



# Farm Labor Challenges and Solutions

**Jim McFerson**

**Tree Fruit Research & Extension Center**

**Washington State University**

**Wenatchee WA**



**USDA Ag Outlook Conference**

**21 Feb 2019**

**Arlington VA**

## **Acknowledgements:**

- Karen Lewis, WSU Extension Tree Fruit Team Leader
- Ines Hanrahan, WA Tree Fruit Research Commission
- WSU colleagues
- USDA



# OUTLINE

**Background**

**Specialty crops**

**High value & capital-intensive**

**Diverse production regions**

**Labor challenges**

**Profitability = optimize cost/unit of consumer-desired products**

**Targeted mechanization and automation along supply chain**

**Postharvest handling & shipping**

**Horticultural management**

**Ongoing innovations**

**Task mechanization**

**Mechanical-assist/robotic harvest**

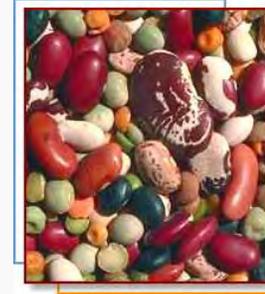
**Sensor-driven horticulture**

**Summary & the way forward**

# ***Horticulture & Plant Breeding***

***UW-Madison --- BS, PhD***

***Texas A&M --- MS***



***Commercial Plant Breeder***



***USDA-ARS-Geneva: Geneticist***



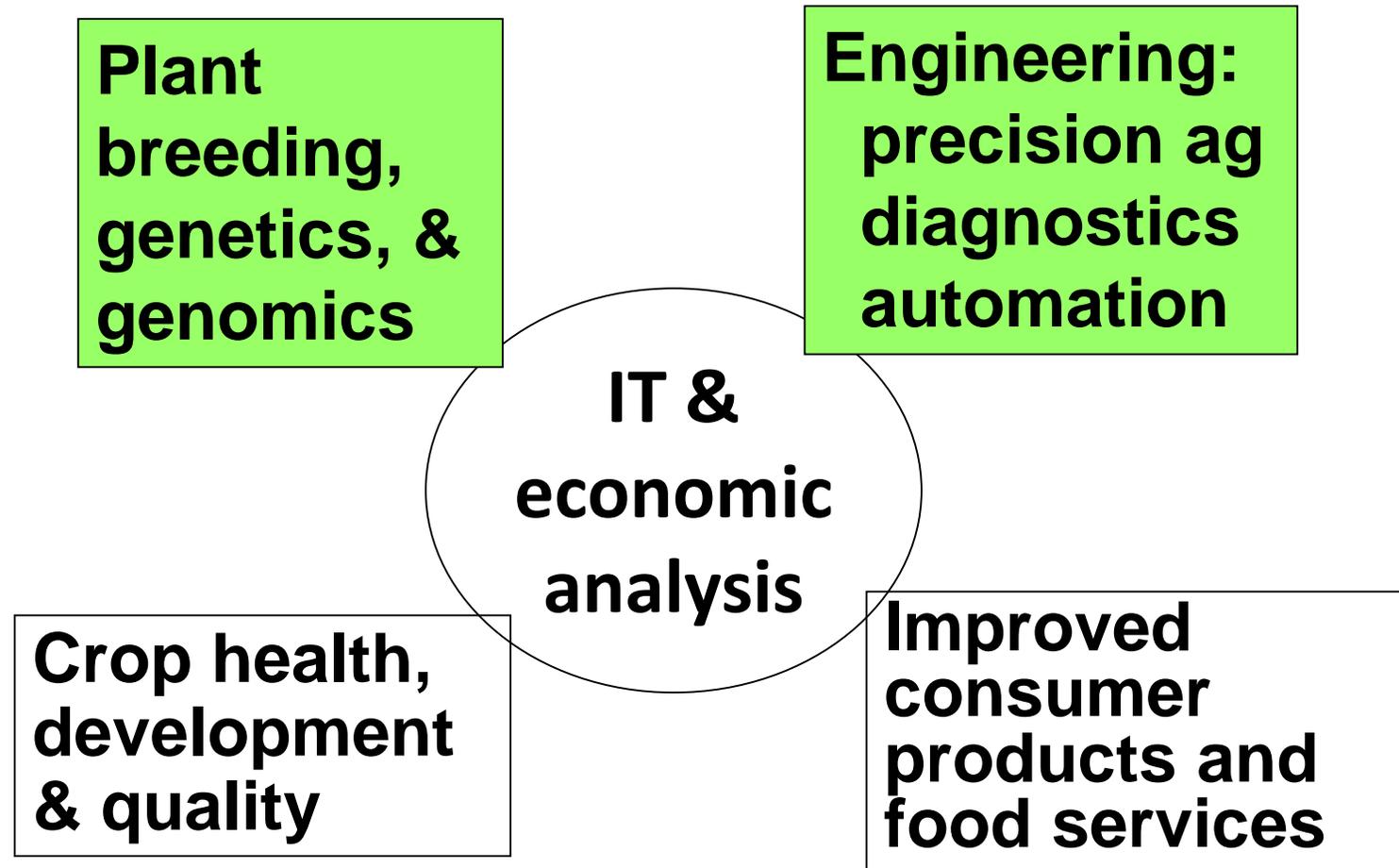
***WTFRC --- Manager, Researcher***

***WSU --- Center Director***



# National Tree Fruit Technology Roadmap (2002)

*To be profitable in a globally competitive marketplace, the U.S. tree fruit industry must deliver the highest quality fruit and reduce production costs 30% by 2010*



