Ag Tech in Washington
Presented by Rob Blakey
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Ag Tech in Washington

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The Overview

• How Washington growers are using capital to optimize labor & fruit quality to remain competitive in a consolidating industry.
• Preview and critique upcoming ag tech offerings

Disclaimer: Stemilt does not endorse any products, services, or suppliers
Personal Introduction

• South Africa
  • PhD in avocado postharvest physiology
  • 6 years at multinational avocado company as research horticulturist

• UK
  • 6 months as Scientific & Compliance Officer

• USA
  • 18 months at WSU as postharvest extension specialist
  • 2 years at Stemilt as R&D Manager & 1 year as IP manager
Background to Stemilt

• Majority owned by the Mathison family
• 10,500 acres in central Washington
• 2/3 apples, 1/3 cherries, minimal pears
• Apple harvest starts end July, ends in late October
• Proprietary varieties: Rave®, SweeTango®, Pinata®, Pink Lady®
• Warehouse has 3 apple & 1 pear lines packing 10 million boxes a year
• Marketing for 4 packing sheds incl. Stemilt
The fundamentals don’t change

Production

Labor & Personnel

Sales & Marketing

Finance
1. Production

- You have to get a high yield of market-appropriate fruit consistently.
- Need to be able to do a task correctly first time, **at the right time**.
- Coming back for remedial action is always more expensive than doing it right first time especially when we are storing high value fruit.
- How do we enable managers to do that?
- How do we mitigate the effect of adverse weather?
1. Production: Yield

- “Packs per Acre” early & consistently
  - Bins per acre
  - Packs per bin
- How can you get that earlier?
- How can we optimize that long term?
1. Production: Fruit Quality

• Need to have the right variety mix, keep your orchards up to date
• Better high color sports to reduce your passes
• Optimize production to get high quality fruit, lowest cost doesn’t win
• Are we selecting the most efficient varieties because low efficiency varieties have a cascading inefficiency cost through the supply chain
• What is going to happen when Honeycrisp prices drop?
• What is Cosmic Crisp going to do?
1. Production: Orchard Uniformity

• Lack of uniformity is inefficient
• Managing to the mean/best/worst area is not the solution.
• Need to move towards precision management

• Crop load
• Fruit quality
• Soil
• Water
• Pest & disease pressure

Need detailed data to manage
2. People (Labor)

• We’re a long way from eliminating labor from tree fruit production but need to increase efficiency
• Increase the time people are adding value
• Observe your people working
• Listen to them
• Make their work & lives easier to make them more effective & efficient
2. Labor Issues in Washington

- Labor has increased above 50% of total costs/acre
- Immigration uncertainty
- Guest worker program (H2A) Adverse Wage
- Over time legislation change
- In-season legislation change with density & variety
- Minimum wage increase tied to Seattle
- Retro-active lawsuits after legislation changes
- Overhead costs to manage guest worker program
- Certification for retail customers

• Apples: Slow ↗ in Demand
• Pears: ↓ Demand
• Need to expand & intensify for economies of scale
3. Sales & Marketing

• Grow what you can sell (what people want to buy)
• Have a great sales & marketing team to sell your great fruit at the right time to the right customer for the right price

Sales plan has to match storage has to match fruit quality
4. Finances

• Need access to capital to replace labor (make people efficient)
• Need to increase acreage to amortize your capital efficiently
• Increasing your fixed costs so increased pressure to hit your yield targets
• Margin for mistake is small so you have to efficient & execute
Mechanization

- Precision crop load management
- Harvest Assist
- Robotic harvest
- Pruning/Hedging
- Leaf Removal
- Mechanical thinning
- Mechanical weeding
- Spraying
Precision Crop Load Management

- A few manufacturers are in the early stages of integrating:
  - Vision system
  - Effector to thin flowers & fruitlets
  - Autonomous driving

- Need the horticultural models to inform the system
- Could be a game changer to improve orchard uniformity

- Probably 7+ years from first commercial adoption but hard to say...
Progression of Harvesting Technology

- **Manual**
  - Ladders
  - Ground

- **Ground Assist**
  - Remove ladders
  - Work at night

- **Platform**
  - Remove ladders
  - Work at night

- **Harvest Assist**
  - Remove ladders & bags
  - Work at night

- **Ground Robot**
  - Remove (high) worker
  - Work 24/7

- **Flying Robot**
  - Remove machine
  - Work 24/7

*It’s very hard to beat a motivated ground picker*
Race the Cold

Do you have the machinery, labor, variety mix & skill to account for a change in weather?

