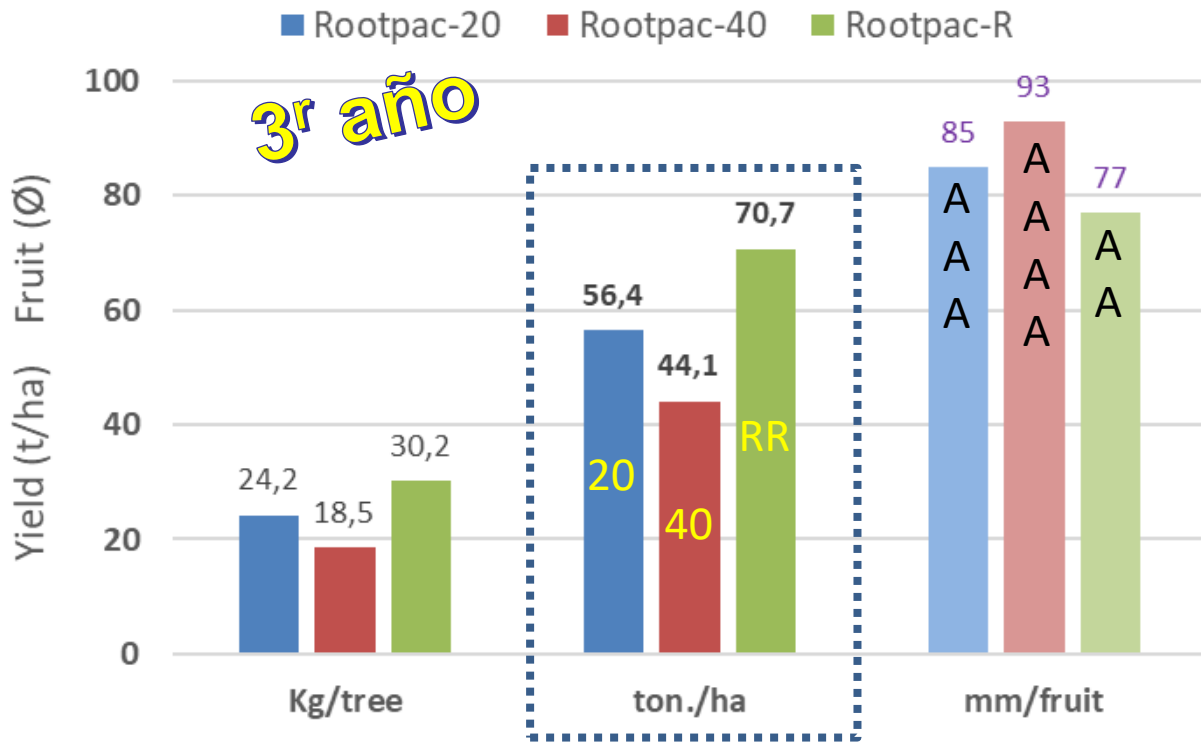
**56,4 t/ha**



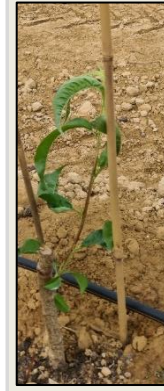
1-agos.-22

# Comparando RP-20, RP-40, RP-R 3,5 x 1,2 m

## PRODUCCIÓN Y CALIBRE DEL FRUTO

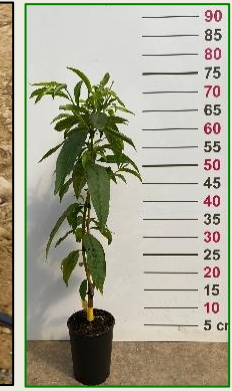


10<sup>th</sup> Abril 2020



RP-20

Abril 2020



RP-40

Mar.2020 Jul.21



RP-R



20<sup>th</sup> July 2021



Díámetro	Indicación del calibre (código)
90 mm o más	AAAA
80 mm - < 90 mm	AAA
73 mm - < 80 mm	AA
67 mm - < 73 mm	A
61 mm - < 67 mm	B
56 mm - < 61 mm	C
51 mm - < 56 mm	D



