# **W**iconshare in the field and beyond

**iconshare** From a piece of land till a modern productive super-intense orchard plantation. Ways to the success. **Hungarian Orchard Growers 2017 Spring Conference** 

- Climate Conditions
- Soil Analysis
- Irrigation
- Soil Moisture
- Salinity
- Microclimate
- Surroundings
- Market Needs





#### **Climate Conditions**

#### In Case of Early Spring Frost we Choose:

- Self-pollinated varieties
- Late flowering varieties





**Climate Conditions** 

#### **Altitude:**

Different apple varieties in high or low altitude



#### **Climate Conditions**

- **Temperature difference between day and night:**
- Cherries need 400-800hr dormancy
- Peaches need 250-450hr dormancy





#### **Soil Analysis**

#### **Mechanical Composition**

Clay soil Vineyard, Almond Potato, Asparagus





#### **Soil Analysis**

High Calcium Carbonate (CaCO<sub>3</sub>)

In peach and almond trees we choose the rootstock GF677 to avoid Iron(Fe) and Zinc(Zn) deficiencies







#### **Soil Analysis**

Ph



Potato, Chestnut Vineyard Rootstock: Richter110 Paulsen 1103







#### **Soil Moisture**

## Moisture conditions

#### Rootstock:Cap6, Plums Rootstock:C29 Apricot Peaches, Cherries

![](_page_10_Picture_4.jpeg)

![](_page_10_Picture_5.jpeg)

![](_page_11_Figure_1.jpeg)

![](_page_11_Picture_2.jpeg)

#### Microclimate

#### Rainfalls

Cherry varieties that don't mature (resistant to cracking like Black Star) the same period that rainfalls occurs in the area will crack due to the prolonged water exposure.

![](_page_12_Picture_4.jpeg)

![](_page_12_Figure_5.jpeg)

#### Microclimate

#### Wind

- Sensitive sprouts that break in kiwis
- Helps in the olive tree pollination
- Sensitive fruits that fall in strong winds

![](_page_13_Picture_6.jpeg)

![](_page_13_Picture_7.jpeg)

#### Microclimate

Day and night temperature difference

Combination of low day temperatures and high night temperatures promote the increased production of anthocyanins which are responsible for the best coloring of the fruits **Conshare** 

![](_page_14_Picture_4.jpeg)

Microclimate

Day and night temperature difference

**Tomatoes best coloring temperatures:** 

- >= 15<sup>0</sup>C
- <= 30<sup>0</sup>C

![](_page_15_Picture_6.jpeg)

#### Surroundings

Situating plantings away from forest edges may also reduce predation by birds, and will assist with pollination and disease prevention through good air circulation.

![](_page_16_Picture_3.jpeg)

![](_page_16_Picture_4.jpeg)

#### **Market Needs**

What is Better?

Earlier Production? or Higher Quality?

![](_page_17_Picture_4.jpeg)

![](_page_17_Picture_5.jpeg)

#### **Cherry varieties mature timeline**

- Early Bigi 4/5 17/5
- Sweet Early 6/5 19/5
- Giorgia 17/5 30/5
- Grace Star 19/5 1/6
- Black Start 25/5 7/6
- Lala Star 31/5 13/6

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![](_page_18_Figure_9.jpeg)

![](_page_19_Picture_1.jpeg)

![](_page_19_Picture_2.jpeg)