# *USDA Definition of Specialty Crop*

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## **BACKGROUND**

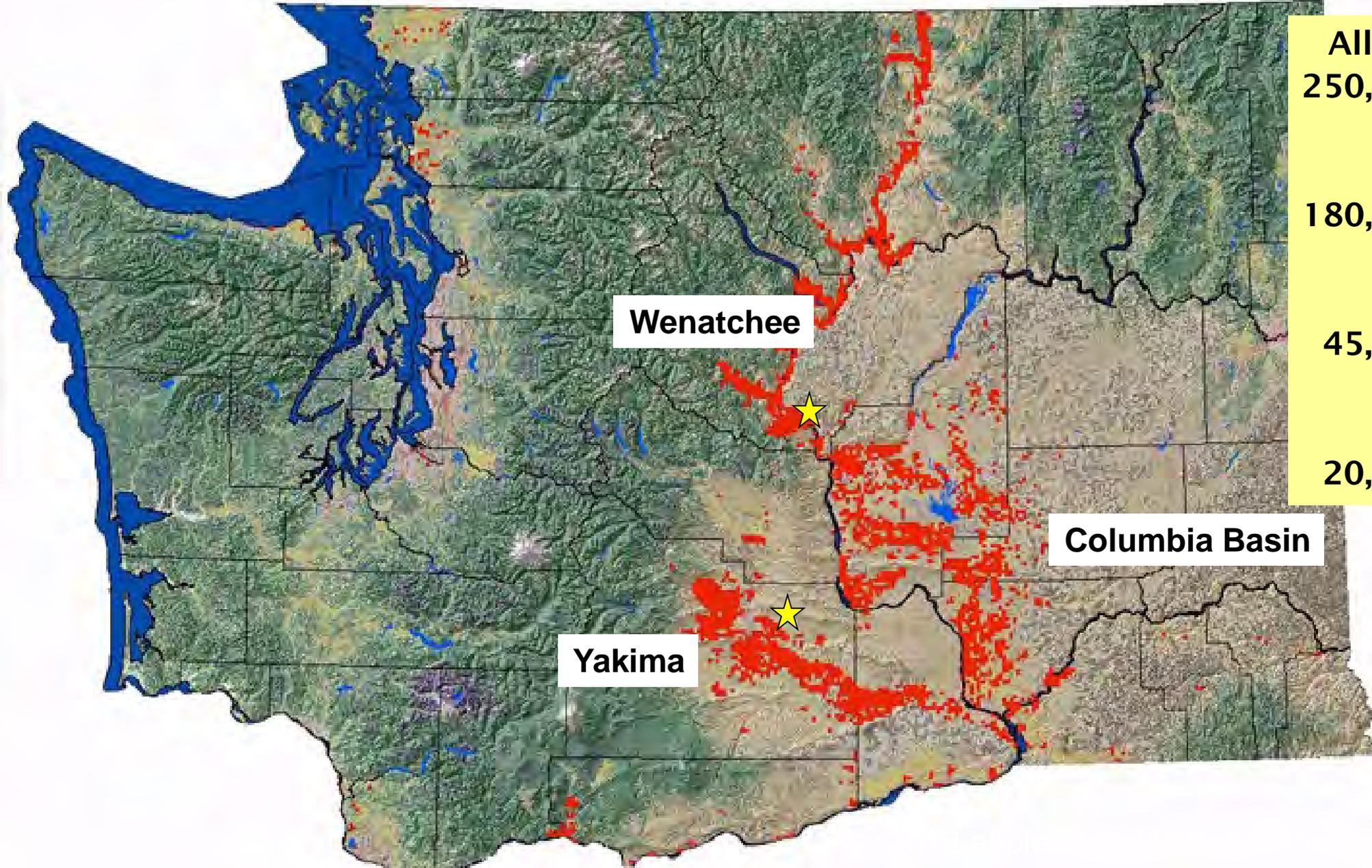
The purpose of this document is to facilitate coordination among the various US Department of Agriculture (USDA) agencies with programs that address the needs of specialty crop producers, handlers and processors. Although a common definition of specialty crops across these agencies is desirable for USDA stakeholders and customers, it is also recognized that the mission of each agency is unique and so the application of a common definition might vary. It is also recognized that individual states may wish to modify the definition used by USDA to satisfy local or regional needs. The agencies involved in this effort were the Agricultural Marketing Service (AMS), the National Institute of Food and Agriculture (NIFA), the Foreign Agricultural Service (FAS), the National Agricultural Statistics Service (NASS), the Office of the Chief Economist (OCE), U.S. Forest Service (FS), the National Resource Conservation Service (NRCS) and the Risk Management Agency (RMA).

## **WHAT ARE SPECIALTY CROPS?**

Specialty crops are defined in law as “fruits and vegetables, tree nuts, dried fruits and horticulture and nursery crops, including floriculture.” This definition, although more exact than previous legal definitions, leaves a certain amount of latitude in interpretation. Fruits, vegetables, tree nuts, nursery crops and floricultural crops are all considered to be horticultural crops. Regardless, the specific mention of these crop groups means that plants so classified automatically qualify as specialty crops. Where interpretation is needed is in which plants, not specifically mentioned in legislation, can be classified as horticulture (sic) crops.



# Tree Fruit Production in Washington



All tree fruit  
250,000 acres

Apple  
180,000 acres

Cherry  
45,000 acres

Pear  
20,000 acres

Wenatchee

Columbia Basin

Yakima

**\$12B+**

**160,000  
jobs**





**What are  
these apple  
growers  
worried  
about?**



# Analysing Pesticide Residues in Apple

J. Stevens, L. Zhao and P.L. Wylie, Agilent Technologies Inc., Wilmington, Delaware, USA

Pesticides are commonly used within the agricultural industry as a means of killing or repelling pests to protect crops and livestock. The risk of pesticide toxicity in the foods we consume remains an area of concern. A number of studies indicate a link between the exposure to pesticides and acute health problems including cancer; respiratory, neurological and dermatological issues, and the risk of miscarriages and birth defects. The risks that pesticides pose to human health have prompted many

The European Norm (EN) method 15662:2007 is a European variation to the QuEChERS method.<sup>1,4</sup> The method uses acetonitrile extraction, followed by the salting out of water from the sample using anhydrous magnesium sulphate (MgSO<sub>4</sub>), sodium chloride (NaCl) and buffering citrate salts to induce liquid-liquid partitioning. A dispersive solid-phase extraction (dSPE) is conducted for clean up using a combination of primary secondary amine (PSA) to remove organic acids, among other components and anhydrous MgSO<sub>4</sub> to reduce the remaining water in the extract. After mixing and centrifugation, the upper layer is ready for analysis. Gas chromatography-mass spectrometry (GC-MS) has been widely used in pesticide analysis for many years. Many pesticides are volatile or semi-volatile, which makes them GC amenable compounds. Previously the SampleQ EN buffered extraction kit and SampleQ EN dispersive SPE kit for general fruits and vegetables have demonstrated good performance for the extraction of a broad variety of semi-polar to polar pesticides analysed by GC-MS-MS.<sup>5</sup> Because volatile and semi-volatile pesticides have been widely used for some time we evaluated the use of these

kits in extracting these classes of pesticide for analysis by GC-MS.<sup>6</sup> For this investigation, an apple sample matrix was chosen because of its high water content. Sample preparation is a critical step in the pesticide extraction process. Food samples with a high content of water can result in an exothermic reaction when the partitioning salts are added directly to them. This can affect analyte recoveries, especially for volatile compounds, by the thermal denaturing of the pesticides. Preparations of homogenized pesticide free apple were fortified with 17 different known pesticides (Figure 1). Identification of all 17 pesticides by GC-MS was required to demonstrate successful extraction and analysis of the sample. To control the amount of water in the sample matrix and, therefore, limit exothermic reactions, the EN kits contain anhydrous salts. As specified in the original QuEChERS methodology,<sup>1</sup> these salts are added to the sample after an organic solvent. Limiting the interaction between the salts and the water in the sample matrix



# E-Verify

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The Global Partnership for Good



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ADMINISTRATION

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# Our biggest challenge





**Uwaga !**  
**Netherlands**  
Jeśli zgubicie Państwo chip do  
rejestracji godzin pracy każdy  
następny jest płatny 20€.