**RR**



**RP-40**



**RP-20**

15-mar.-23

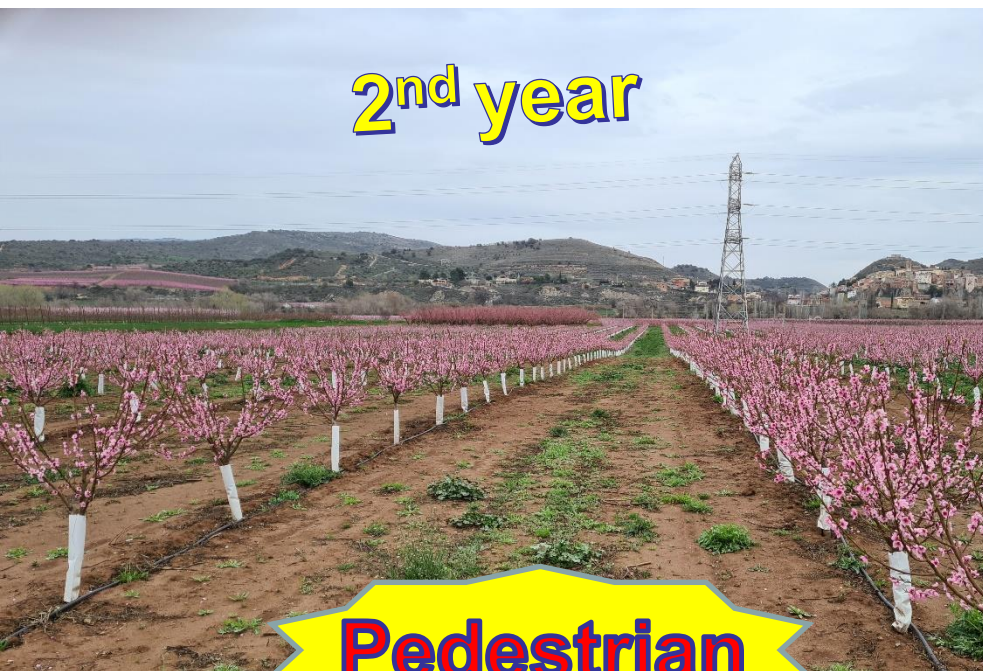
**4° año**

**3,5 x 1,2 m**





**2<sup>nd</sup> year**



**Pedestrian**

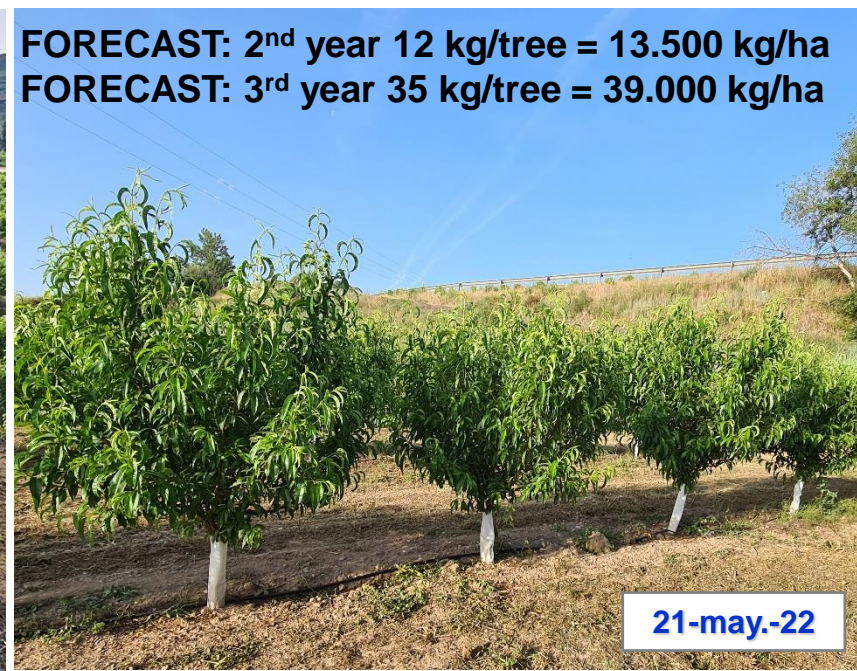


**420 flowers/tree**

**16-mar.-22**



**FORECAST: 2<sup>nd</sup> year 12 kg/tree = 13.500 kg/ha**  
**FORECAST: 3<sup>rd</sup> year 35 kg/tree = 39.000 kg/ha**



**21-may.-22**

**KINOLEA/RP-20** 4,5 x 2 m (1.111 tres/ha) (pla. 25 April 2021, 1 year old tree from "micro graft")



**Pedestrian**

**End 2<sup>nd</sup> year**



25-octub.-22



**FORECAST: 3<sup>rd</sup> year 35 kg/tree = 39.000 kg/ha**

**3<sup>rd</sup> year**



**Pedestrian**



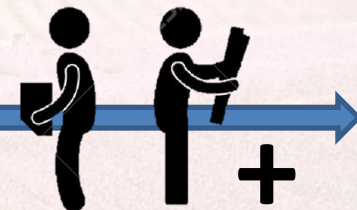
# 3D MECHANIZATION OF PRUNING



# DIFFERENT OPCIONES Y COSTES PARA OCUPAR EL ESPACIO CON SISTEMAS DE FORMACIÓN AXIALES EN MELOCOTONERO



Mano de obra: incremento, mayor número de ejes

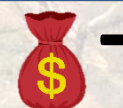


Coste similar de la estructura de soporte

3,5 x 1 m = 2.857 árb./ha



Coste de plantación decreciente, menor nº árboles



# SISTEMAS DE FORMACIÓN 2D, MANO DE OBRA REQUERIDA (9,5 €/h) Y PRODUCCIONES



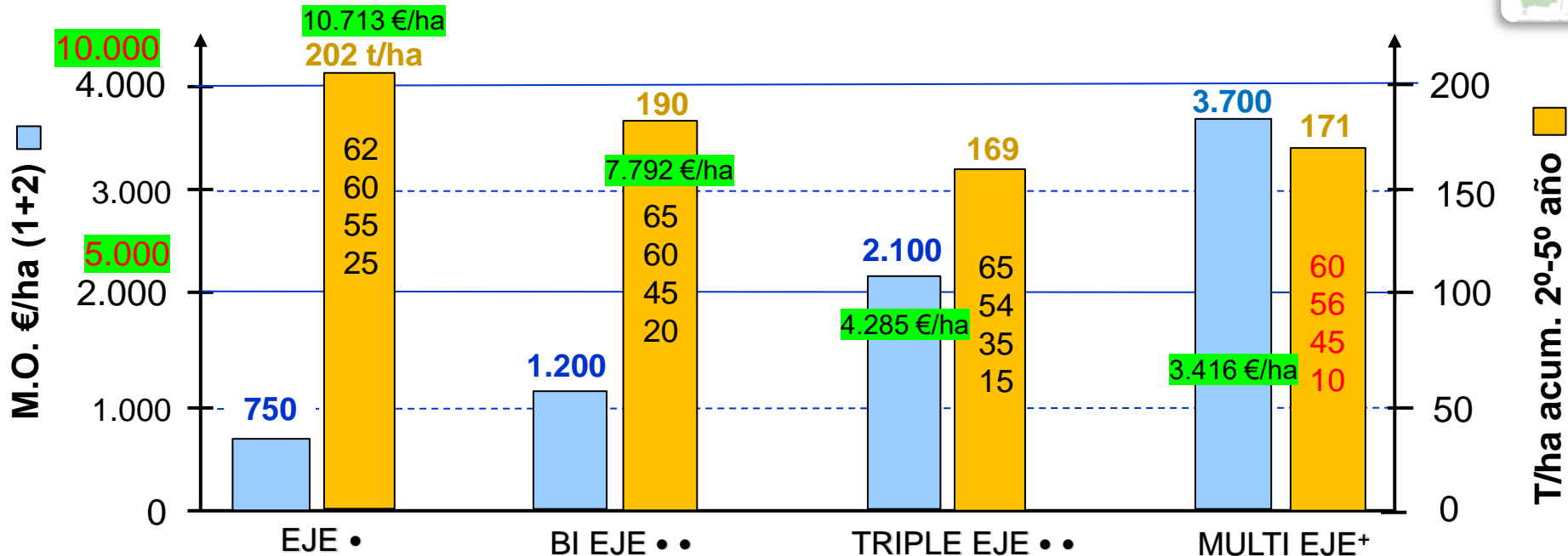
Final julio



Variedad  
media  
estación

SISTEMA	3,5 x 0,8 m	3,5 x 1,1 m	3,5 x 2,0 m	3,5 x 2,5 m
Árb./ha	3.571	2.597	1.428	1.142
€/ha a 3 €	10.713	7.792	4.285	3.416
MO €/ha* (año 1+2)	750	1.200	2.100	3.700

