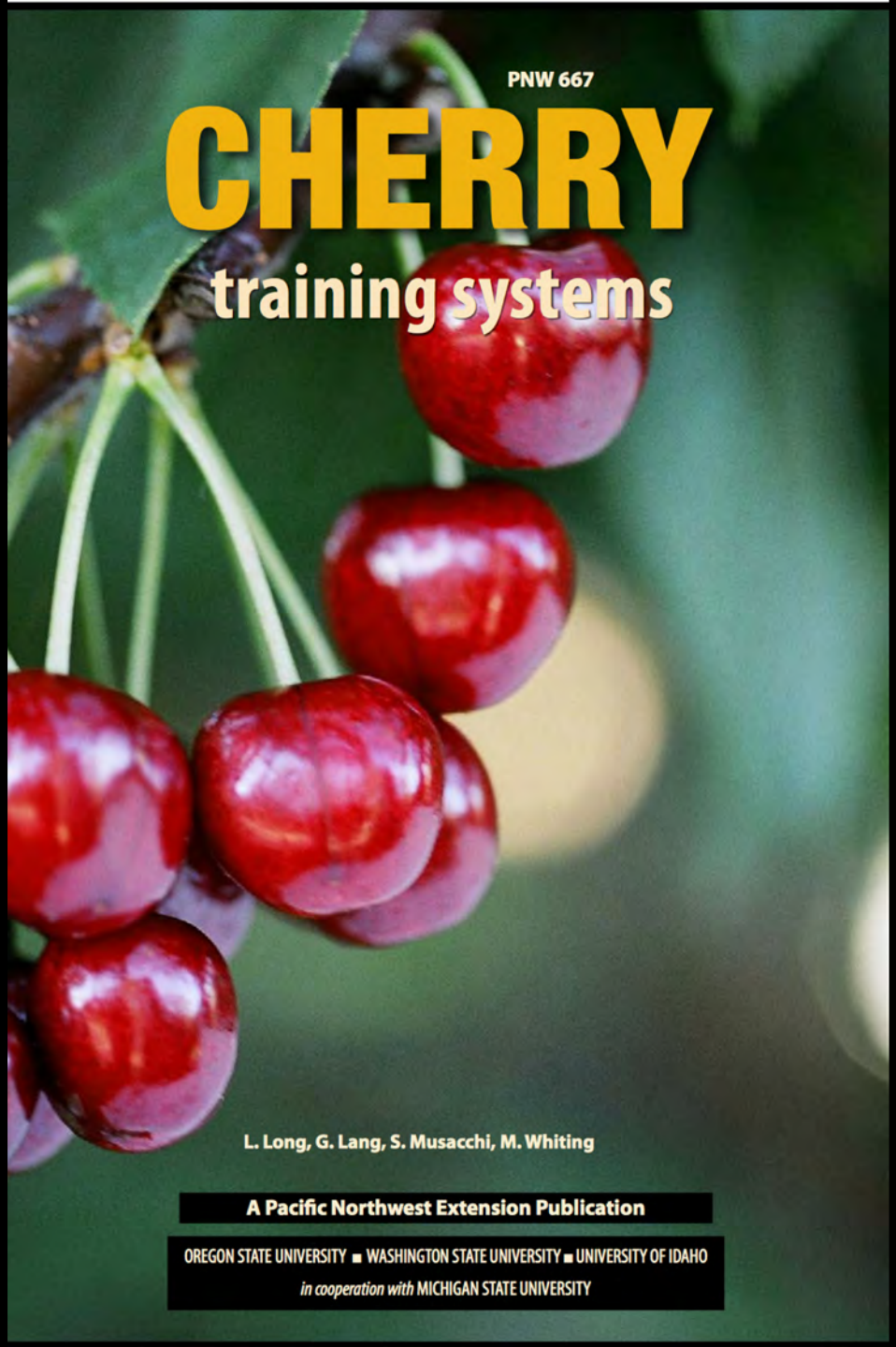
Future Orchard Systems

Matthew Whiting

Washington State University

Sweet cherry is trained to many different systems

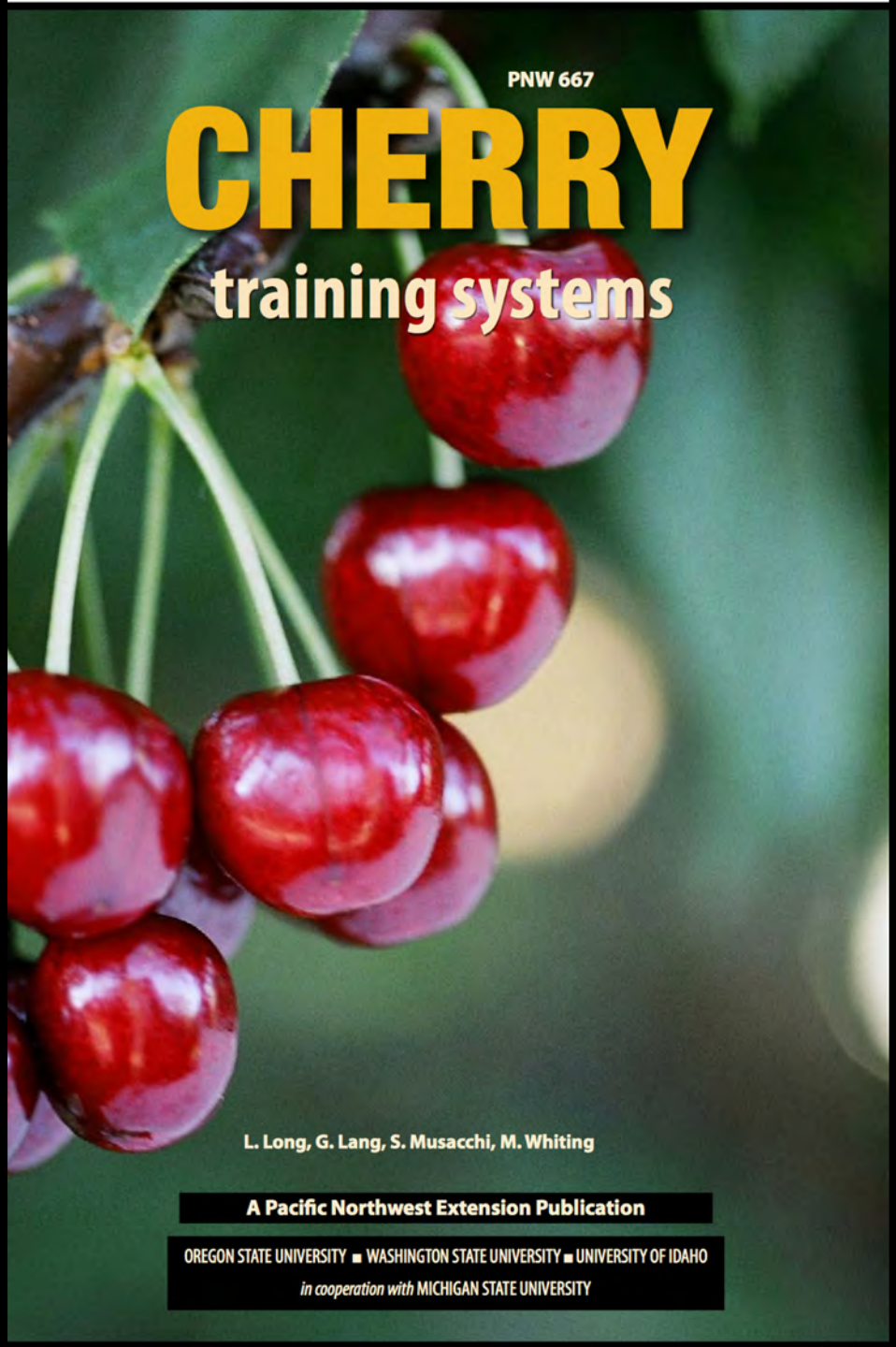
- How to choose?