Courtesy JJ Dagorret – Automated Ag
Ground Assist – Bandit Scout

• Can’t beat pickers on the ground
• Bin Assist reduces walking for pickers
• More time picking increases their efficiency
• We haven’t seen the benefit but only have 2. Bigger test with better fruit may change our minds
Platform – Bandit Xpress

Courtesy JJ Dagorret – Automated Ag
Platform – Cub for High Density
Cyclone Harvester with Automated Ag Bandit

• Early days - only 2 available currently
• With SweeTango, we didn’t see any difference in bruising between platform & Cyclone
• Fruit need to be put in one-by-one to avoid impact bruising
Flying Robot

- Tevel Technologies out of Israel
- Early days but making great progress
- Detection & picking done
- Next stage is to integrate with bin management system
- Probably won’t replace ground pickers
- Redundancy with cheap units
- Can have multiple tasks on multiple crops to reduce costs
- Picking service gives flexibility

www.tevel-tech.com
Labor Efficiency

Need to get people working where they add most value
• Fruitlet thinning
• Picking - not hauling bags, not climbing ladders, not walking
• Detail pruning
• Scouting (for the moment)
Orchard Uniformity

• To achieve orchard uniformity you need to measure variability to manage, take action, measure again
• Currently done with scouts
• Moving to aerial imagery
• Future will add in row imagery
Aerial Imagery

What
• What are they offering?
  • Technical
  • Expertise
  • Service
• Is it scalable?
• How can it add value?

Who
• Ceres Imaging
• HEMAV
• Aerobotics
• Slantrange
• Skycision
• Drone Deploy
• AeroVironment

Not an exhaustive list
Aerial Imagery

• NDVI (Normalized Difference Vegetative Index)
• Thermal
• Chlorophyll Index
• Water stress
• Can overlay USDA soil survey
What we’ve learned in year 1

Key criteria

1. Technical imagery
2. Local service
3. Expertise
4. User experience
   1. Ease of use to add value
   2. Measure to manage
5. Scalability

Decision to go with Ceres Imaging

1. Technically proficient
2. Local service in WA, quick turn around of imagery
3. Expertise in Washington & California
4. Easy to use user interface but without metrics
5. Scalability – use fixed wing plane
Worked Example

- Used imagery over 1500 acres - mostly cherries, some apples & pears
- Weekly imagery 6 May – 5 August 2019
- This example: apple orchard on Stemilt Hill, Wenatchee, WA
- Area is very hilly, variable soils. Grower uses a lot of compost which is applied at variable rate (manual tree assessment)
- Question to ask yourself: Can AU$6.50/ha/week for ±30 weeks add value?
17 August 2019
Some benefits we’ve seen

1. **Water stress:** Add sprinklers in areas where red continuously appeared, increasing water applied in stressed areas.

2. **Harvest:** During targeted cherry harvest - where more heat penetrated the fruit ripened first & therefore was picked first.

3. **Fruit Quality:** Had slip skin problems, reduced water based on imagery & did not have any slip skin this harvest

4. **Inputs:** Areas that were consistently blue did not place fertilizer - saved money in application rates

5. Sometimes you need to restart an orchard
Some benefits we envision

1. Water stress: over head cooling quality check
2. Water stress: identify blocked sprinklers
3. Uniformity: Trouble shoot high/low vigor areas
   Eventually can we tie imagery into automatic variable rate?
4. Yield & Fruit Quality: Match fruit quality & yield to imagery
In-Row Imagery

What they promise:
• Fruit count
• Fruit size
• Fruit color (?)
• Water stress
• Yield mapping
• Growth curves
• Disease (?)
Automated Fruit Counting – Farm Vision
Automated Fruit Counting - iUNU
Automated Fruit Counting

Why?
• Reduce labor
• Increase accuracy of estimates
• Increase uniformity of crop
• Guide crop load management
• Guide storage plan
• Guide sales plan

When?
• First commercial: 2021
• Big roll out: 2022/3
Monitoring & Data

• Need an efficient system to collect, store & interrogate data from your farming operations

• Farmer’s gut feel is normally right but having data gives you greater insight to make better decisions & get hidden insights
Warehouse

What
• Automated QC with AI for defects, size, color in bins
• Dynamic CA technology (respiration, chlorophyll fluorescence, ethanol)
• Automatic Storage & Retrieval Systems (bins, pallets)

Why
• Better centralized data back to the farm & storage manager
• Better packs per bin
• Less handling, better stock management, reduced losses, better labor efficiency
Some final thoughts
Conclusion

• There’s a lot of ag tech available, get involved, let companies work in your orchards, don’t commit too soon
• Don’t just collect cool imagery
• Do you have resources to implement?
• Decide how you’re going to leverage tech to improve your business
• Execute
Thank You

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