#### Ripening dates of cherries (relative to Burlat) in Emilia-Romagna Burlat ripens on May 25th

Varie	ty	May	June	July
ripening date days relative to Burlat				
-7 PRIMULAT® Ferprir	<b>⊪</b> +0-0-0	-0-0-0-	0-0-0-0-0	0-0-0-0-0
-3 EARLY LORY® 1789	w-lo-o-o	-0-0-0-	0-0-0-0-0	0-0-0-0-0-0
BUR	uī-ō-ō-ō	-0-0-0	0-0-0-0-0-0	0-0-0-0-0-0
+6 LORY BLOOM® 1788	<u>w-</u> 0-0-0	-0-0-0-	0-0-0-0-0	0-0-0-0-0
+7 SABRINA® SUMN314	ин <u>0-0-</u> 0	-0-0-0-	<u>• • • • • • •</u>	0-0-0-0-0
+8 FEU	<b>₽</b> -0-0	-0-0-0-	•-0-0-0-0-0	0-0-0-0-0-0
+9 GIOR	GIA-O-O-O	-0-0-0-	0-0-0-0-0	0-0-0-0-0-0
+10 FOLF	ER*+O-O-O	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+10 SAMBA® Sums	**+0-0-0	-0-0-0-	0-0-0-0-0	0-0-0-0-0-0
+10 LORY STRONG® 1786	₩+0-0-0	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+12 BIG LORY® 1787	₩+0-0-0	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+12 FERDOU	°E+O-O-O	-0-0-0-	$0 \bullet 0 0 0 0 0$	0-0-0-0-0-0
+12 CELESTE® Sumpa	□•+0-0-0	-0-0-0-	$0 \bullet 0 0 0 0 0$	0-0-0-0-0-0
+15 FERTIL	<b>u</b> +0-0-0	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+16 NEW MOON® Sum	<b>•••</b> + <u>0</u> - <u>0</u> - <u>0</u>	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+18 FERMI	w-0-0-0	-0-0-0	6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 -	000000
+18 SIMCOE® Prot	1a+0-0-0	-0-0-0	000000	000000
+19 SONATA® Sumle	•• <u>+</u> 0-0-0	-0-0-0-	0-0-0-0-0-0	0-0-0-0-0-0
+20		-0-0-0	0-0-0-0-0-0	0000000
+20 CANADA GIANT® Sumg	<b>*</b> +0-0-0	-0-0-0	0-0-0-0-0-0	0000000
+20 SATIN® Sume	-0-0-0	-0-0-0	0-0-0-0-0-0	0-0-0-0-0-0
+22 FERNI	-0-0-0			
+23 FERRO				
+24				
+24				
+20				
+30 SKEE				
+30				
+3U REG				
+30 STEETHEART - SUIIZ				
14E LATE LOS				
140 LATE LOP		~~~~		

training system	rootstock	tree spacing	trees/ha
vase	Colt, MaxMa Delbard®14	5-5,5 x 3-4	450-670
Catalan vase	Colt, MaxMa Delbard®14	4,5-5 x 2,5-3	670-890
palmette	MaxMa Delbard®14, Gisela 6	4-4,5 x 3-3,5	740-1000
slender spindle	Gisela 5 e Gisela 6, Piku 1 e 4, P-HL-C	3,5-4 x 1,5	1670-2850
pillar	Gisela 5 e Gisela 6, Piku 1 e 4, P-HL-C	3-3,5 x 0,5-1	2850-3330
perpendicular V or Y	Gisela 5 e Gisela 6, Piku 1 e 4, P-HL-C	4-4,5 x 1-1,5	1480-2500

![](_page_20_Figure_2.jpeg)

![](_page_20_Picture_3.jpeg)

	Free Systems	Linear Systems	
Rootstock	Vase - Cypress	Palmette - Fence	Super Slender Axe
Wild Cherry Rootstock	6x6 – 8x8	-	-
Maxma 60	6x6 – 8x8	-	-
Mahaleb Rootstock	6x6 – 7x7	-	-
Colt	5x5 – 6x6	4x5 – 4,5x5	-
CAB-6P	5x5 – 6x6	4x5 – 4,5x5	3x5 – 4x5
Maxma 14	5x5 – 6x6	4x5 – 4,5x5	3x5 – 4x5
Gisela 6	-	3,5x4,5 – 4x4,5	1,5x4,5 - 2,5x4,5
Gisela 5	-	3,5x4,5 – 3,5x4,5	0,80x4,5 - 1,5x4,5

![](_page_21_Picture_2.jpeg)

Gisela 6 Rootstock + Lapins Variety = X Lapins Variety + Mazzard Rootstock =

Mazzard Rootstock + Greystar Variety = X

Greystar Variety + Gisela 6 Rootstock =

![](_page_22_Picture_4.jpeg)

![](_page_22_Picture_5.jpeg)

#### Advantages and Drawbacks of High-density Sweet Cherry Systems

- Early bearing
- High yields
- Harvest efficiency and ease
- Tree efficiency (light and spray distribution)
- Easy to protect with covers

![](_page_23_Picture_7.jpeg)

![](_page_23_Picture_8.jpeg)

#### Advantages and Drawbacks of High-density Sweet Cherry Systems

- Fruit quality?
- Early return on investment and breakeven cost?