Published 2015

Available online

Or as an app



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7 different systems!

- Spanish bush
- Kym Green Bush
- Steep leader
- Tall spindle axe
- Vogel central leader
- Super slender axe
- Upright fruiting offshoots

What factors should one consider?

- Interception/distribution of light

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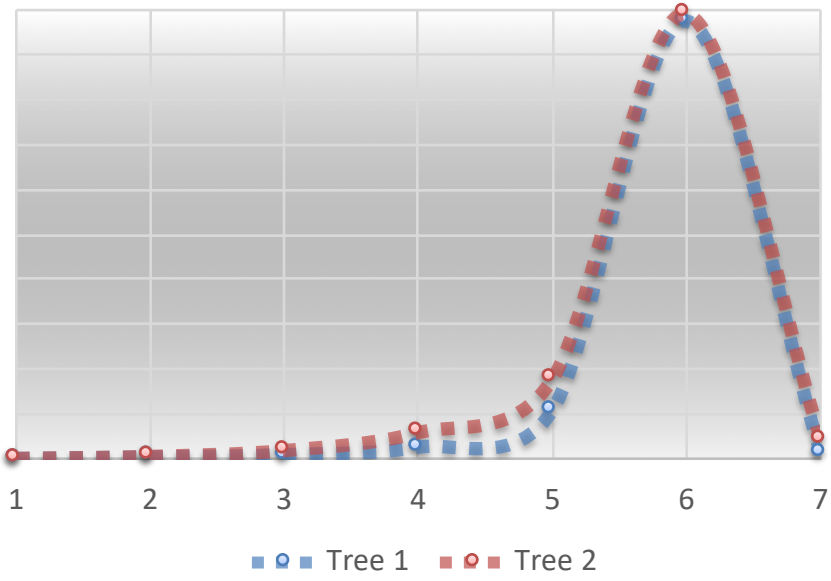
- Quantity and quality of fruit

2016 Color

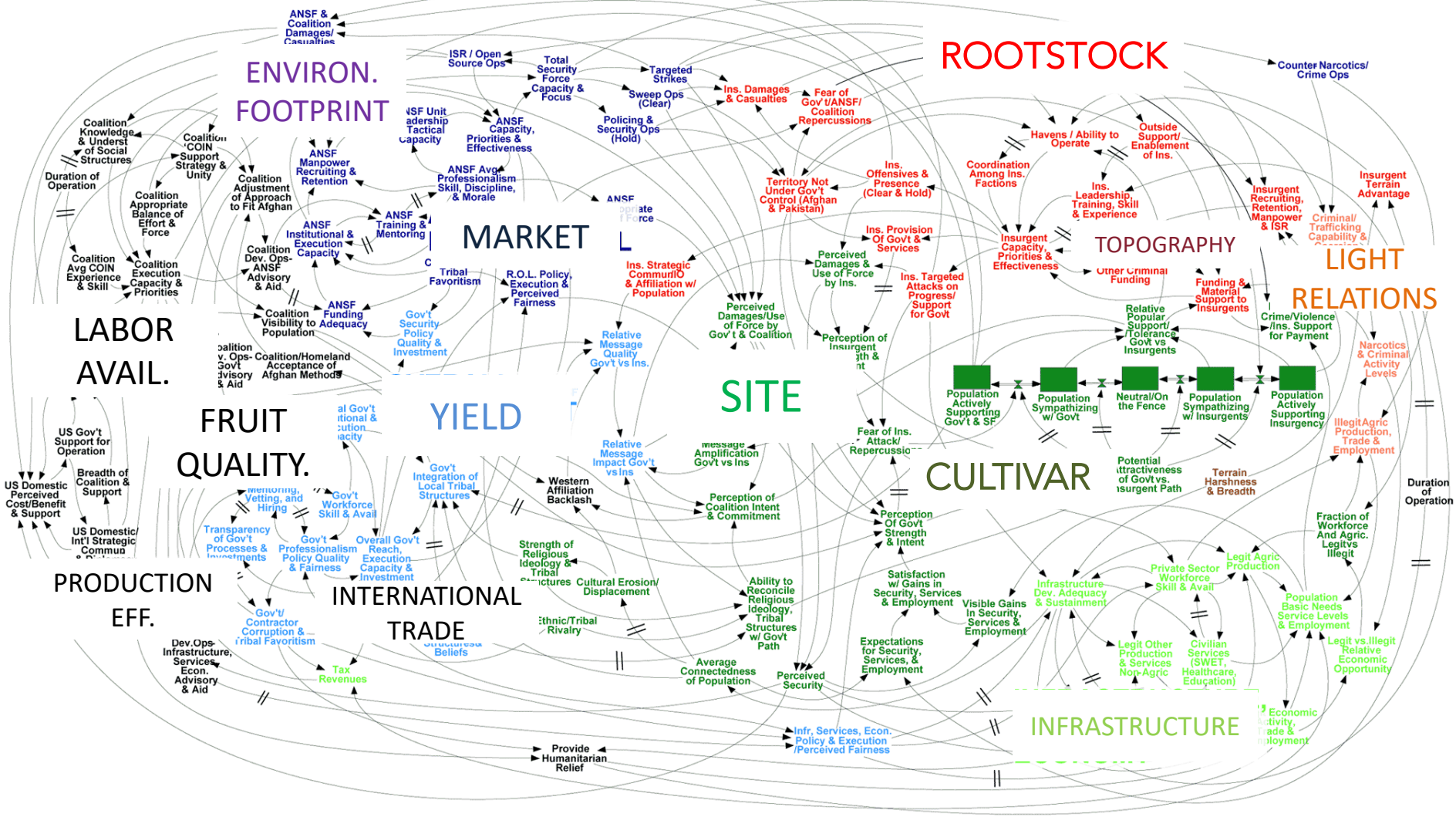
2017 Color



- Interception/distribution of light
- Quantity and quality of fruit
- Uniformity of fruit

- Interception/distribution of light
- Quantity and quality of fruit
- Uniformity of fruit
- Production efficiency
  - Harvest
  - Pruning
- Environmental footprint
- Labor requirements & safety
- Ability to adopt mech./automation

Training system selections process:



WORKING DRAFT – V3

22 billion sweet cherries need to be picked

220,000,000 kilos
7,333,333 hours
916,000 days (2500 years)