(\*): Mano Obra posicionamiento, poda y colocación cañas



# SUMMARY of current and new options in PEACH training systems



Canopy Architecture	Training system	Rootstocks	Planting distances (m)	Planting density (tre./ha)	Canopy accessibility	Mechanization	Cost of production	Investment
3D	Spanish Gobelet	GF-677 Garnem Cadaman	5.0-5.5 m x 2.5-3.5 m	667 (5x3 m)				
	Reduced Sp. Gobelet	Rootpac-R Rootpac-40 Rootpac-20	4.5 m x 2.0-2.5 m	889 (4.5x2.5)				
2D	1 Axis	Rootpac-40 Rootpac-20	3.0-3.5 m x 0.8-1.1m	2,857 (3.5x1.0)				
	2 Axis	Rootpac-R Rootpac-40 Rootpac-20	3.0-3.5 m x 0.9-1.2m	2,604 (3.2x1.2)				
	3 Axis	Rootpac-R GF-677	3.0-3.5 m x 1.2-1.8m	2,083 (3.2x1.5)				
	4 Multileader	Rootpac-40 Rootpac-R GF-677	3.0 m x 1.5-2.5m	1,960 (3.0x1.7)				



# SWEET SARETA/GiSeIA®5 8 years, 3.5 x 0.5 m



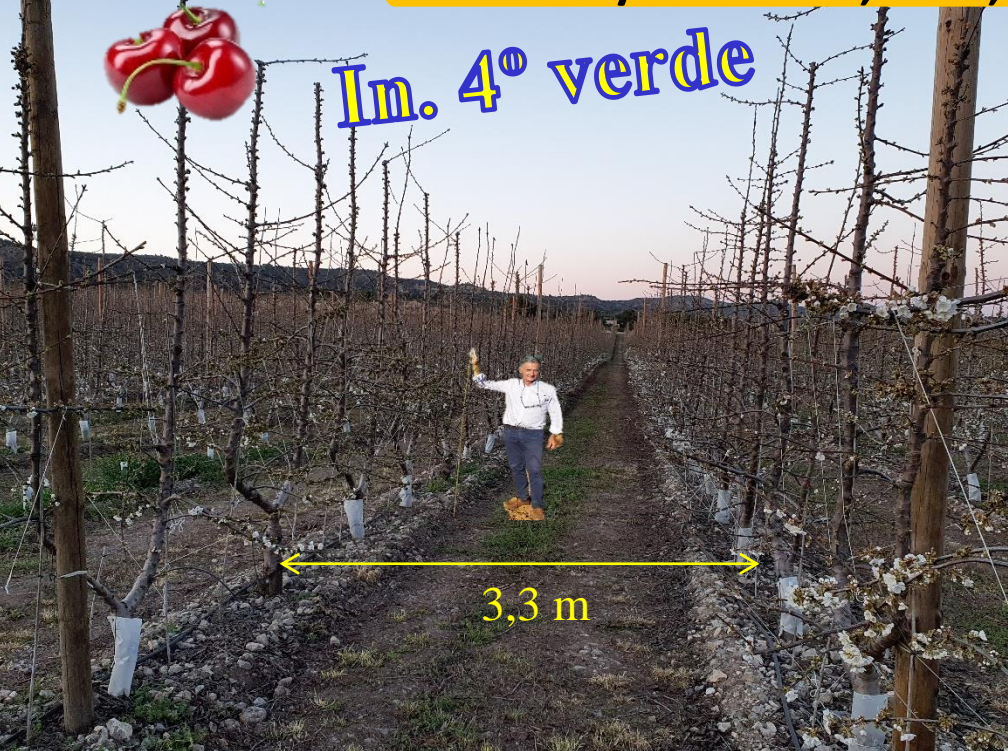
Fotos: M. Giori



NIMBA / Adara: 3,3 x 1,8 m : in. 3r verde o. d.



In. 4° verde



# LOVITA/Myrobolan C 3,8 x 1,2 m en U



22 feb. 2023



**SUNGOLD/Myrobolan**  
**4,0 x 1,0 m AXIS**  
**(4 years)**



**23 Feb. 2023**





**'Stanley' / Rootpac® 20 EJE CENTRAL 3r verde Banat (Serbia). 3,0 x 0,5 m**



**Cuadro 1.** Marcos de plantación, producciones y calidad de fruto de diferentes variedades de ciruela europea y japonesa en diferentes países con sistema de formación en eje central y patrón Rootpac®20.

Variedad	Marco plant. (m)	Producción (t/ha)						Calibre (mm)
		2º	3º	4º	5º	6º	Acum.	
Emilia Romagna – Ferrara (Italia)								
'Stanley'	3,0 x 0,5	20	45	65	48	52	230	40
Veneto – Verona (Italia)								
'Agust Delight™'	3,5 x 0,8	16	52	–	–	–	68	55
'Blue Moon™'	3,5 x 0,8	13	48	–	–	–	61	55
'Owen T™'	3,5 x 0,8	11	45	–	–	–	56	60
'Crimson Gloo™'	3,5 x 0,8	14	49	–	–	–	63	60
Banat (Serbia)								
'Stanley'	3,0 x 0,5	35	45	–	–	–	80	40
'Angeleno™'	3,0 x 0,5	15	30	–	–	–	45	55