![](_page_24_Picture_4.jpeg)

![](_page_24_Picture_5.jpeg)

Advantages and Drawbacks of High-density Sweet Cherry Systems

- High establishment cost
- High level of inputs (training labor)
- High level of knowledge
- Must protect from frost since trees are smaller
- Short lifespan?

![](_page_25_Picture_7.jpeg)

![](_page_25_Picture_8.jpeg)

![](_page_26_Picture_1.jpeg)

![](_page_26_Picture_2.jpeg)

![](_page_26_Picture_3.jpeg)

![](_page_26_Picture_4.jpeg)

![](_page_27_Picture_1.jpeg)

![](_page_27_Picture_2.jpeg)

#### Narrow "Fruiting Wall" Canopies for Space Efficiency under Protective Structures

![](_page_28_Picture_2.jpeg)

![](_page_28_Picture_3.jpeg)

**Cherry Systems Fundamentals: Growth and the Basic Fruiting Units** 

![](_page_29_Figure_2.jpeg)

Understanding this basic set of leaf populations and fruiting sites is a fundamental key to all training systems

![](_page_29_Picture_4.jpeg)

#### High Performance Orchards: Precisely-Structured Trees with Simplified Fruiting Units

![](_page_30_Picture_2.jpeg)

![](_page_30_Picture_3.jpeg)

![](_page_31_Figure_1.jpeg)

simplified strategies for fruit wood renewal

- Shoot Promotion The goal in forming shoots in Years 1-2 should be to establish fruiting units for Years 2-4:
- Heading (not desirable)
- Promalin (sensitive to climate)
- Bud selection
- Bud notching/scoring(susceptible to bacterial cancer)

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![](_page_32_Picture_7.jpeg)

#### Super Slender Axe (SSA)

![](_page_33_Picture_2.jpeg)

![](_page_33_Picture_3.jpeg)

#### Super Slender Axe (SSA)

**Nursery Trees** 

Spacing: 2.5 x 11 ft

100-120 cm in height from the graft union, strong buds, moderate internode spacing

![](_page_34_Picture_5.jpeg)

![](_page_34_Picture_6.jpeg)

#### **Pruning Regime for SSA Training**

- Establishing adequate fruiting units is key to SSA success.
- Most SSA cropping occurs on basal non-spur flowers of year-old shoots.
- Thus, each SSA tree must have an adequate number of fruiting units (new shoots) that are uniformly arrayed along the central leader and have uniform, moderate vigor.
- SSA tree structure should be fully developed by the end of Year 2.
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![](_page_35_Picture_6.jpeg)

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- SSA tree structure should be fully developed by the end of Year 2.
  Conshare

![](_page_36_Picture_6.jpeg)

There is no single best system. Growers who will be successful if they understand the fundamental training rationale and fruiting units for each system, and how to adapt their system management for their specific needs: their orchard site, their variety characteristics, their markets, and their labor situation.

![](_page_37_Picture_2.jpeg)

![](_page_37_Picture_3.jpeg)

![](_page_38_Picture_1.jpeg)

![](_page_38_Picture_2.jpeg)

#### Harvest calendar for yellow-fleshed peaches (relative to Redhaven) In Emilia-Romagna, Italy, Redhaven ripens around July 10<sup>th</sup>-15<sup>th</sup>