ROBOT READY

T&G's mammoth 2-D project pages 12-14

inside

11
COMMODITY LEVY
Make your vote count!

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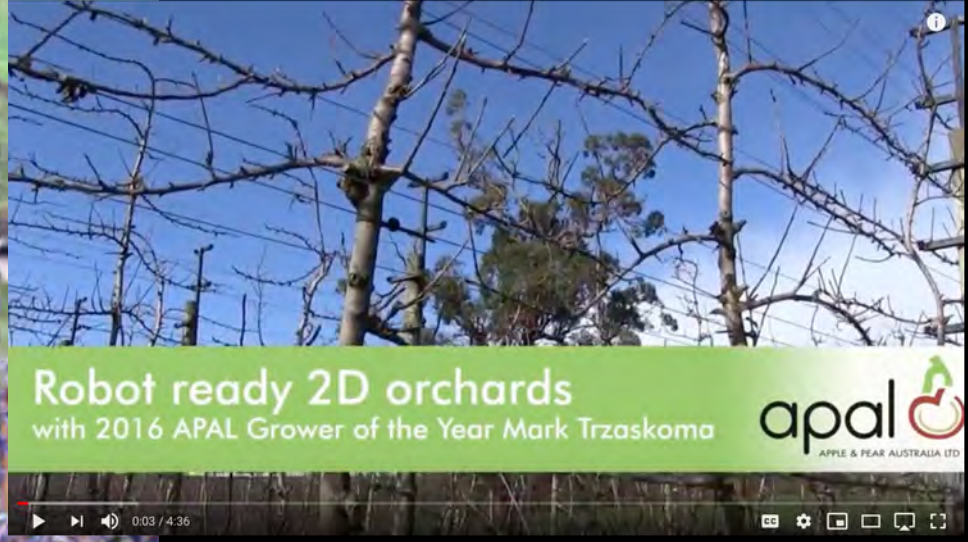
64
BLOCKCHAIN:
it's business Jim, but not as we know it



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LandWISE 2017
INCORPORATED

Are we ready for automation?

Havelock North Function Centre 24-25 May 2017

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Robot ready 2D orchards
with 2016 APAL Grower of the Year Mark Trzaskoma
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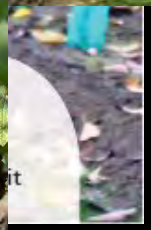

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40+ year old Bing/Mazzard, multi leader 20 x 20 ft

Goal: improve efficiency/profitability with orchard system

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What training system to use?

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1. Establishment
   - Ease and cost
   - Precocity
2. Maintenance
   - Managing tree tops
   - Renewal pruning
   - Sustainable productivity

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Establishment

- Ease and cost
- Precocity

Photo: M. Ayala

What is successful in other crops?

‘SciFresh’/M9 – 100+ bins/ac

What is successful in other crops?

Keys to success:

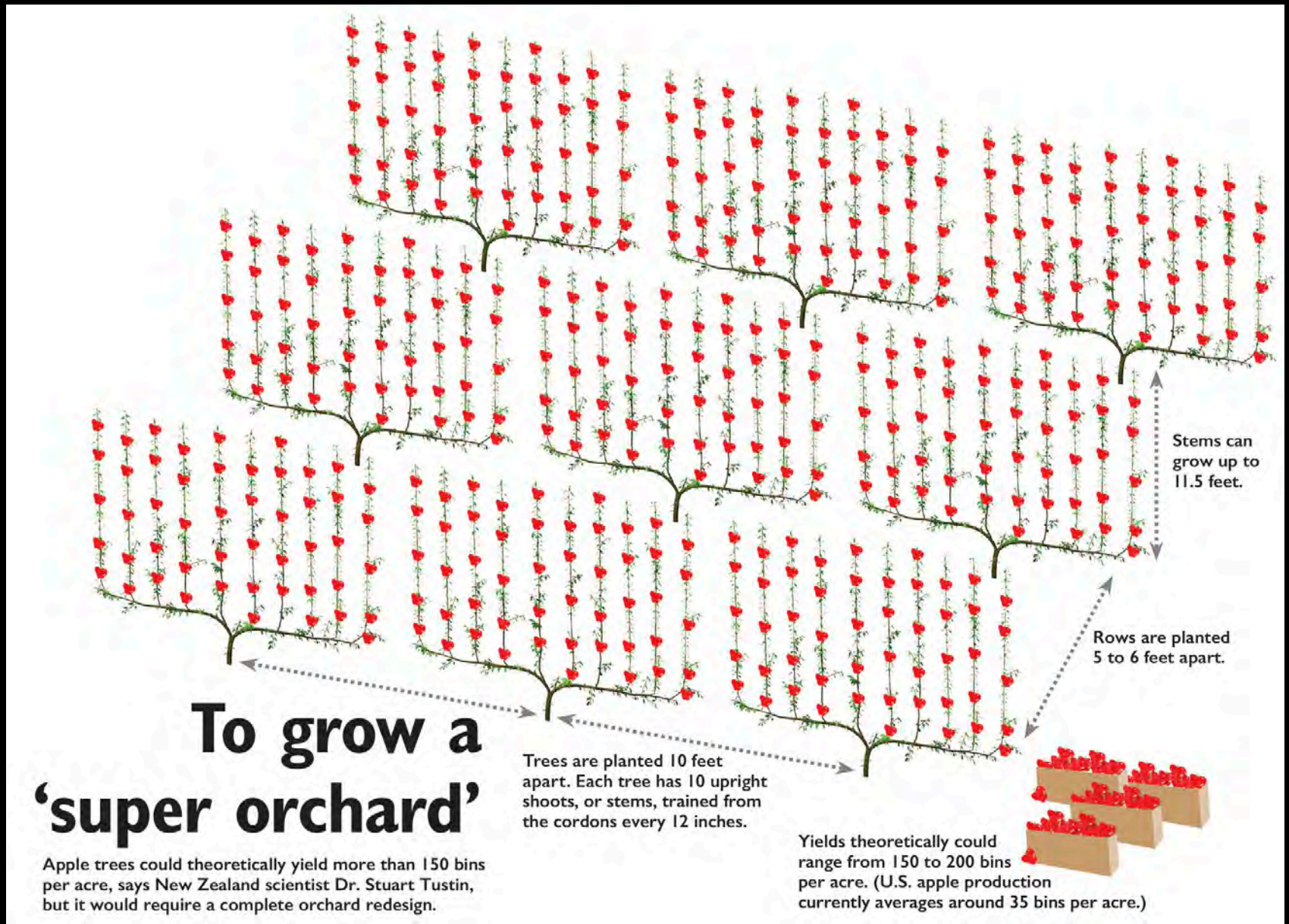
- Compact fruiting wall
- High input efficiency
- Predictable fruiting and vigor (calm trees)
- Precision orchard management

‘SciFresh’/M9 – 100+ bins/ac

Sweet cherry fruiting walls

10 year old Tieton/Gisela5, UFO 10 x 6 ft

New? idea for apples:



Sweet cherry fruiting walls

5 year old Early Robin/Gisela12, UFO 12 x 4 ft

Sweet cherry fruiting walls

6 year old ‘Early Robin’/ ‘Gisela 12’, Tatura 13 x 5.5 ft

Future orchard systems

- High light interception, good light distribution
- Compact, fruiting wall
- Repeated processes
- High production efficiency
- Suitable for mechanization/automation

Back to the future

Utilizing platforms:

(pedestrian orchard)