**~20 billion times/year**





**1933**



**2019**



**Years of minor  
innovation**

# Is this THE ANSWER??



# ***NO...***

## **All tree fruit sectors confront labor shortages**

- ***Nursery*** (management, production, breeding, sales)
- ***Orchard*** (management, production, equipment operators and mechanics, fabricators)
- ***Harvest and post-harvest handling*** (management, QC, equipment operation, marketing, sales)
- ***Extension*** – science translation and application, outreach
- ***Field Horticulturists***
- ***IT & Logistics***
- ***Scientists*** - Genetics, Entomology, Pathology, Horticulture / Plant Physiology, Soils
- ***Engineers*** – Bio Systems, Computer, Mechanical

# Most effective ways to improve orchard profitability

# Increase price

# Improve yields

**Cut production costs**



# SCIENCE- BASED INNOVATION



# Most effective ways to improve orchard profitability

# Increase price

# Improve yields

# Cut production costs

# Washington Apple Industry



**Then**

200,000 acres

4,500 growers

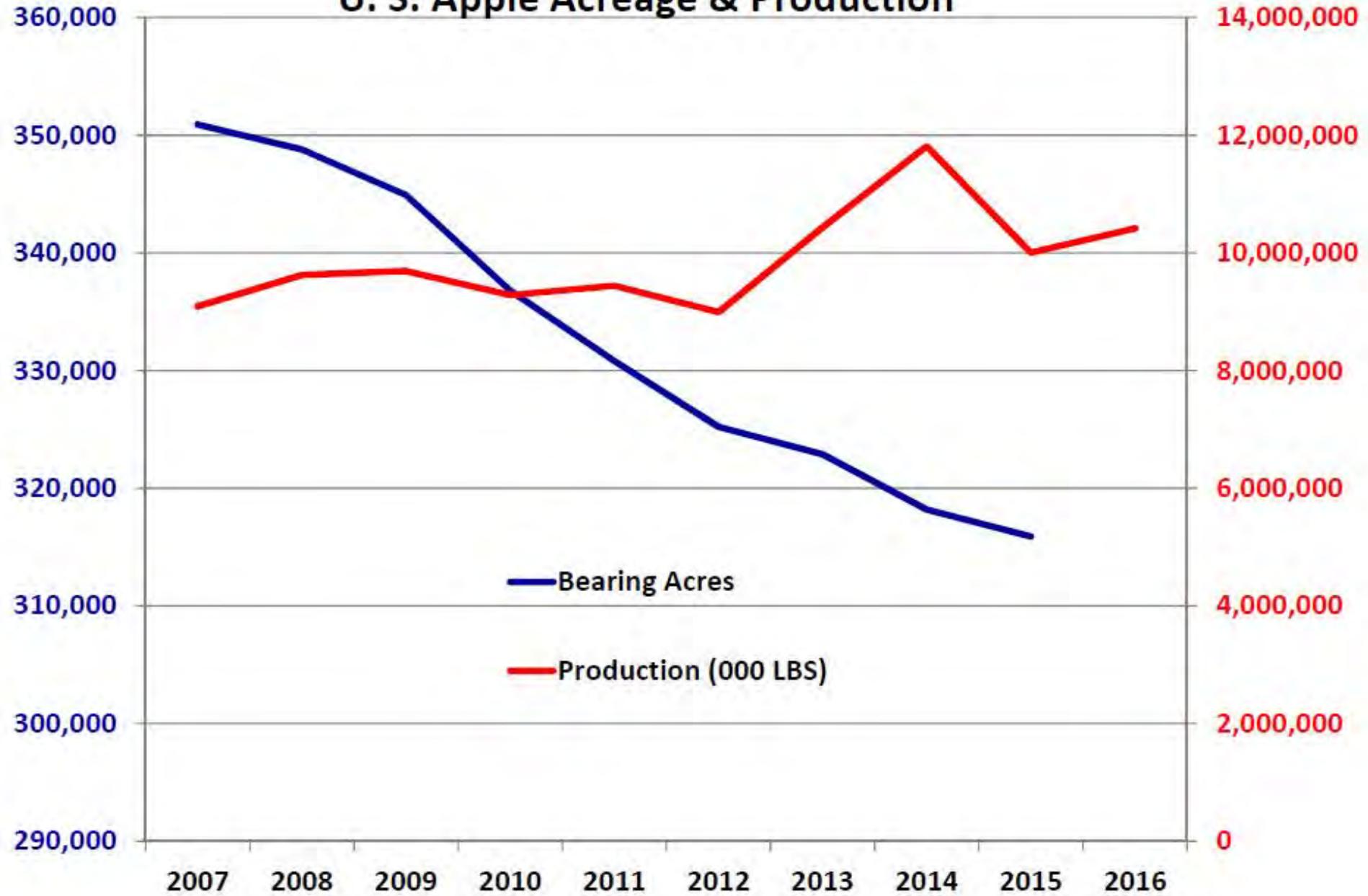
162,000 acres

1,260 growers



**Now**

## U. S. Apple Acreage & Production



*Part of  
the  
answer*

**Production  
management**



**Genetics**



# Increase plant populations and intensify management



# Large-scale Packing Lines



# Site specific genetics and production systems: Predictable & accessible

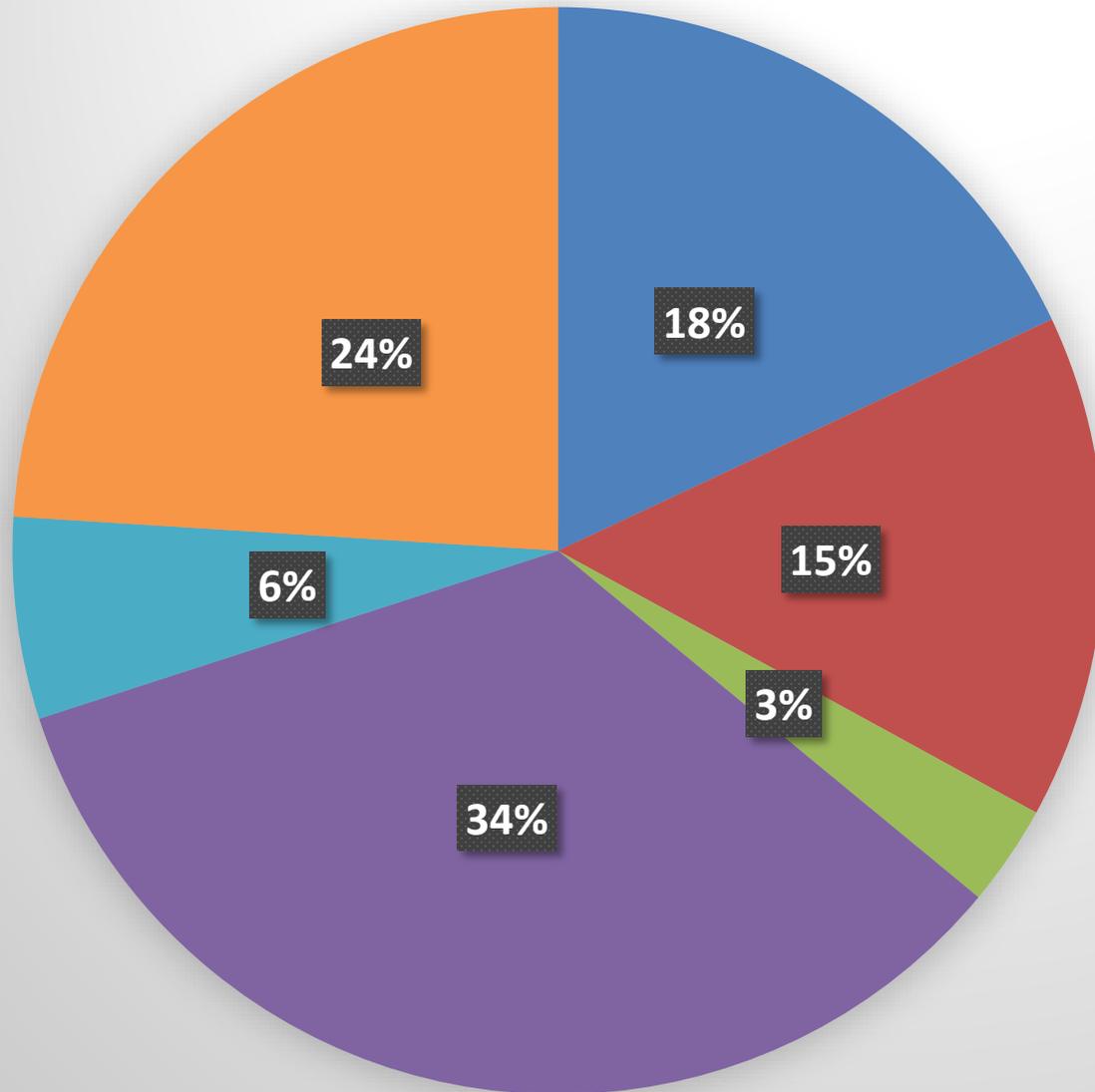


*Measure,  
model,  
and  
manage  
... the  
right  
genetics  
in the  
right site*