# 'APRIMED' (AP-65) (PAC-00.05)

PAC 00-05

## General information

**Specie:** Plum apricot hybrid [(*P. besseyi* x *P. armeniaca*) x *P. cerasifera*]

**Origin:** Breeding and selection program of Agromillora.

**Breeders code:** PAC 00-05.

**Estado Sanitario:** Virus free: PPV, PNRV, PDV, ACLSV ApMV, PLMVd and phytoasmas.

**Deposit:** *Prunus* collection in Monistrol, Barcelona, Spain, and in Chile in 2009.

**Status:** Experimental rootstock in field testing in several European countries.



## Agronomic Traits

**Vigour:** Medium similar to Adesoto.

**Compatibility:** Good with apricot and Japanese plum varieties. Forms very even graft unions with apricot varieties.

**Growth habit:** Erect and somewhat open.

**Productivity:** Very productive with all tested apricot varieties.

**Fruit size:** Forms fruit with good calibre.

**Propagation:** Does well by *in vitro*. Difficult by hard wood and Herbaceous cuttings.

**Adaptability:** Adapts well to the growing conditions in Spain.

**Others:** Has a rigid stem with little or no ramification in the first year. Leaves are very apricot like. Productive, does not form suckers (root or crown suckers). Generates trees that are very homogeneous with all the tested apricot varieties.

## Resistances and (or) tolerances

**Cold:** Apparently tolerant

**Drought:** Unknown.

**Asphyxia:** Highly tolerant

**Chlorosis:** Tolerant.

**Salinity:** Sensitive.

**Root-knot nematodes:** Highly resistant to immune.

**Lesion nematodes:** Unknown.

**Agrobacterium tumefaciens:** Unknown.

**Armillaria mellea:** Unknown.

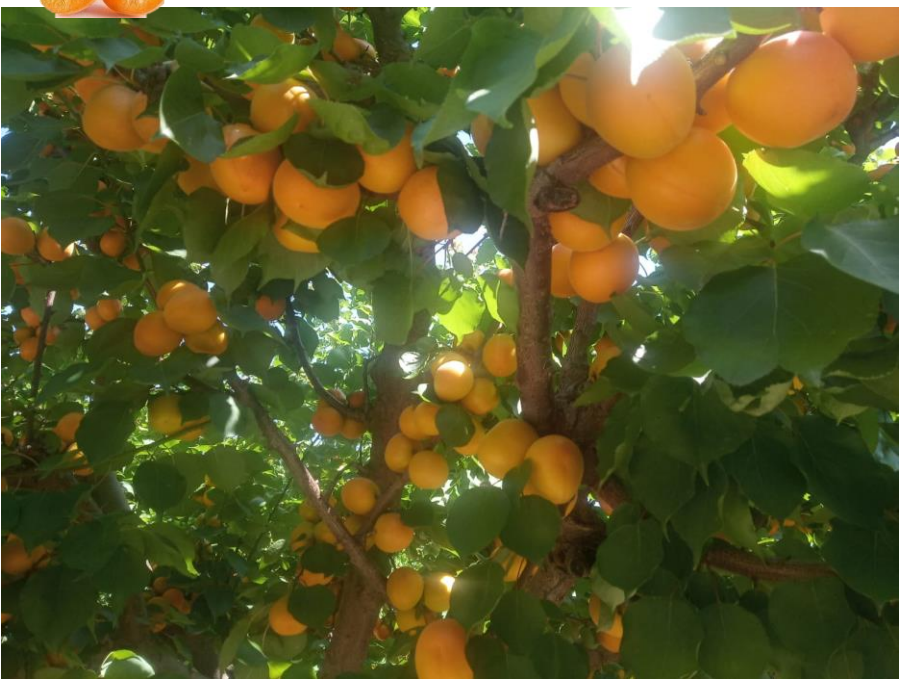
**Rosellinia necatrix:** Unknown.

**Global rating:** Very interesting rootstock for apricots. Good replacement for standard rootstocks used for apricots such as Adesoto, apricot seedling rootstocks, Marianna and Myrobalan type rootstocks.

A new and distinct hybrid plum-apricot plant used as a rootstock that exhibits root-knot nematode resistance, high tolerance to root asphyxia, and compatibility with apricot and plum varieties.



**OSCAR / AP-65 6º verde: 5,5 x 3,5 m. ideal 4,5 x 2,5m**



**6º verde**

CANDASNOS (Huesca)