- Limb tying
- Thinning
- Pruning
- Harvest (hourly)

- Work at night

- 30% improvement worker efficiency

Potential for night harvest:

Video courtesy of Domex Superfresh Growers®

Key issues: efficiency, visibility, fruit quality

Pruning

- Second greatest expense
- More difficult than harvesting

Pruning

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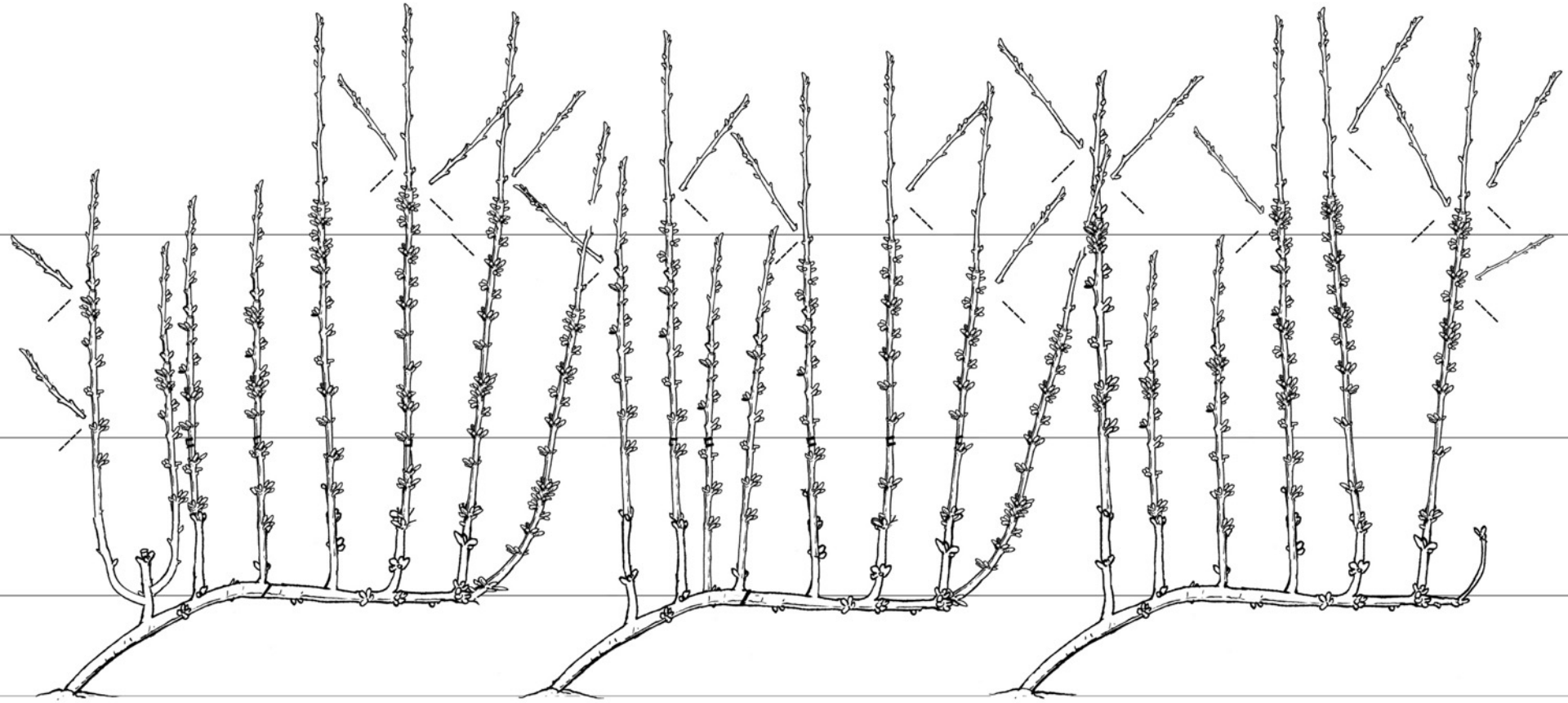
- More difficult than harvesting

- 71 second video - steep leader
- 66 cuts made
- 0.93 cuts per second
- All from ground

- Rules?
- Follow up?
- Ability to mechanize?

Efficient orchard architecture

The UFO System



Pruning rules:

1. Remove lateral wood with stub cuts
2. Renew largest uprights with stub cuts

Mechanical pruning

- Mech pruning ca. 25x faster
- Hand pruning is 4.5x machine costs
- 48 ac to cover machine cost in 1 yr