# 'Fuji' Apple Annual Variable On-Farm Expenses

***On-Farm Labor 52%***



■ Orchard Activities

■ Chemicals

■ Irrigation

■ Harvest Activities

■ Maintenance &  
Repairs

■ Ins, OH, Int

# Most effective ways to improve orchard profitability

**Increase price**

**Improve yields**

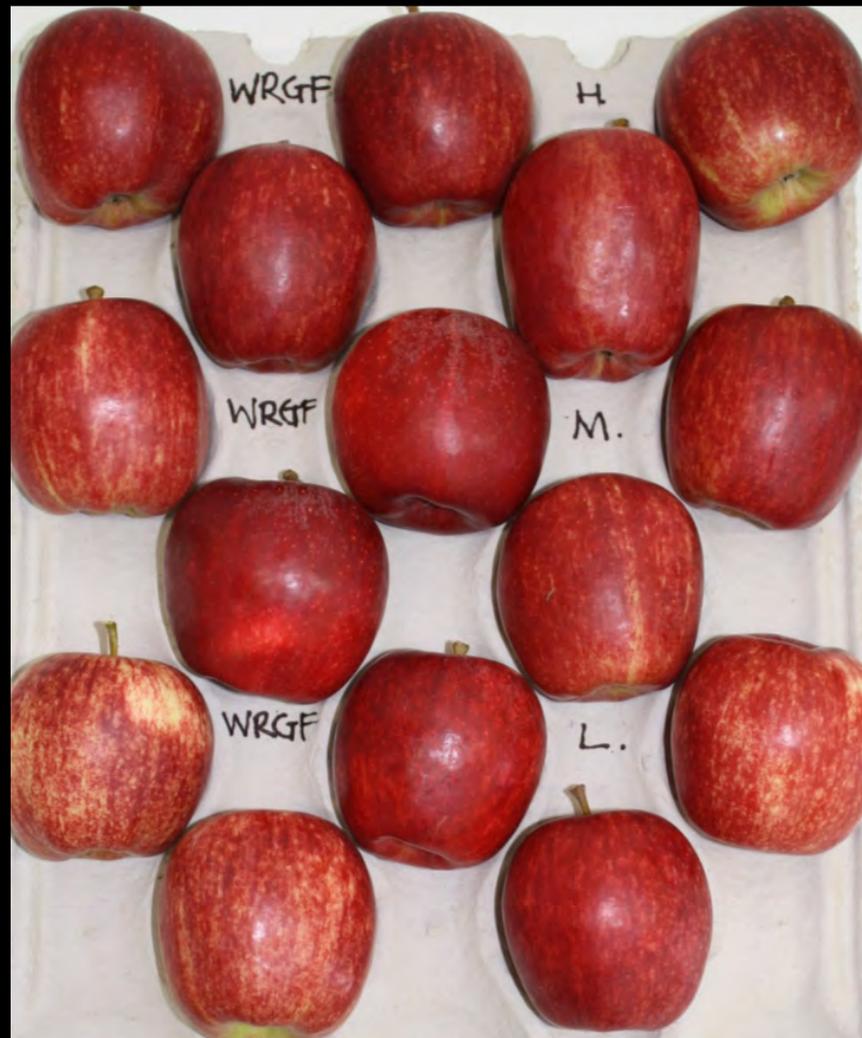
**Cut production costs**

# TARGET FRUIT

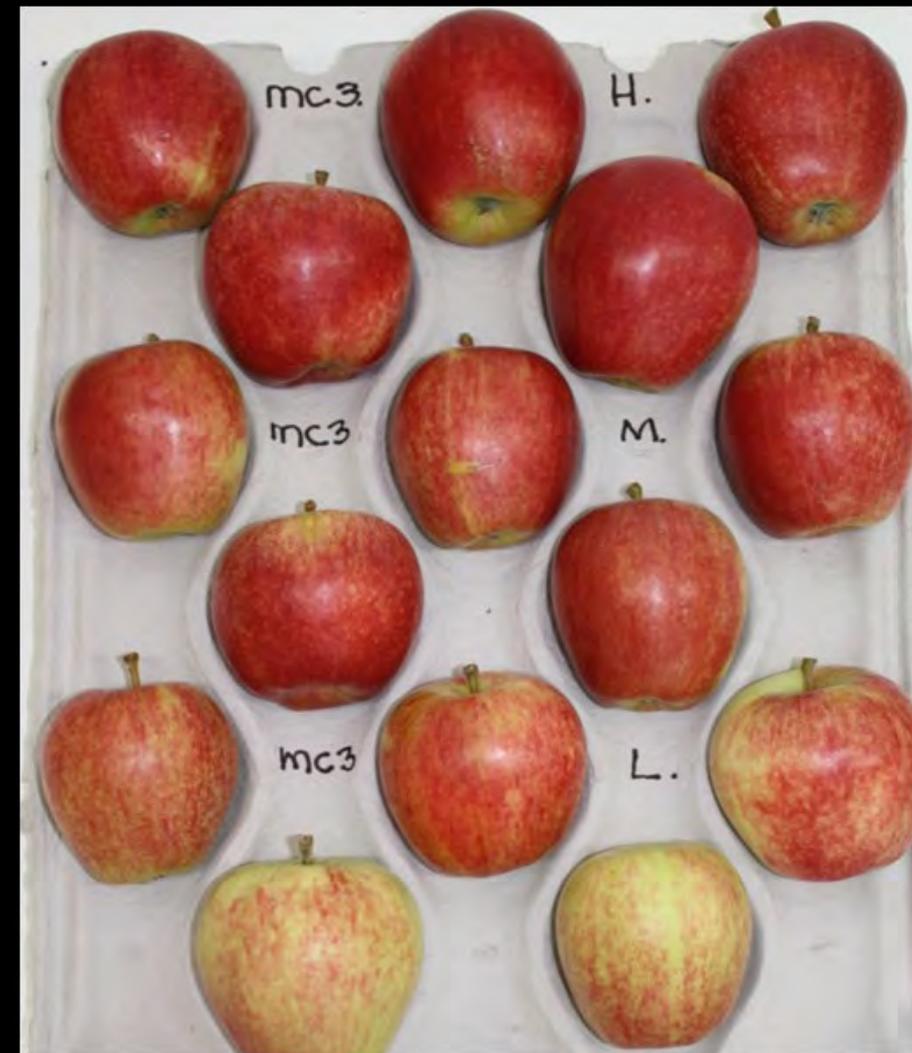
80+ bins/A

Size distribution

Eating quality



Good horticulture



Bad horticulture

# Honeycrisp™ Apple



**EXPLOSIVELY CRISP**



**Minnesota Agricultural Experiment Station, University of Minnesota**

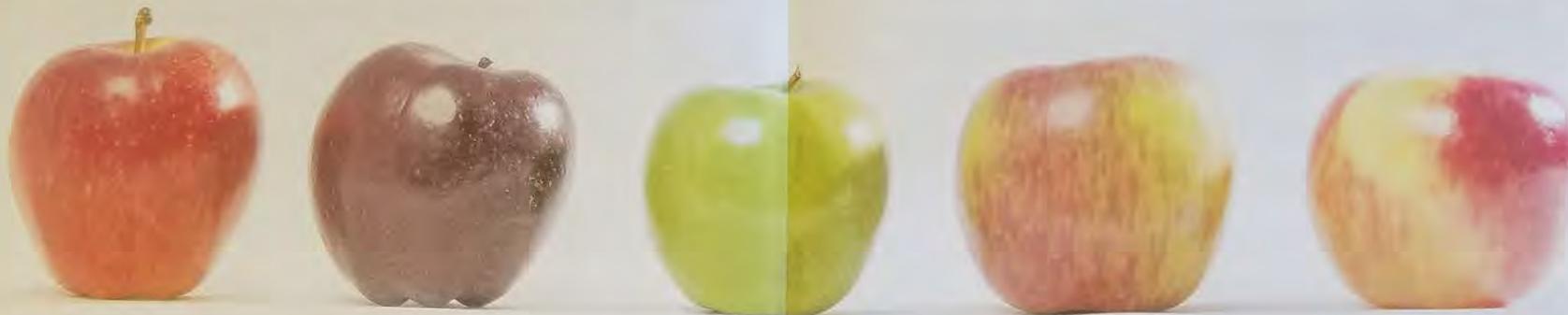
[Read the Report](#)

# Honeycrisp: a breakthrough cultivar

- *Honeycrisp: introduced 1991 by Univ of Minn*
- *Dramatic attention and U.S. market share*
- *Ultra-crisp juicy texture and pleasing flavor*
- *30 years from crossing to commercialization*



*Focus on fruit quality*



The top five apple varieties produced in the state are, from left: Gala, Red Delicious, Granny Smith, Fuji, and Honeycrisp.

Business World photo illustration/Dan Se

# Red Delicious

## AN 8-DECADE RUN AS TOP APPLE IS ABOUT TO END

By **Nevonne McDaniels**  
Business World writer

**W**ENATCHEE — Bing Crosby and Tommy Dorsey topped the music charts. Disney's "Pinocchio" and Alfred Hitchcock's "Rebecca" were on the big screen. Red Delicious was the up-and-coming, second only to Winesap in apple production in Washington state.

That was in 1940. "That was the last time Red Delicious wasn't on top," said Rebecca Lyons, international marketing director for the Washington Apple Commission. "Red Delicious has been the highest production volume apple for 78 years." The iconic Washington apple could lose its top spot this year if the Washington State Tree Fruit Association

forecast released in August holds true. It calls for Red Delicious to account for 21.5 percent of the total crop behind Gala, with 24 percent.

The "classic" red apple gained ground with growers and shippers because it looks good and stores and ships well.

"It's the iconic apple that helped identify Washington state," Lyons said.

In the 1980s, it accounted for more than half — and at one point 75 percent — of the state's apple crop. In 1986, of the 160,000 acres of apples planted in the state, Red Delicious was on 121,000 of them. That same year, just 230 acres were planted in Gala, according to the U.S. Department of Agriculture tree fruit acreage report.

A shift was about to start, though. New varieties were being introduced that could be planted closer together with higher yields, with harvest at different times.