**15 jul.-2020**



**AP-65**



**MONTCLAR**

NELSON / AP-65: 2,75 x 1,5 m. Planted dormat bud February 2021



**NELSON / AP-65: 2,75 x 1,5 m. Planted dormat bud February 2021**



**17 mar.-2023**



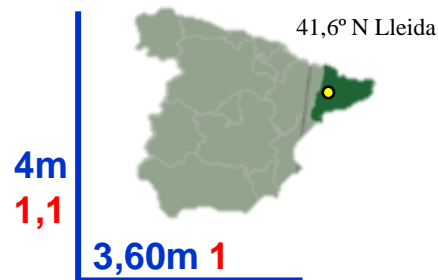
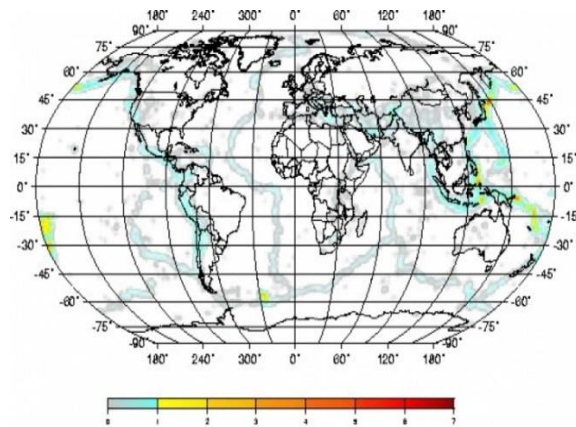
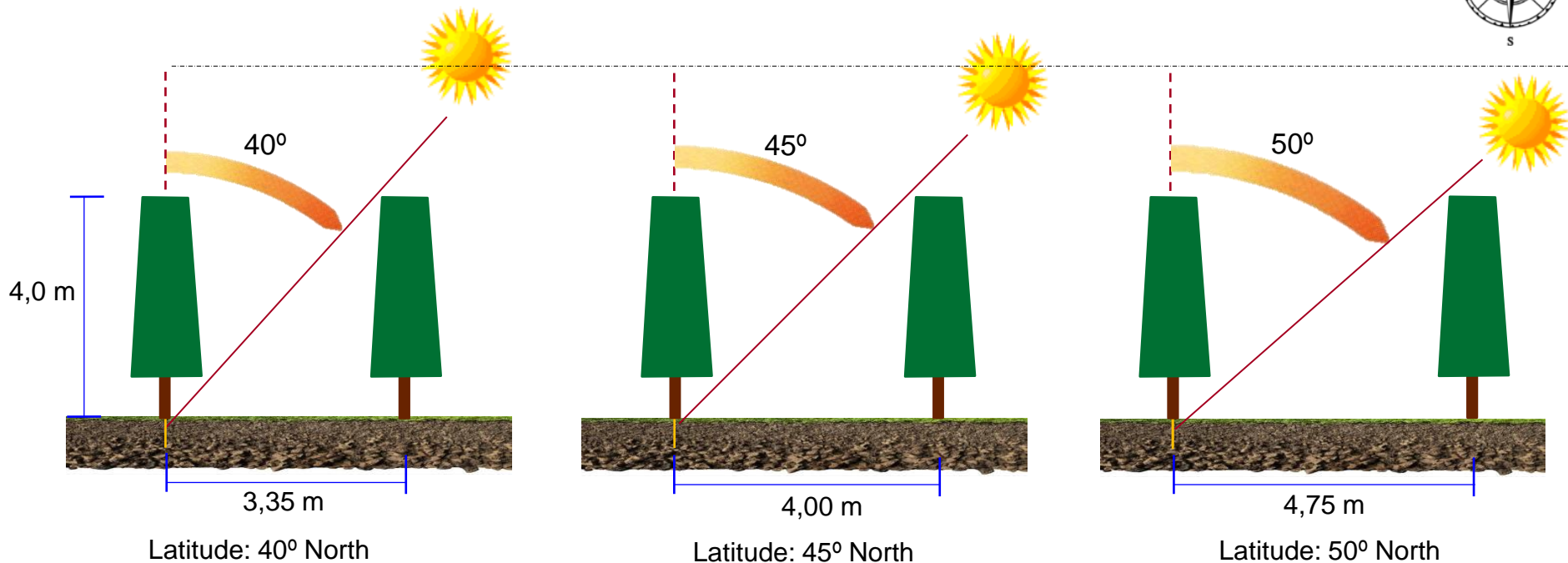
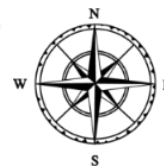
**CANDASNOS (Huesca)**



**14 abril-2023**



# Optimal orientation of the rows N-S and distance between lines in relation with three height and latitude





# ENSAYO PATRONES 'RootPAC®'

## SISTEMAS DE FORMACIÓN

### VARIEDAD 'BOREAL' 2019-....

(SOSES - LLEIDA)





# Second year BOREAL/RP-40: 3,2 x 0,9 m (3.470 ar./ha)



Figura 2. Producció dels diferents tractaments avaluats (les barres de color gris indiquen els kg arbre<sup>-1</sup> i els punts de color vermell indiquen tones ha<sup>-1</sup>).

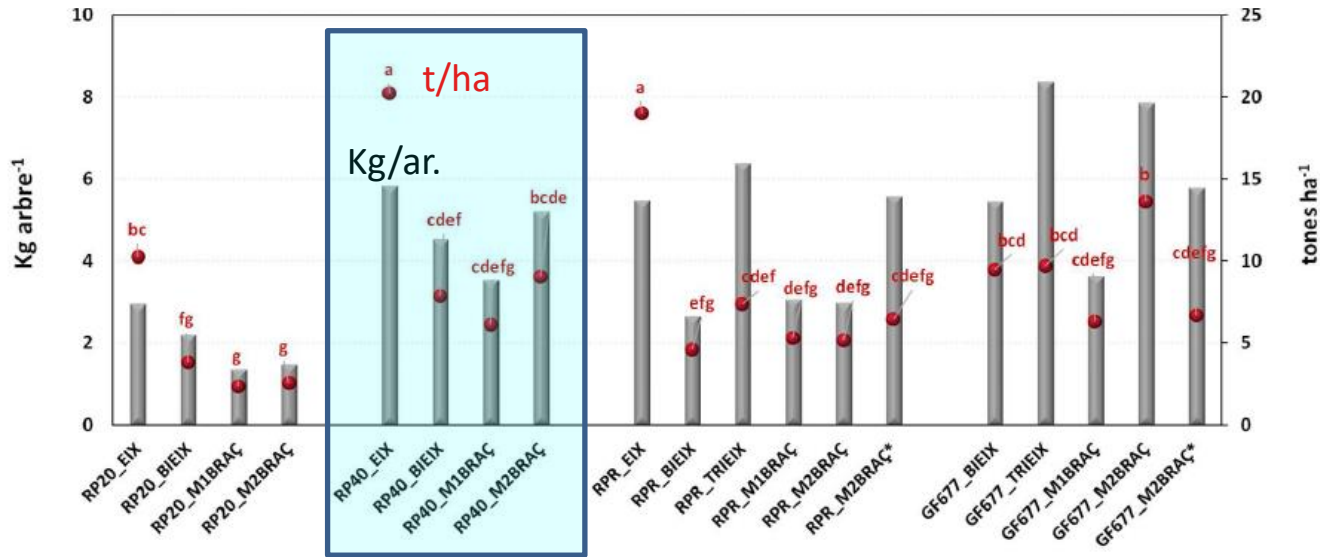
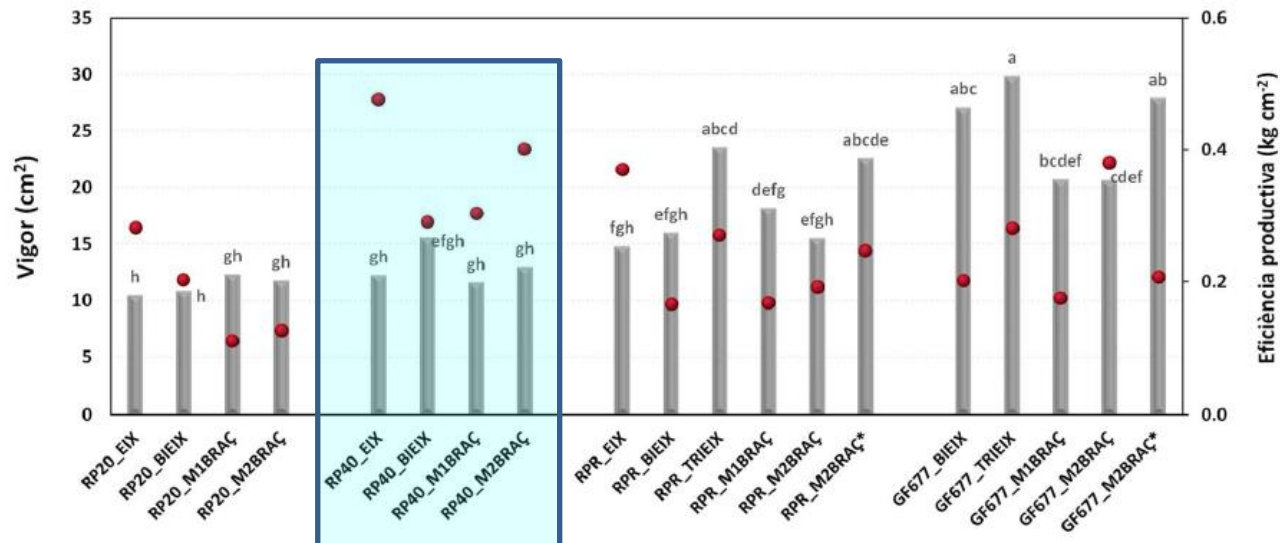