Estimated pruning costs

	$741
	$168
	$590

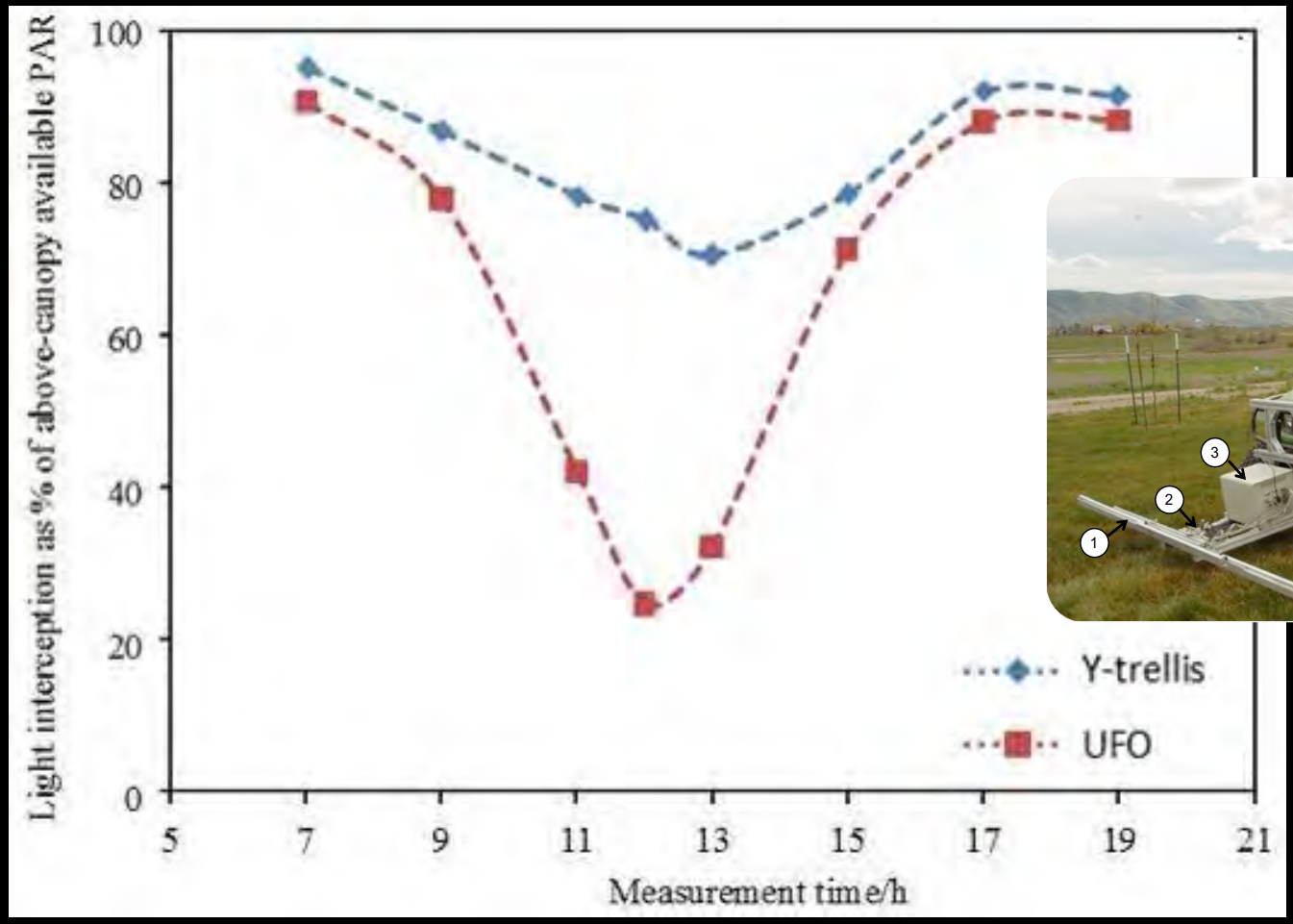
Vertical system

Angled system

1 ‘wall’ per row
1 ‘wall’ every 10 ft

2 ‘walls’ per row
1 ‘wall’ every 6 ft

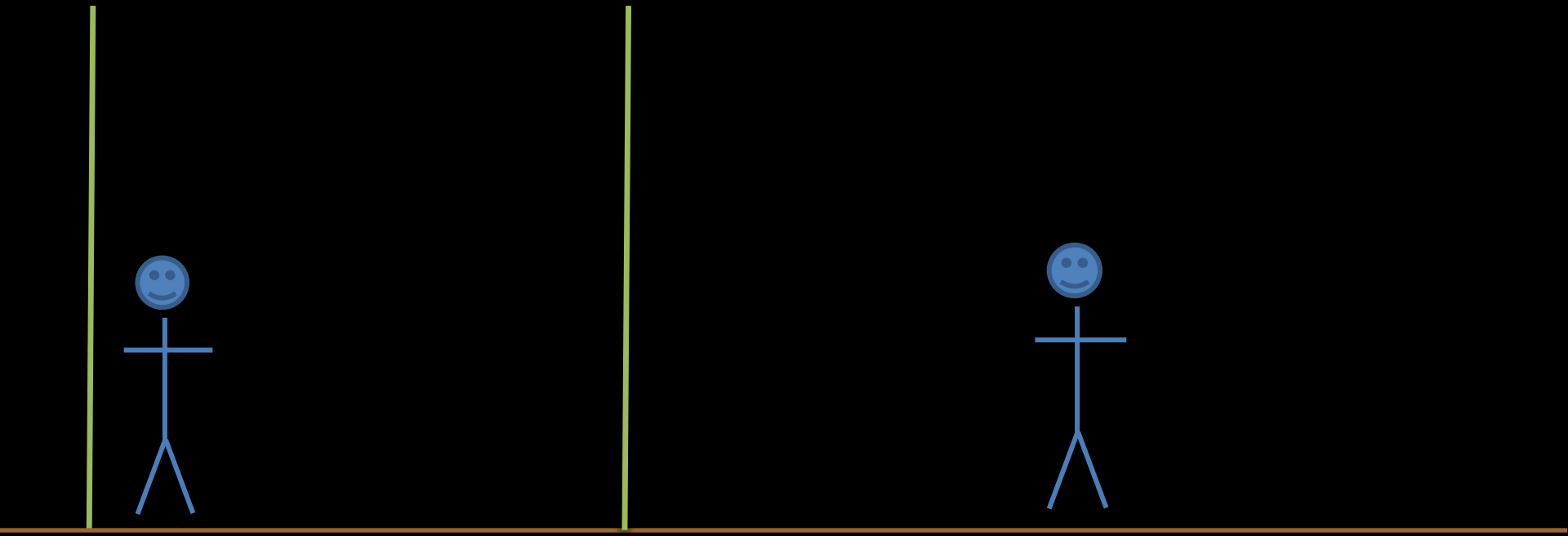
PAR interception of vertical and angled fruiting walls



- Diurnal trend was nearly symmetric around solar noon
- *Yield potential* on angled canopies is greater than planar canopies
  - 5 year-old 'Santina'/Gisela12 – 14 tons/ac (Y-trellis UFO)
  - 4 year-old 11 tons/ac

Future orchard systems?

Vertical system



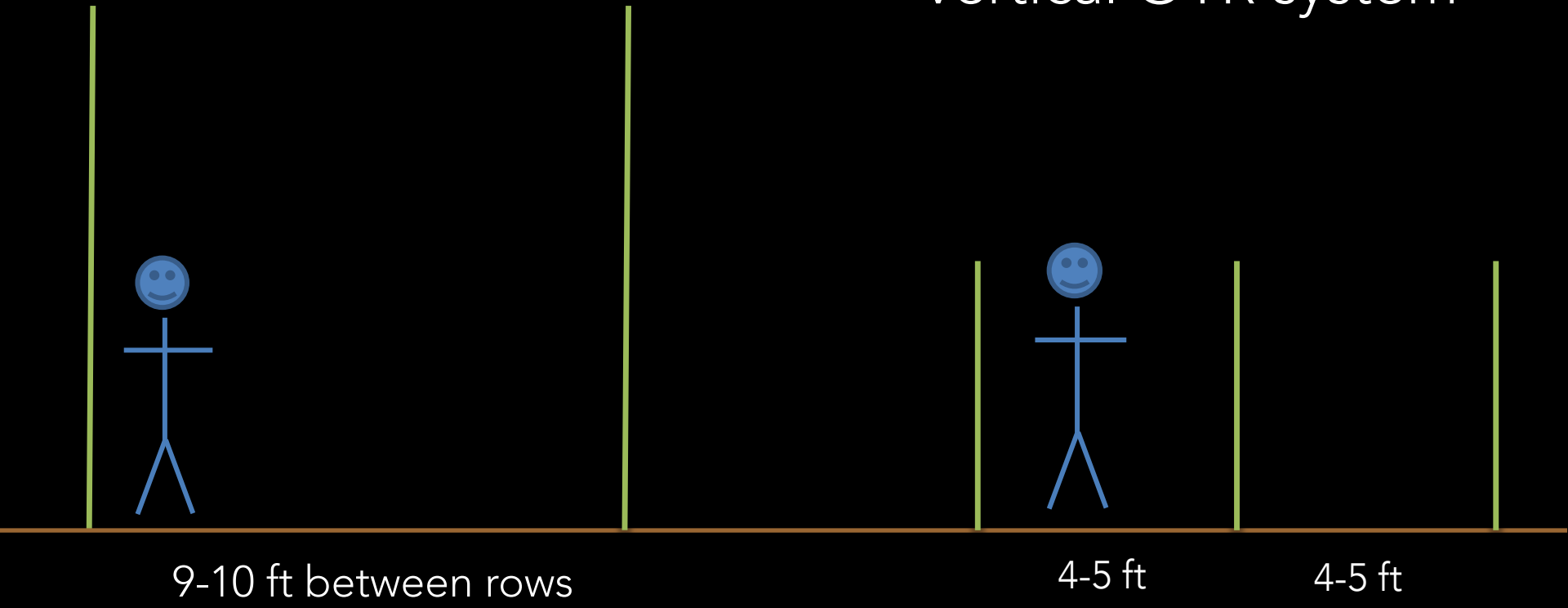
9-10 ft between rows

>1:1 canopy height : row spacing

Future orchard systems?