spreading out the demand for labor. Consumers were willing to pay more for different apples and controlled atmosphere storage techniques were being fine-tuned to maintain quality later in the season.

In 2017, Gala topped Reds in total acreage for the first time, with Fuji, Honeycrisp and Granny Smith gaining ground, following a trend that started gaining traction in the early 2000s.

"Reds over the past 20 years have been less dominant," said Tim Kovis, a spokesman for the Washington State Tree Fruit Association. "We've been seeing growers trying to diversify."

The demand for Reds hasn't disappeared.

"A lot are shipped to Mexico and India and some to the Asian markets," Kovis said. "They're a very durable apple that travels well and there's not a lot of post-harvest challenges that others have."

accounts for a 45 percent slice of the co-op's apple volume. The co-op has 85 to 90 growers, mostly in the Lake Chelan Valley, but some along the river in the Tonasket and Okanogan area.

"That's where it was last year. We anticipate it to be in that range this year," he said. "We're a little bit unusual. We sell the majority in the export market. We have a pretty decent return on Red Delicious, higher than some other warehouses that sell domestically. They aren't the same as Honeycrisp, but for Red Delicious we're competitive."

Some of the co-op's growers have switched to new varieties.

"It's an evolution that probably will hit all the warehouses at some point," he said. "If the production of Reds continues to decrease statewide, we may see an increase in price. When Golden's decreased in volume, we

The ongoing trade war between the U.S. and countries that import lots of apples, especially Red Delicious, is creating a challenge.

England said smaller warehouses, like Manson Growers, have an advantage in some ways.

"We have flexibility to move volume between countries pretty easily without impacting the overall return for growers," he said. "If a country has a high tariff that will impact revenue, we can move that volume to another country."

Each country has a different "ideal" size, color and shape.

"They all have their own preference. That's why it's so involved. We want to find a home for every apple we pick," England said. "A lot of things we can't control, like exchange rates, tariffs and political factors. But we can control quality and timing. We do a good job on the

The Apple Commission's Lyons said about 50 percent of the Red Delicious crop is sold overseas.