Figura 3. Vigor de l'arbre (barra de color gris) i eficiència productiva (punt color vermell) dels diferents tractaments avaluats.



2º año a ojo dormido

Figura 4. Percentatge de fruits en cadascuna de les categories de calibre dels diferents tractaments avaluats. Les barres negres representen l'error estàndard.

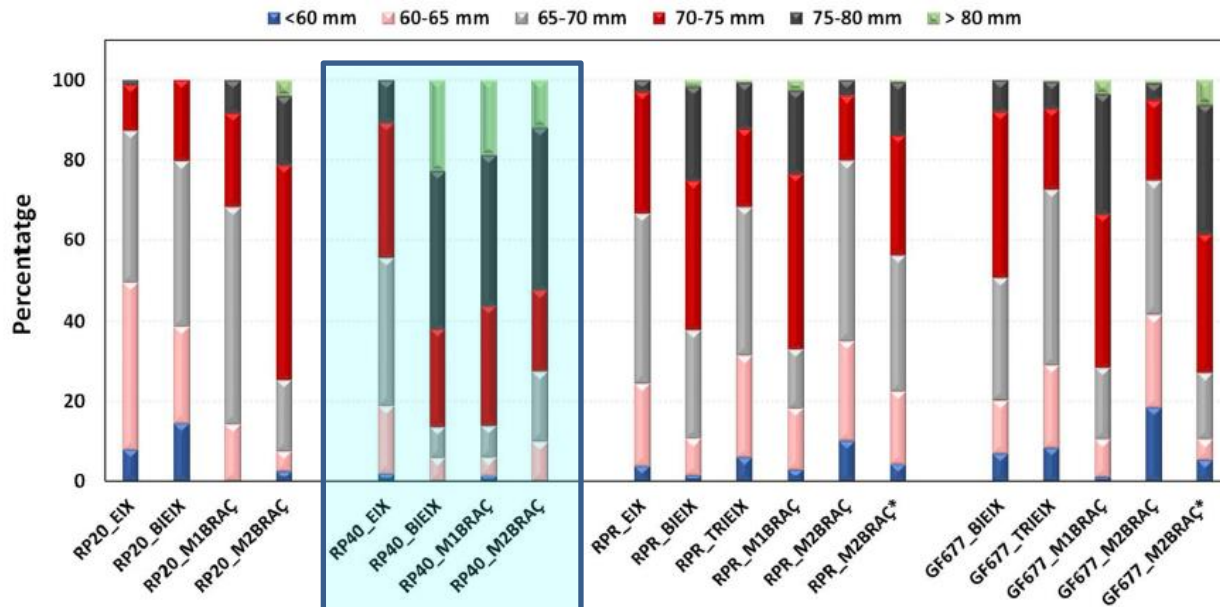
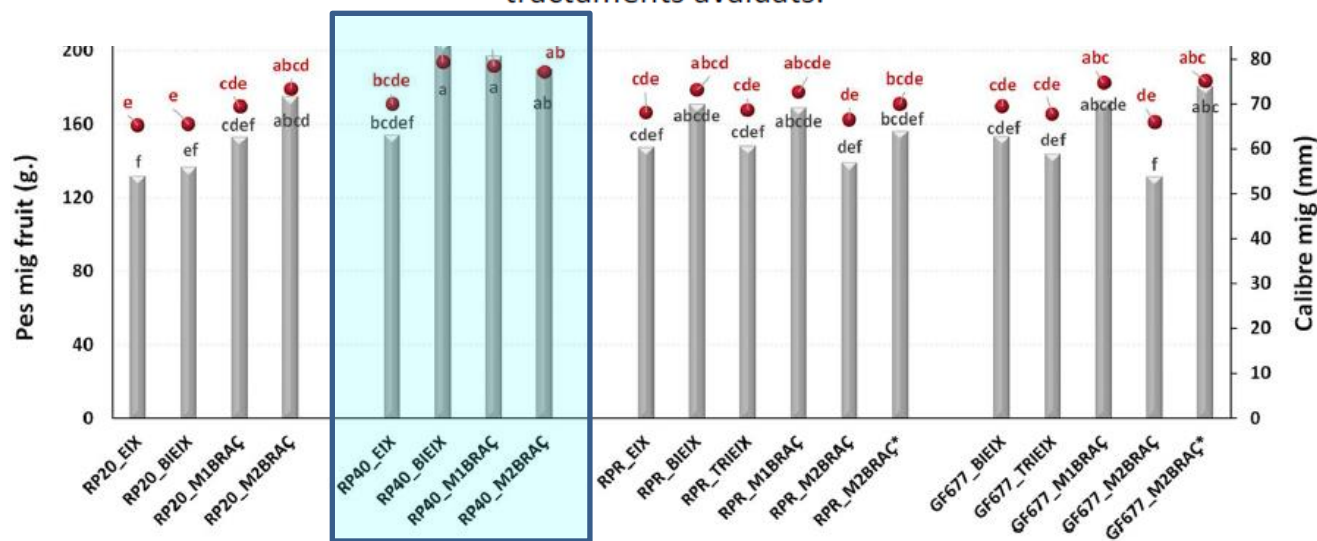


Figura 5. Pes mig (barra de color gris) i calibre mig del fruit (punt color vermell) dels diferents tractaments avaluats.