Vertical system

Vertical OTR system



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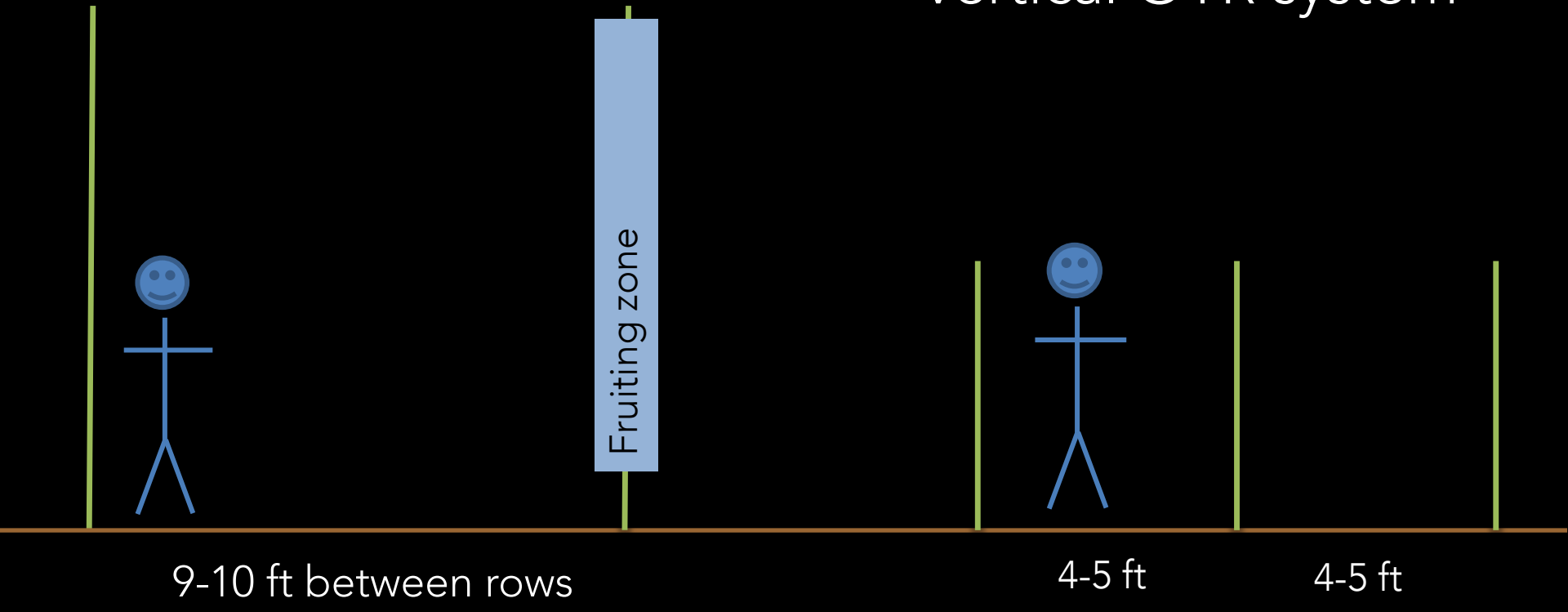

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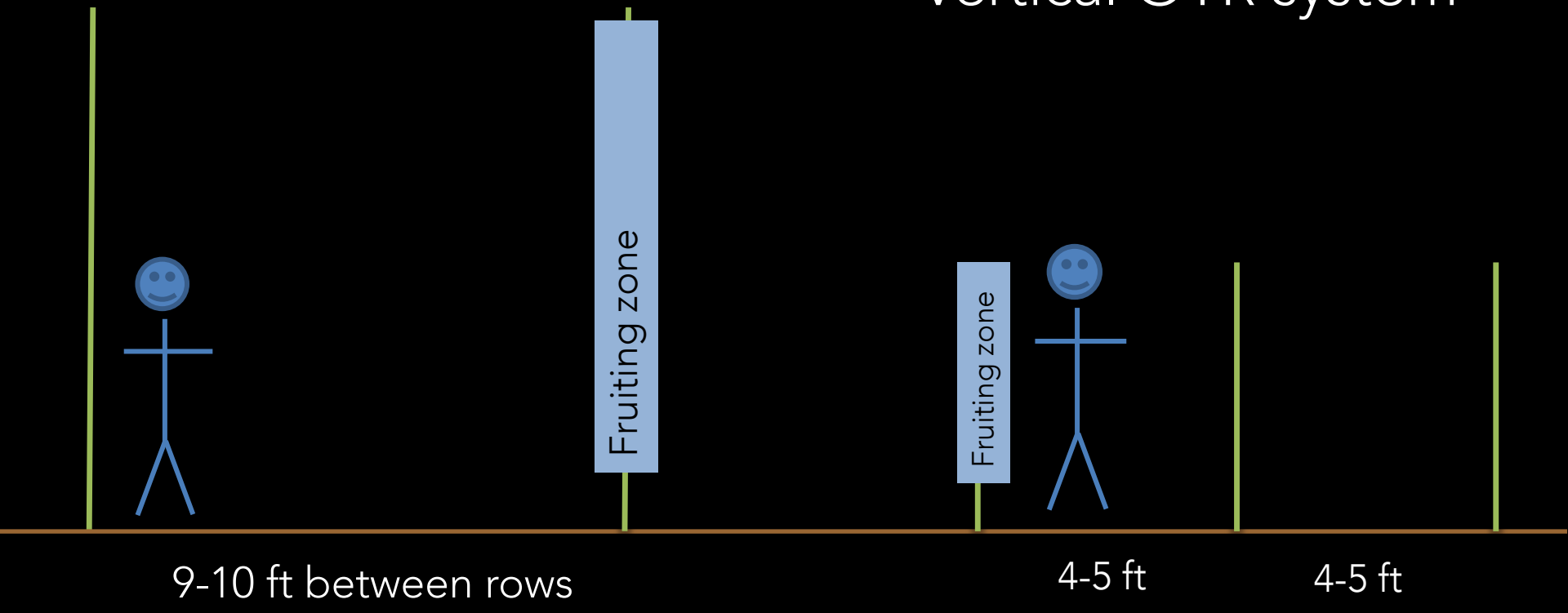