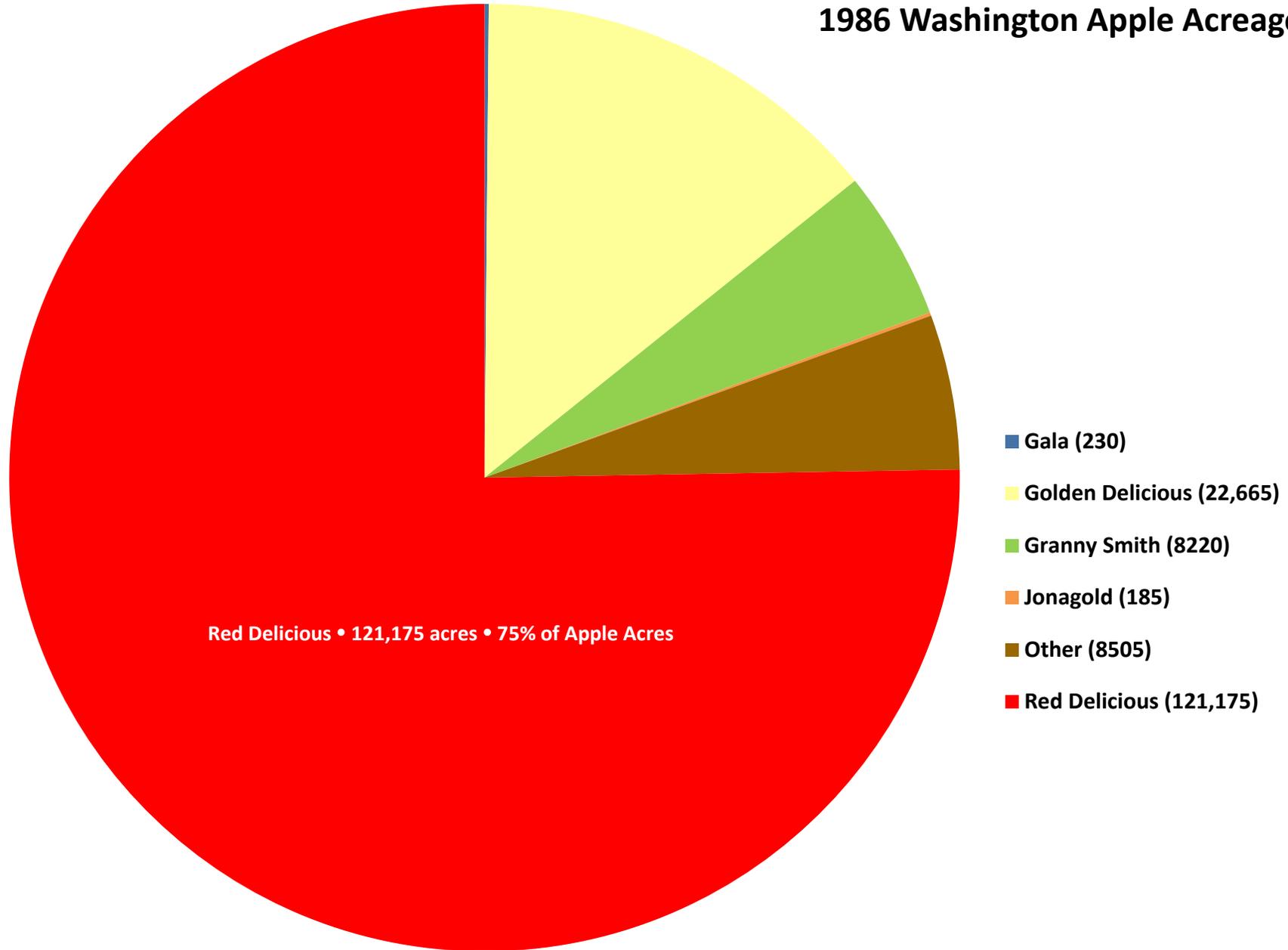
Other varieties are waiting in the wings.

"You've heard about Cosmic Crisp?" she said of the new variety bred by Washington State University. "Everyone is pretty excited about that. You see a lot of sticks in the ground in the baby orchards."

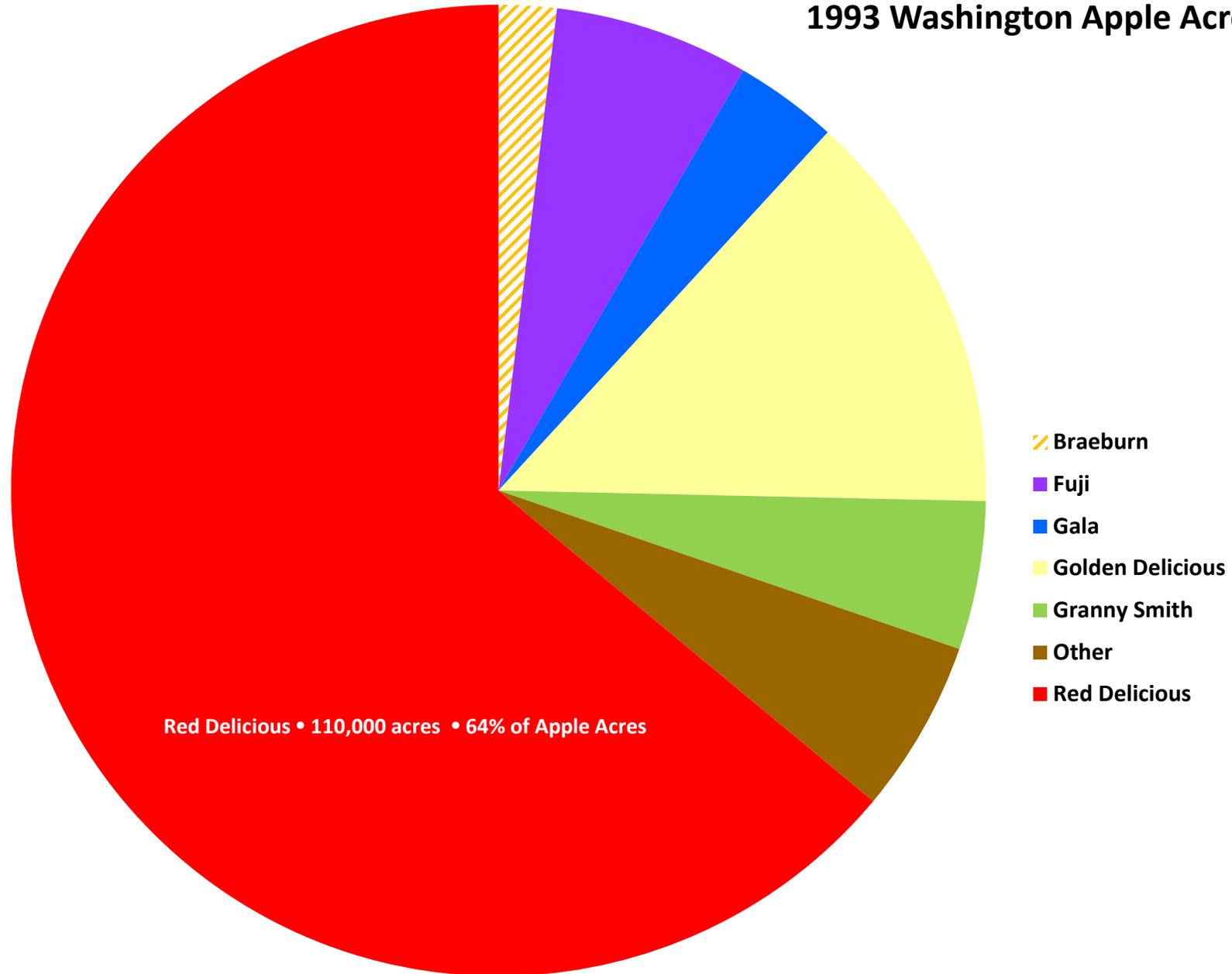
Even so, she said, "I have a hard time believing that Red Delicious will go away entirely. I could be wrong. There are the Winesaps? It's taken a long time for those to go away. We still have a few grown commercially and see them in roadside stands. We'll see what happens with Red Delicious. This is an interesting time in the apple business."