	variety	June	July	August	September
ripening (daws w	t date				
-37	TASTIRED <sup>®</sup> Zairisup*·	00000	000000	000000	000000
-37	FRANÇOISE	00000	$\tilde{0}$	$\tilde{0}$	00000
-37	SAGITTARIA*	00000	$\tilde{0}$	$\tilde{0}$	000000
-35	PULCHRA*	00000	000000	00000	000000
-22	SUGAR TIME*	000000	000000	000000	000000
-22	ZEE DIAMOND*	000000	000000	000000	000000
-16	BRITTNEY LANE*	00000	000000	000000	000000
-15	RUBIRICH <sup>®</sup> Zainoar*	000000	000000	000000	000000
-5		000000	$\circ \bullet \circ \circ \circ \circ$	$\infty$	000000
-5	ROYAL GLORY <sup>®</sup> Zaifisan*	000000	00000	000000	000000
0	RICH LADY*	000000	000000	000000	000000
+3	VISTARICH® Zainobe*	000000	0000000	000000	000000
+3	RUTAL TIME" Zairetop"				
+11	RUTAL SUMMER® ZAISOSDIE				
+10					
+20	POVAL CER Zalpela				
+21	ROME STAR*	0000000		••••••	000000
+25	ROYAL TOP® ZAI587PJ*	$\tilde{0}$	$\tilde{\mathbf{o}}$	<u> </u>	000000
+26	RED ELEGANT*	000000	$\check{\circ}\check{\circ}\check{\circ}\check{\circ}\check{\circ}\check{\circ}\check{\circ}\check{\circ}\check{\circ}$	ŏŏŏŏŏŏ	00000
+28	ZEE LADY <sup>®</sup> Zaijula*	000000	$\overline{000000}$	00000	000000
+28	ROYAL PRIDE <sup>®</sup> Zaisula*	000000	000000	000000	000000
+30	SWEET DREAM*	000000	000000	000000	000000
+36	ROYAL ESTATE <sup>®</sup> Zaizizan*	000000	000000	000000	000000
+40	ROYAL JIM <sup>®</sup> Zaigadi*	000000	000000	000000	000000
+44	ROYAL SWEET <sup>®</sup> Zaibiji*	000000	000000	00000	000000
+45	SWEET HENRY*	000000	000000	00000	000000
+48	PLUS PLUS <sup>®</sup> Maillarplus*	000000	000000	00000	000000
+50	RED STAR*	000000	$\sim$	00000	000000
+55	SWEET JUANA*	000000			
+60	TARUIBELLE <sup>®</sup> Beiletardie*	-000000	000000	000000	000000

![](_page_39_Picture_1.jpeg)

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Harvest calendar for white-fleshed peaches (relative to Redhaven) In Emilia-Romagna, Italy, Redhaven ripens around July 10<sup>th</sup> -15<sup>th</sup>

	variety	June	July	August	September
ipening	date				
aays wi	th respect to Reanaven)				
-34	AMANDA <sup>®</sup> Zaibaro*-	00000	000000	000000	000000
-22	SPRING SNOW*	0000000	000000	000000	000000
-18	-PATTY <sup>®</sup> Zaisito*	000000	000000	000000	000000
+5	MAURA <sup>®</sup> Zaifisan*-	000000	000000	000000	000000
+8	NATHANA <sup>®</sup> ZAI655PB*-	000000	000000	000000	000000
+13	FRANCY*	000000	0000000	000000	000000
+15	NERISA® ZAI 668PB*-	000000	00000	000000	000000
+21	ROSALIA <sup>®</sup> ZAI580PB*-	000000	000000	00000	000000
+24	URANIA <sup>®</sup> ZAI613PB*-	000000	000000	<b>0</b>	000000
+28	OCTAVIA <sup>®</sup> Zaigle*-	000000	000000	$0 \bullet \bullet$	000000
+38	KEVINA® Zaidaso*	-0-0-0-0-0-0-	000000	0000000	000000
+40		-0-0-0-0-0-0-	000000	0-0-0-0-0-0-	000000
+52	GLADYS <sup>®</sup> Zailati*	000000	000000	000000	000000
+52	LUCIUS <sup>®</sup> ZAI666PB*-	000000	000000	000000	000000

![](_page_40_Picture_1.jpeg)