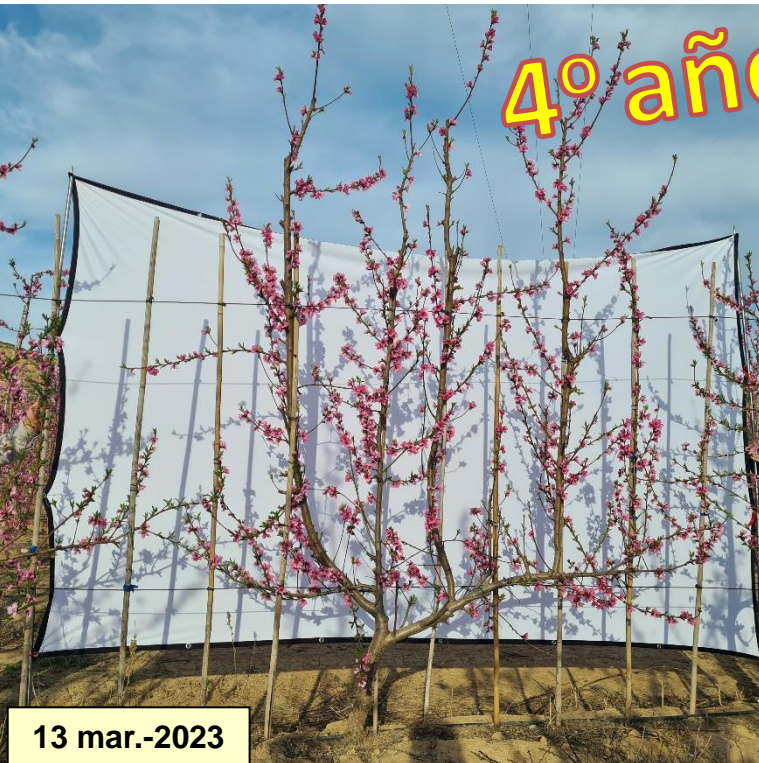


2º año a ojo dormido

# BOREAL / Rootpac-R



4º año ojo dormido



13 mar.-2023

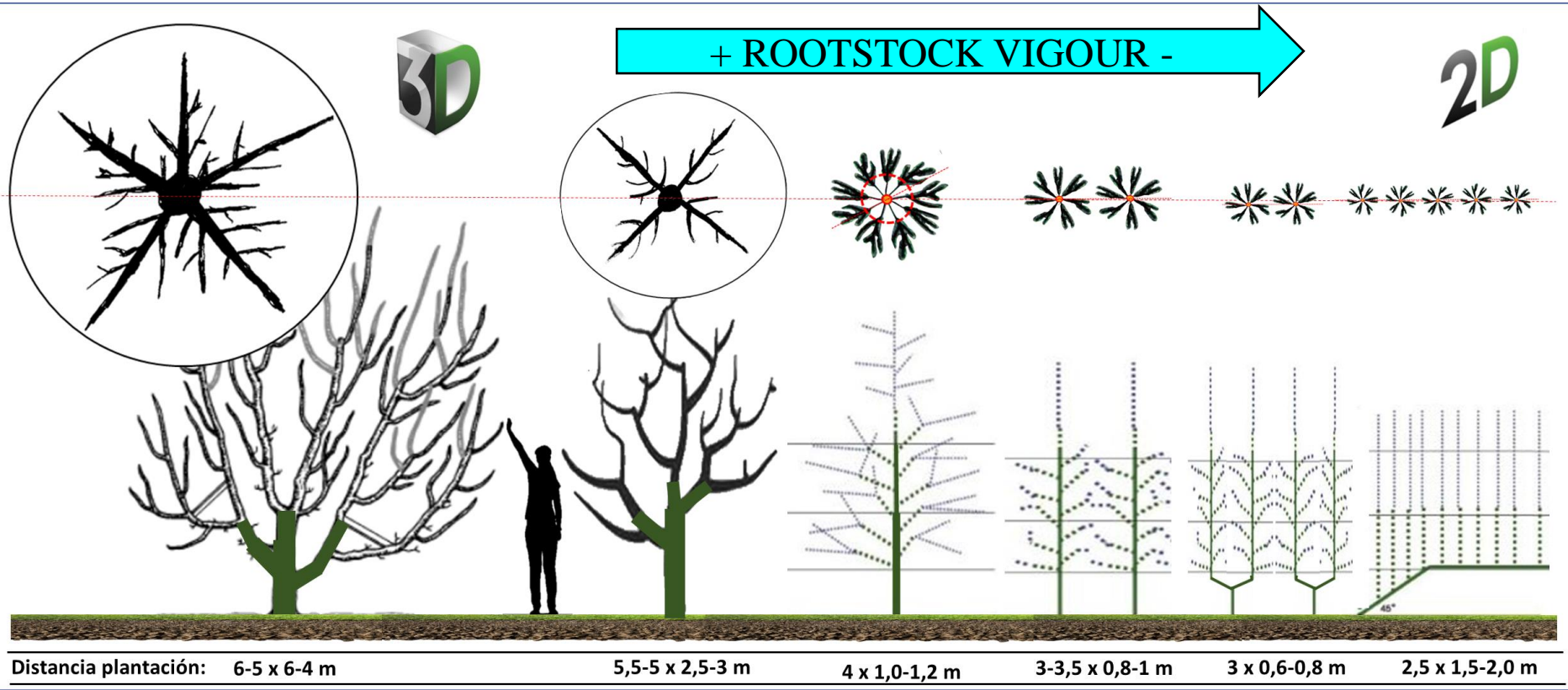


**WHAT'S NEXT?**





# CHANGING TREE ARCHITECTURE + DEVELOPMENT OF VIGOUR CONTROL ROOTSTOCKS IN PEACH



Iglesias & Echeverría, 2022



# Forecast + Field View

**RGB + NIR (Camera)**



# Autonomous spraying



mini  GUSS

 **BALTRONS**  
SERVICE





# WHAT'S NEXT?

2010



2023

1945



# Robotic Harvest



advanced.farm.