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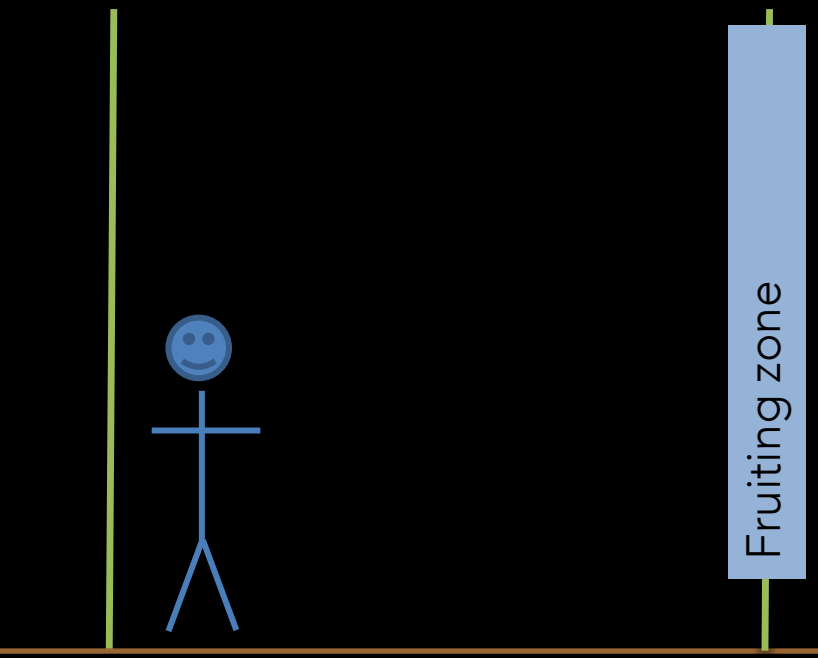

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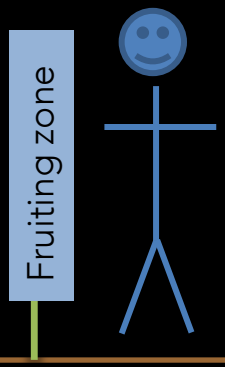

4-5 ft

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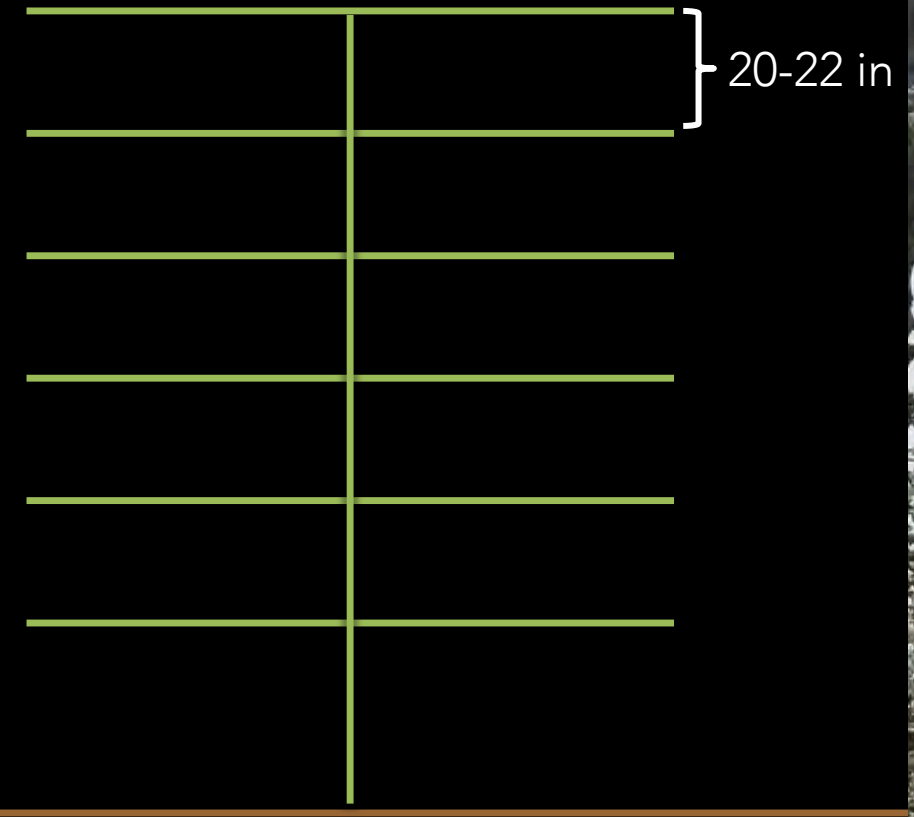
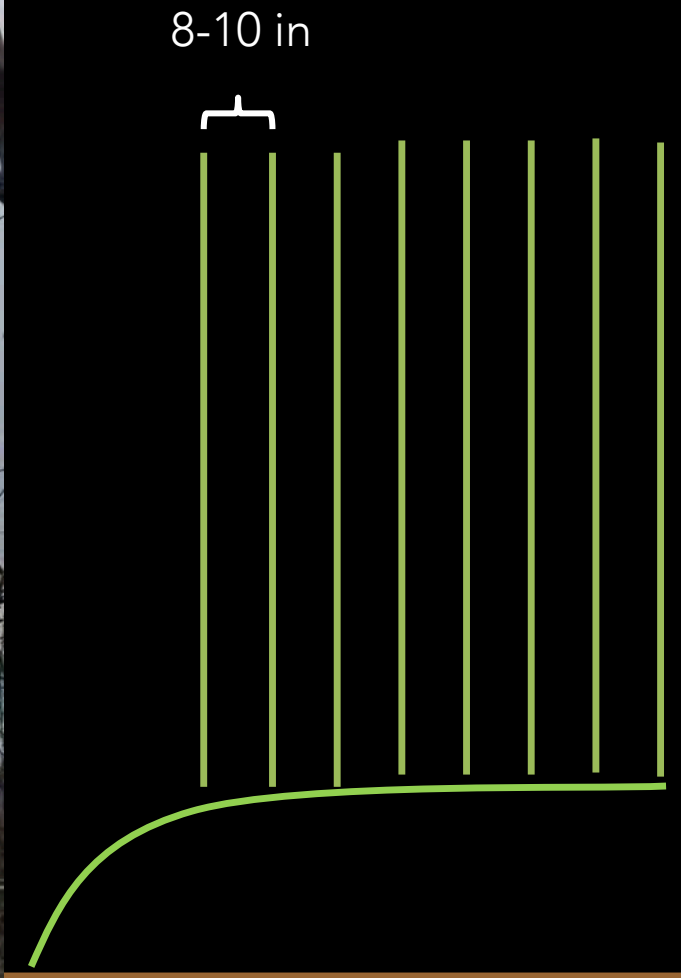
Tatura-style system:

Permanent vertical
Renewable horizontal fruiting wood





UFO system:

Permanent horizontal wood
Renewable vertical fruiting wood

Tatura-style system:

Permanent vertical
Renewable horizontal fruiting wood

UFO system:

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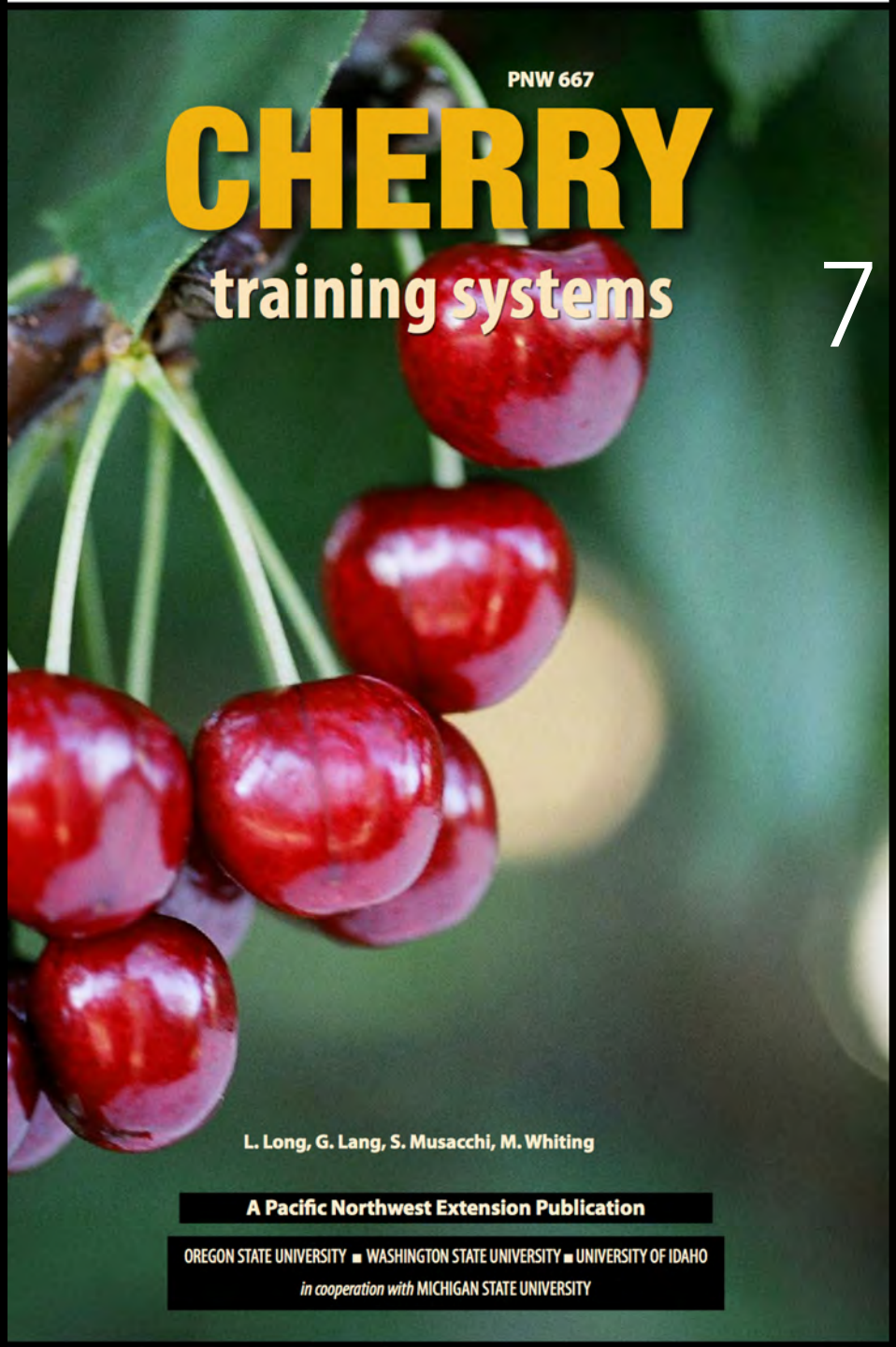
Renewable vertical fruiting wood



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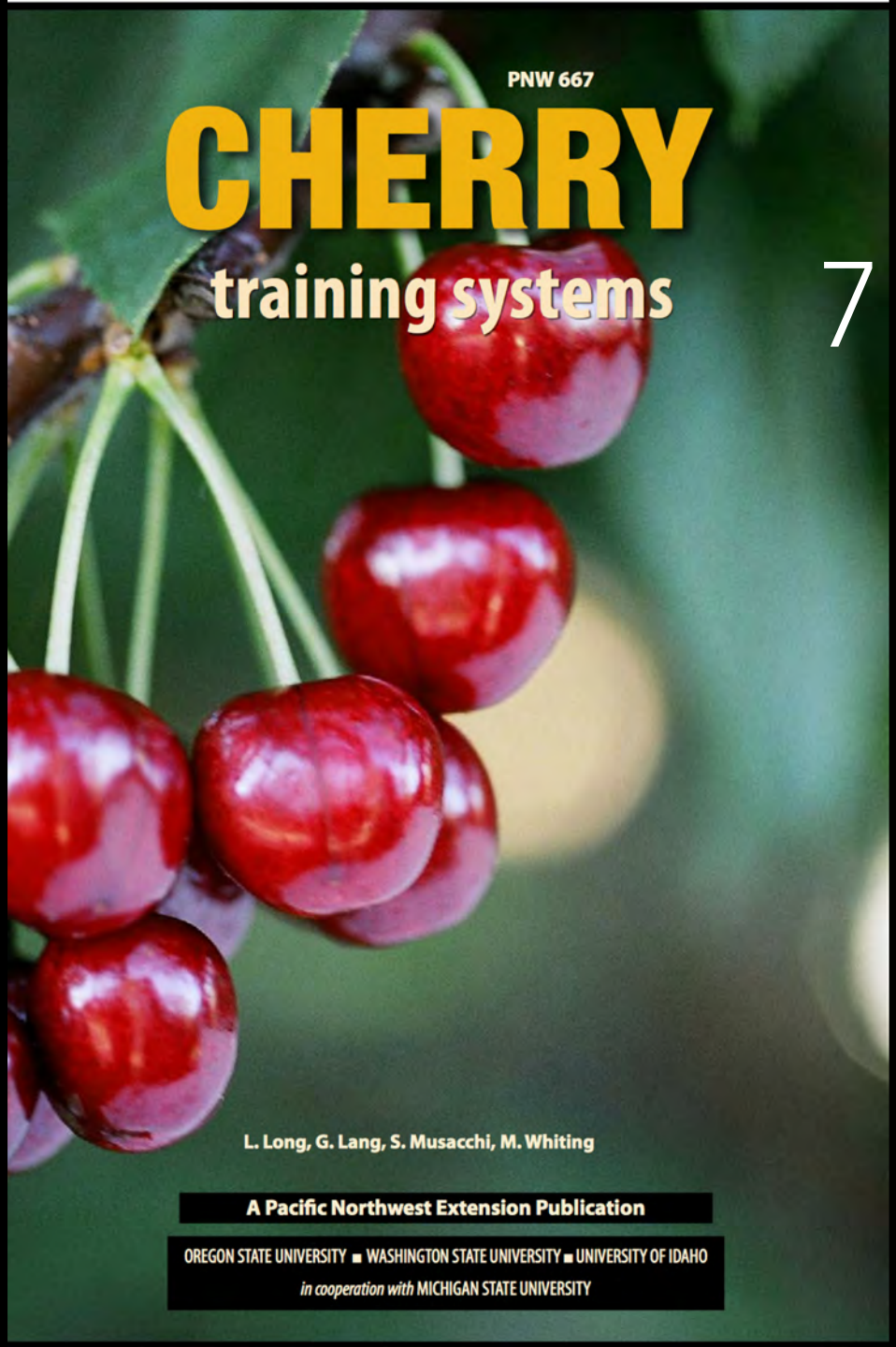

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Keys for success:

- The right genetics
  - Growth habit
  - Vigor
  - Fruiting
- The right system
  - Simple
  - Planar
  - Efficient
- Multi-disciplinary collaboration with stakeholders

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