#### Harvest calendar for yellow-fleshed nectarines (relative to Big Top® Zaitabo\*) In Emilia-Romagna, Italy, Big Top® Zaitabo\* ripens between July 8th-13th

variety	June	July	August	September
ripening date				
Carlys white respect to big top 2 anabo 7  FARLY BOMBA® Zaitrobo*-	000000	000000	000000	000000
18 BIG BANG® Maillara*-	000000	000000	000000	000000
-16 REBUS 028*	000000	000000	000000	000000
-7 BIG SUNSHINE®	000000	<u>.</u>	000000	000000
-5 BIG HAVEN <sup>®</sup> Honey Haven*-	000000	00000	000000	000000
-5 BIG FIRE® ZAI691 NI*-	000000	00000	000000	00000
BIG TOP® Zaitabo*-	000000	00000	00000	00000
+5 HONEY KIST*-	000000	000000	000000	000000
+7 REBUS 038*	000000	000000	000000	000000
+13 ALITOP*-	000000	000000	000000	000000
+15 REBUS 195*	000000	000000	000000	000000
+22 EARLY ZEE <sup>®</sup> Zaigloze*-	000000	000000	00000	000000
+24 STARK RED GOLD	000000	000000	••••••	000000
+25 CONQUETE®-	000000	000000	••••••	000000
+27 NECTAROSS	000000	000000	00000	000000
+32 RED PARADISE*	000000	000000	000000	000000
+33 VENUS	000000	000000	000000	000000
+38 ORION*	000000	000000	000000	000000
+40 MARIA DOLCE	000000	000000	000000	000000
+42 RED DEVIL® ZAI666NU*-	000000	000000	000000	000000
+42 SWEET LADY*	000000	000000	000000	000000
+54 GIANNA LAURA DOLCE*-	000000	000000	000000	••••••
+55 RED FAIR® Zaifane*-	000000	000000	000000	••••••
+55 DARK FAIR® Zaidapi*-	000000	000000	000000	00000
+59 RED LATE <sup>®</sup> Zailared*-	000000	000000	000000	00000
+64 LATE FAIR <sup>®</sup> Zaitreme*-	-000000	+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0	+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0+0	000000

![](_page_41_Picture_1.jpeg)

![](_page_41_Picture_2.jpeg)

#### Harvest calendar for white-fleshed nectarines (relative to Big Top® Zaitabo\*) In Emilia-Romagna, Italy, Big Top® Zaitabo\* ripens between July 8th-13th

variety	June	July	August	September
ipening date days with respect to Big Top <sup>®</sup> Zaitabo*)				
-22 QUEEN RED <sup>®</sup> Zaitolio*	000000	000000	000000	000000
-8 MARIA LINDA*	000000	••••••	000000	000000
-6 ROYALE QUEEN <sup>®</sup> Zaisirly*	000000	$\bullet \bullet $	000000	000000
+2 QUEEN GEM <sup>®</sup> Zaibioga*	000000	000000	000000	000000
+14 MAGIQUE® Maillarmagie*	000000	0000000	$\infty$	000000
+20 QUEEN DIAMOND <sup>®</sup> ZAI726NB*	000000	00000	000000	000000
+32 QUEEN GLOBE® ZAI809NB*	000000	000000	$\circ \bullet \bullet \circ \circ \circ$	000000
+37 BIG BEL <sup>®</sup> Zaibeglo*	000000	000000	000000	000000
+42 LYUS*	000000			
+OZ SILVER BRIGHT@ZAT/TONB*	000000	000000	000000	000000

![](_page_41_Picture_5.jpeg)

Training systems and tree density						
tree form/shape tree spacing (m) trees/ha						
vase	5-5,5 * 3-4	450-660				
palmette	4-4,5 * 3-3,5	630-830				
candelabra	4-4,5 * 3-3,5	630-830				
Catalan vase	4,5-5 * 2,5-3	670-890				
U-shape	4-4,5 * 2-3	740-1250				
slender spindle	4,5-5 * 1,5-2	1000-1500				
trellised-Y	5 * 1,5	1330				
super spindle	4-4,5 * 1-1,2	1850-2500				

![](_page_42_Figure_2.jpeg)

![](_page_42_Picture_3.jpeg)

![](_page_43_Picture_1.jpeg)

![](_page_43_Picture_2.jpeg)

#### Ripening dates of apricots (relative to San Castrese) in Emilia-Romagna San Castrese ripens between June 25<sup>th</sup> and July 2<sup>nd</sup>