aigritec

MONASH University

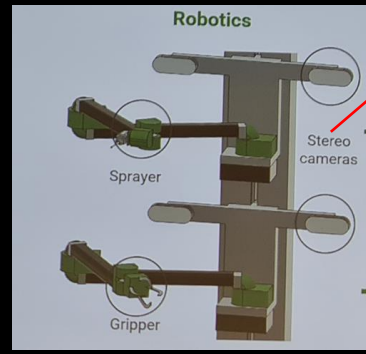
FF Robotics

MUNCKHOF Fruit Tech Innovators

Ripe Robotics

TEVEL

www.interpoma.com



Interpoma Congress

Nov. 2022

- **VISIBILIDAD DEL FRUTO**
- **ACCESIBILIDAD A LA COPA**



**Flying Autonomous Robots**



# TEVEL



<https://youtu.be/kLmersqggOY>



## Kingsburg, California





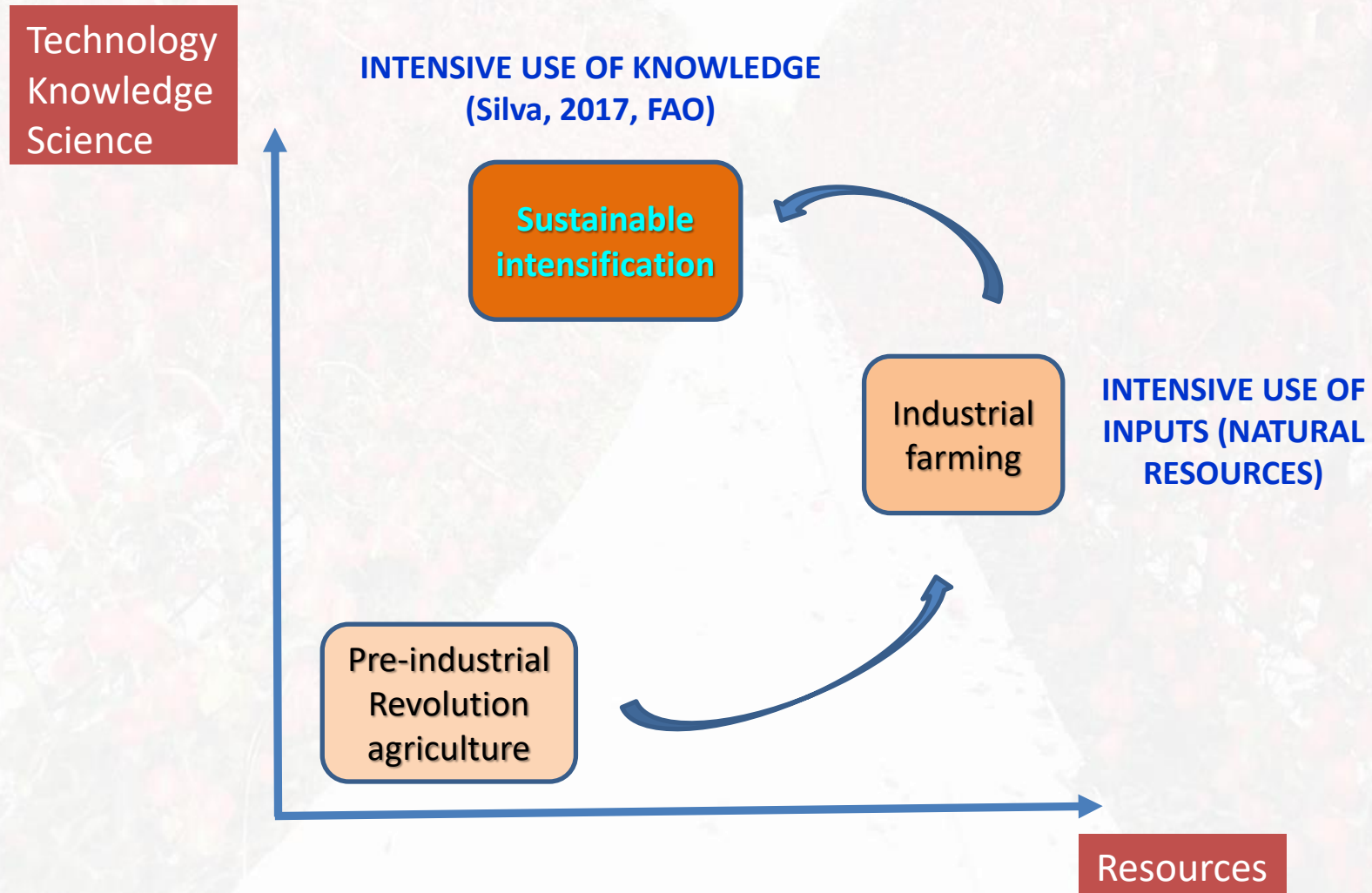
# ADVANCED FARM



30 apples/min



# A NEW CONCEPT FOR NEXT STEP IN AGRICULTURE TRANSFORMATION: **SUSTAINABLE INTENSIFICATION**



# CONCLUSIONES



- ✓ *El entorno actual del aumento de costes de producción en melocotonero y la incertidumbre de precios obliga a **reducir los costes de producción y mantener o mejorar la calidad.***
- ✓ *La innovación como en otras especies frutales se basa en la intensificación con un cambio de la forma (**bidimensional**) y del volumen de copa (**reducido**), para hacerla **más eficiente en el uso de inputs, en particular la mano de obra, los tratamientos fitosanitarios, el agua o fertilizantes.***
- ✓ *Disponiendo de patrones de vigor controlado la intensificación y las formas planas permiten una entrada en producción más rápida y **no dependen de los fitorreguladores**, pero requieren una mayor inversión.*
- ✓ *Los sistemas intensivos aportan **una mayor sostenibilidad** tanto ambiental como de las rentas de los productores con precios razonables de venta razonables y nos acercan a la **FRUTICULTURA 4.0***