	Variety	May	June	July	August
days wit	th respect to San Castrese				
-39	PRICIA*	000000	000000	000000	000000
-38	TSUNAMI® EA5016*	000000	000000	000000	000000
-35	PRIMANDO*	000000	000000	000000	000000
-33	LUNAFULL*	000000	000000	000000	000000
-31		+000000	000000	000000	000000
-29	PRIMAYA*	+000000	000000	000000	000000
-25	PRIMARIS*	000000	00000	000000	000000
-25	PRIMIUS*	000000	00000	000000	000000
-24	RUBISTA® E140*	000000	00000	000000	000000
-24	NINFA*	-000000	•00000	000000	000000
-18	SOLEDANE*	-000000	00000	000000	000000
-15	BORA@ B0 90610010*	-000000	000000	000000	000000
-15	PINKCOT <sup>®</sup> Copty*	-000000	000000	000000	000000
-13		-000000	0000000	000000	000000
-10	PRIABEL*	000000	000000	000000	000000
-8	ORANGE RUBIS® Couloumine*	000000	0000000	000000	0000000
-6	MEDAGA*	-000000	0000000	000000	000000
4	BELLA D'IMOLA	000000	0000000		000000
4	BIG RED® EA4006*	0000000			
4	MEDIABELL*	0000000			
4	GULDRICH (SUNGIANT)	000000			
-3	BUREALE				
0	SAN CASTRESE				
41	PALIMMELLA			000000	
+6	STELLA*		000000	000000	000000
+6	PIEVE*	-000000	0000000	••••••	000000
+7	PORTICI	-000000	000000	00000	000000
+11	BERGERON	-000000	000000	00000	000000
+14	FARALIA*	-000000	000000	00000	000000
+31	FARELY*	-000000	00000	00000	000000
+35	FARTOLI*	000000	000000	00000	000000
+41	FARBALY*	000000	000000	000000	00000
+51	FARHIAL*	-000000	000000	000000	000000
+56	FARLIS*	-000000	000000	000000	000000
+57	FARIUS*	000000	000000	000000	000000
+61	FARDAO*	-000000	000000	000000	000000
+65	FARCLO*	-00000	00000	00000	00000

Training systems and tree density					
tree form/shape tree spacing (m) trees/ha					
vase variants	5-5,5 * 3-4	450-660			
Catalan vase	4,5-5 * 2,5-3	670-890			
palmette	4-4,5 * 2,5-3	740-1100			
trellised Y	4-4,5 * 2-2,5	890-1250			
slender spindle	4-4,5 * 1,5-1,8	1230-1660			
perpendicular V or Y	5 * 1,5	1330			
pillar	4-4,5 * 1-1,2	1850-2500			

![](_page_44_Figure_2.jpeg)

![](_page_44_Picture_3.jpeg)

![](_page_45_Figure_1.jpeg)

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#### **Traditional Vase**

![](_page_46_Picture_2.jpeg)

![](_page_46_Picture_3.jpeg)

![](_page_47_Picture_1.jpeg)

![](_page_47_Picture_2.jpeg)

![](_page_48_Picture_1.jpeg)

![](_page_48_Picture_2.jpeg)

![](_page_49_Picture_1.jpeg)

![](_page_49_Picture_2.jpeg)

![](_page_50_Picture_1.jpeg)

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![](_page_50_Picture_2.jpeg)

#### Ripening dates of apple varieties (relative to Golden Delicious clone B) in Emilia-Romagna Golden Delicious clone B ripens September 15th

Variety	July	August	September	October
days with respect to Golden Delicious clone B	🔵 hai	vest date	😑 ripenin	o date
-30 -TR	00000	<del></del>	000000	000000
-27 DEVIL GALA*-	00000		000000	$\tilde{o}$
-27ANNAGLO*-	ŏŏŏŏŏ		000000	$\tilde{o}$
-27RUBY GALA® Gala rossa*-	00000		000000	$\tilde{o}$
-27 ROYAL BEAUT <sup>®</sup> Proselect*-	00000	000000	000000	$\tilde{o}$
-27 SCHNIGA® Schnitzer*-	00000	000000	000000	00000
-27 GALAXY* Selecta®-	00000	000000	000000	00000
-12 RED CHIEF® Camspur*-	00000	000000	00000	00000
-10 EARLY RED ONE <sup>®</sup> Erovan*-	00000	000000	00000	00000
-10 JEROMINE*-	00000	000000	00000	00000
-10 RED CAP® Valtod*-	000000	000000	00000	000000
-10 SCARLET SPUR® Evasni*-	00000	000000	00000	000000
-10 SUPERCHIEF® Sandidge*-	00000	$\infty$	00000	000000
-10 RENETTA DEL CANADA-	00000	$\infty$	00000	00000
-8 -TR-CRIMSON CRISP® Coop 39*-	000000	$\phi \phi \phi \phi \phi \phi \phi$	00000	000000
O GOLDEN Clone B-	000000	$\rightarrow 000000$	000000	00000
O GOLDEN Clone B LB*-	000000	$\infty$	000000	$\infty$
GOLDEN SMOOTHEE <sup>®</sup> CG10YD*-	000000	$\phi \phi \phi \phi \phi \phi \phi$	000000	$\infty$
GOLDEN 527®-	000000	$\infty$	000000	$\infty$
O GOLDEN RUGGINE-	00000	$\phi \phi $	000000	$\infty$
+5 -TR-PRIMIERA® Coop 42*-	00000	$\phi \phi $	000000	$\infty$
+7 ROYAL BRAEBURN*-	00000	$\phi \phi $	0000000	000000
+7 TR BRINA*-	000000	$\phi \phi $	0000000	000000
+8 GOLD CHIEF® Gold Pink*-	00000	$\phi \phi \phi \phi \phi \phi \phi$	0000000	000000
+8 -TR	00000	$\phi \phi \phi \phi \phi \phi \phi$	0000000	000000
+10 TR FLORINA	00000	$\phi \phi \phi \phi \phi \phi \phi$	0000000	000000
+12 SWEET STONE*-	00000	$\phi \phi \phi \phi \phi \phi \phi$	000000	000000
+15 ANNURCA ROSSA DEL SUD-	00000	$\phi \phi $	000000	$\infty$
+15 ANNURCA BELLA DEL SUD-	00000	000000	000000	$\infty$
+15 GRANNY SMITH-	00000	$\phi \phi $	00000	$\infty$
+15 NEIPLING EARLY STAYMAN-	00000	$\phi \phi $	00000	000000
+15 SUPERSTAYMAN	00000	$\phi \phi $	00000	$\infty$
+15 - IR BAWADE-	000000	000000	00000	000000
+20 ZHEN® Aztec*-	000000	2000000	000000	•00000
+20 KIKU® Fubrax*	000000	000000	000000	•00000
+25 IMPERATORE (MORGENDUFT)-	000000	2000000	000000	00000
+25 IMPERATORE DALLAGO	000000	200000	000000	00000
+30 -TR	000000	2000000	000000	000000
+35 SIMIRENKO	00000	200000	++++++++++++++++++++++++++++++++++++	00000

Training	systems	and	orchard	spacing
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training system	tree spacing (m)	trees/ha
slender spindle (hills, mountains)	3-3,2 * 0,8-1,2	2600-4160
slender spindle (plains, valley)	3,5-3,7 * 0,9-1,3	2080-3180
solaxe	4-4,5*1,2-1,5	1480-2080
V	3,5*0,7-0,8	3500-4000
super spindle	3-3,2*0,5	5700
trellised-Y	3,5*1	2860
candelabra	3,5*1,5-2	1400-1900

![](_page_51_Figure_3.jpeg)

![](_page_51_Picture_4.jpeg)

The Problem: What System to Plant?

- There is great disparity of opinion on the optimum planting density.
- Some growers plant 500-750 trees/ha on semi-dwarfing rootstocks with Central Leader.
- Most growers plant 1250-2500 trees/acre on dwarfing rootstocks with some version of Vertical Axis.
- A few growers plant 5000 trees/acre on dwarfing rootstocks with Super Spindle.

![](_page_52_Picture_6.jpeg)

#### **Viable Orchard Systems**

System	Trees/acre	Trees/ha	Spacing (ft.)	Rootstocks
Slender Pyramid	340	840	8' x 16'	M.26, G.30,G.935
Vertical Axis	622	1538	5' x 14'	M.9, G.41,G.11
Slender Axis	908	2244	4' x 12'	M.9, G.41,G.11
Tall Spindle	1320	3262	3' x 11'	M.9, G.41,G.11
Super Spindle	2178	5382	2' x 10'	M.9, G.41,G.11

![](_page_53_Picture_3.jpeg)

#### **Slender Spindle/M.9**

![](_page_54_Picture_2.jpeg)

![](_page_54_Picture_3.jpeg)

#### **Triple Row Slender Spindle/M.9**

![](_page_55_Picture_2.jpeg)

![](_page_55_Picture_3.jpeg)

#### Geneva Y-trellis/M.26

![](_page_56_Picture_2.jpeg)

![](_page_56_Picture_3.jpeg)

#### V-Slender Spindle/M.9

![](_page_57_Picture_2.jpeg)

![](_page_57_Picture_3.jpeg)

#### Tall Spindle/M.9

![](_page_58_Picture_2.jpeg)

![](_page_58_Picture_3.jpeg)

- Tree density had a highly significant effect on yield per ha.
- The highest density system achieved 50Mt/ha on the 4th year while the lowest density system did not surpass 25 Mt/ha.

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![](_page_59_Figure_3.jpeg)

- Tree density had a highly significant negative effect on cumulative yield per tree but a highly significant positive effect on yield per ha.
- The cumulative yield per ha of the highest tree density was 3X greater than the lowest density

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250200 Cum Yield (MT/ha) 150 100 Empire 50 Fuji Gala McIntosh 1.000 2.000 5.000 3.000 4,000 6.000 Tree Density (trees/ha)

Effect of Tree Density on 7 Yr. Cumulative Yield

#### **Early Cropping**

Cropping must begin:

- In the second year with the Tall Spindle system.
- Cropping targets for the Tall Spindle:
- Year 1 1-5 fruits
- Year 2 20 fruits
- Year 3 40 fruits
- Year 4 70 fruits
- Year 5 90 fruits

![](_page_61_Picture_10.jpeg)

![](_page_61_Picture_11.jpeg)

#### **Pruning Year 3-5**

- Allow crop to bend the top.
- Limit height of tree only after top has bent by cutting leader to a weak fruitful side branch.
- Remove branches larger than 3/4 inch diameter.
- Remember "large branches create large trees"
- Shorten older, pendant branches to a weak side branch or spur.
- With Gala begin stubbing back pruning.

![](_page_62_Picture_8.jpeg)

![](_page_62_Picture_9.jpeg)

#### **Pruning Years 6-20**

- Limit height of tree by cutting to a fruitful side branch.
- Annually remove 2 branches per year ( limb renewal pruning).
- Focus on the middle tiers of branches first then on upper branches.
- Remove low hanging branches.
- Shorten pendant branches to point of bend.
- Do not over prune. Conshare

#### **Pruning Years 6-20**

![](_page_64_Picture_2.jpeg)

![](_page_64_Picture_3.jpeg)

#### **Young Tall Spindle Orchard**

![](_page_65_Picture_2.jpeg)

![](_page_65_Picture_3.jpeg)

#### **Older Tall Spindle**

![](_page_66_Picture_2.jpeg)

![](_page_66_Picture_3.jpeg)

![](_page_66_Picture_4.jpeg)

#### Conclusions

1) The tall spindle or Slender Axis systems appear to be the most profitable systems.

- 2) High tree density gives high early yield.
- 3) Highly feathered trees are the key to the systems.
- 4) Minimal pruning at planting (No heading the leader or tipping the feathers at planting)
- 5) Branch angle management. Bending feathers below horizontal at planting induces early cropping and limits branch size.
- 6) Branch caliper management. Ruthless removal of large branches keeps trees manageable. "Large branches create large trees"

![](_page_67_Picture_8.jpeg)

# **W**iconshare in the field and beyond