Nevonne McDaniels | 664-7151

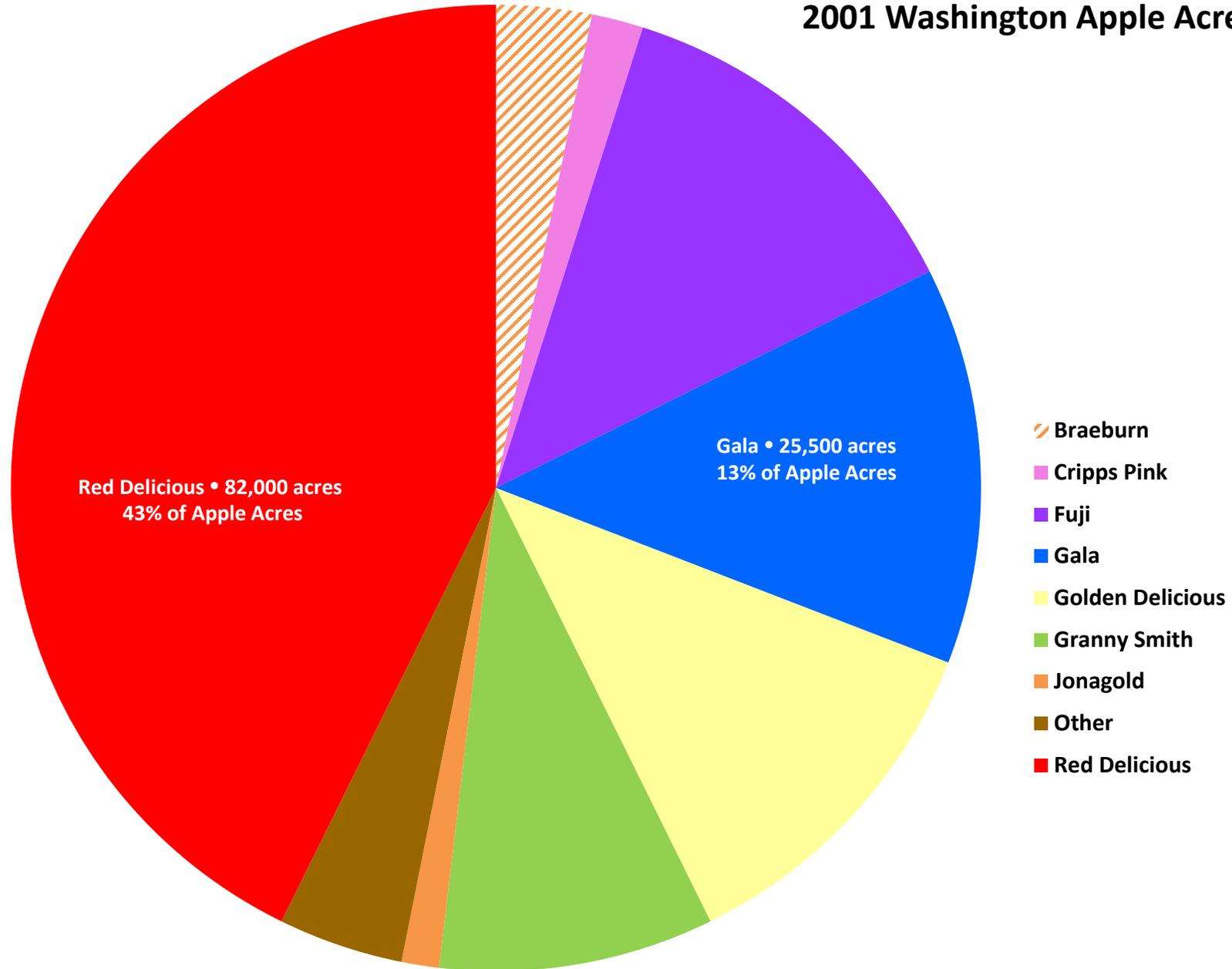
# 1986 Washington Apple Acreage



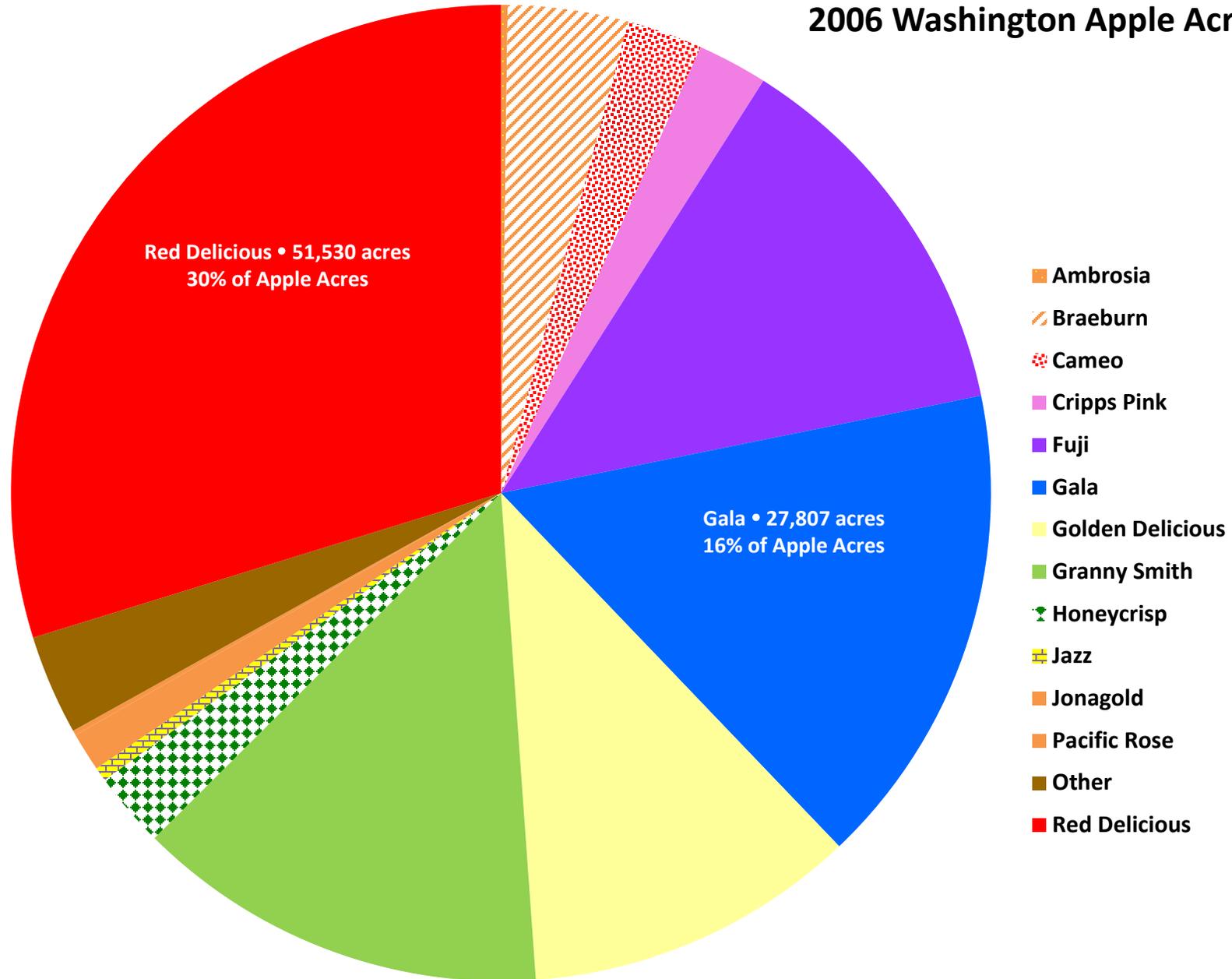
# 1993 Washington Apple Acreage



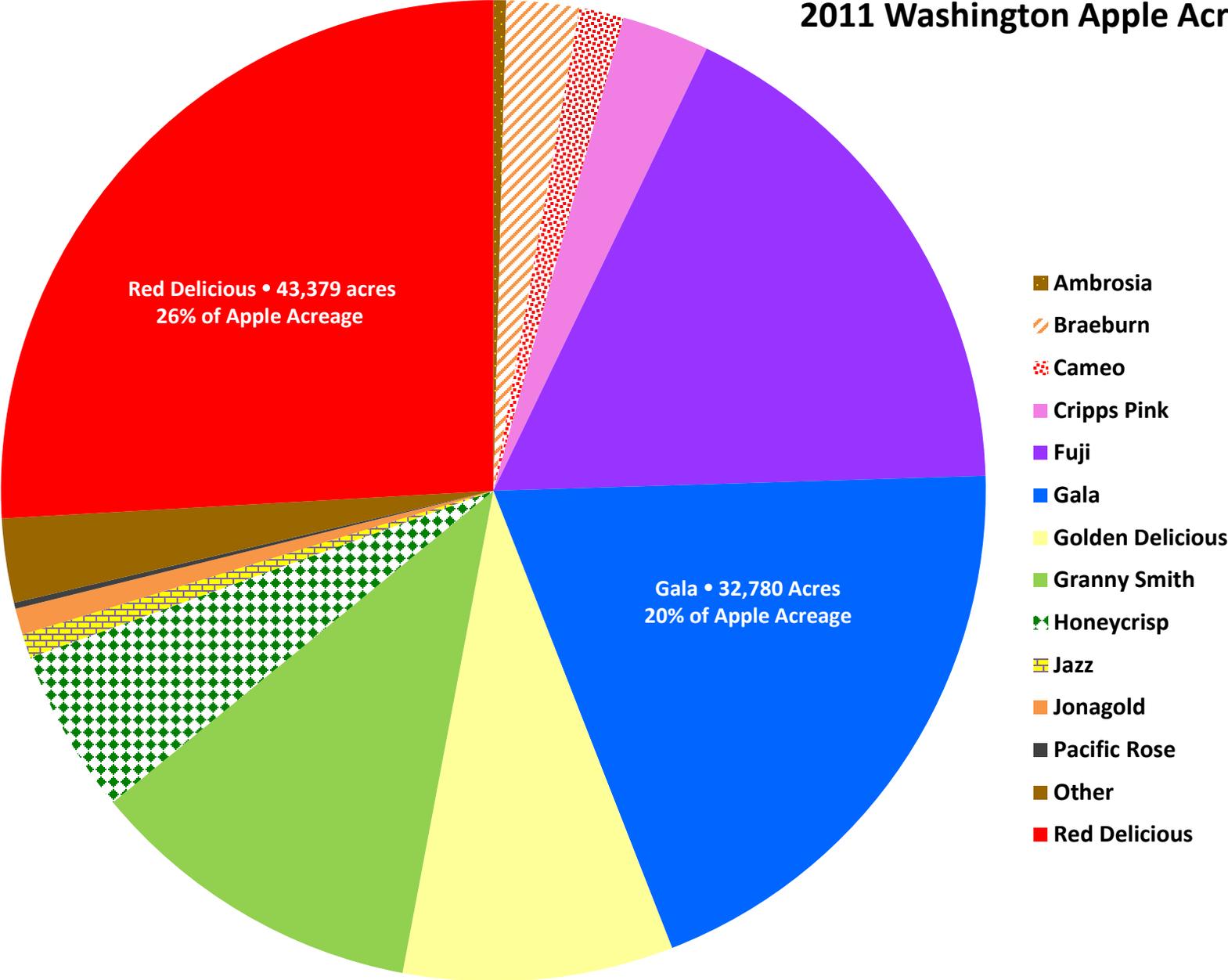
## 2001 Washington Apple Acreage



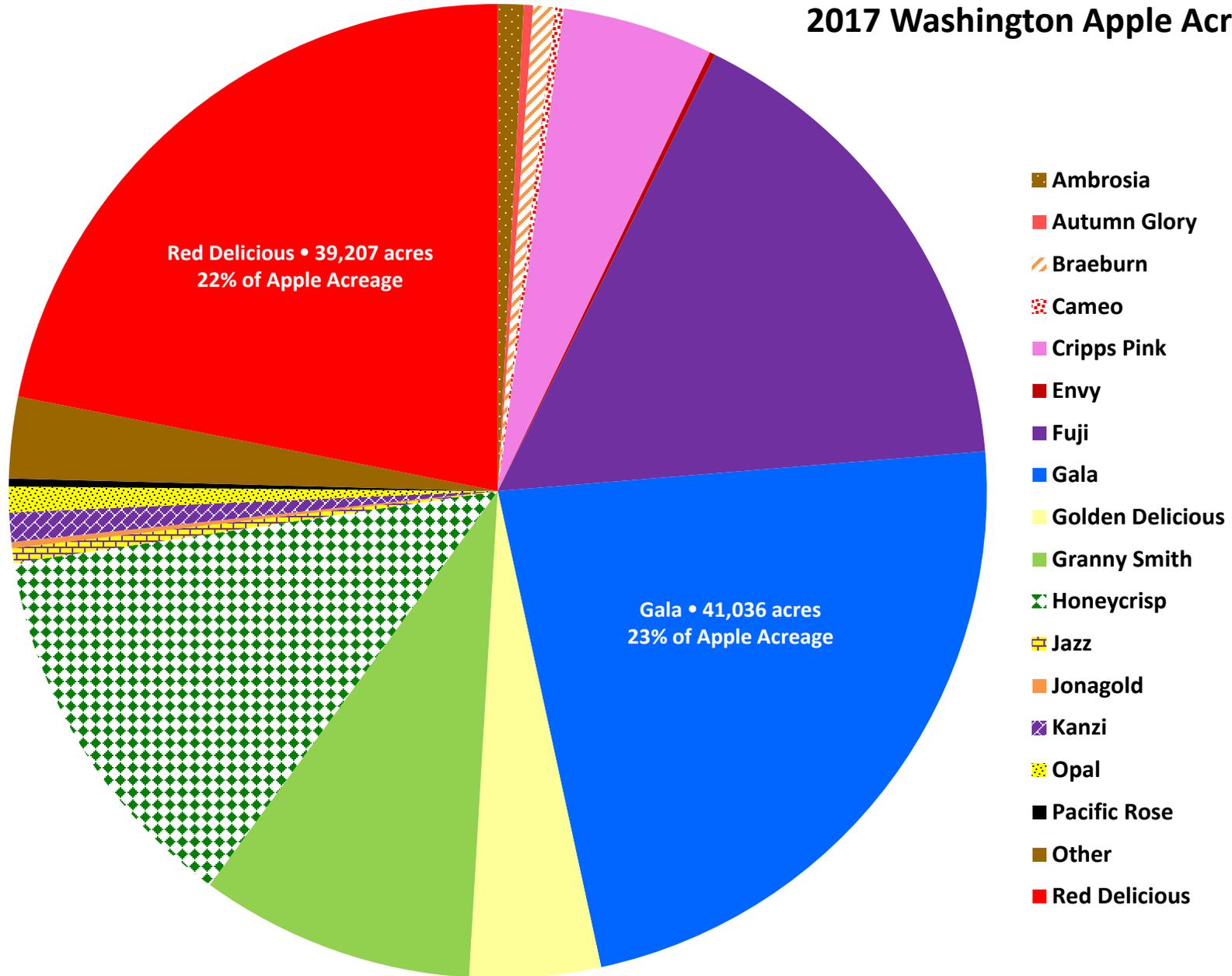
## 2006 Washington Apple Acreage



# 2011 Washington Apple Acreage



# 2017 Washington Apple Acreage



# Washington's new cultivar



# What's next?

*In the market or in the beta validation phase*

- Mechanical thinning
- Mechanical pruning
  - Platforms
  - Harvest assist
  - Robotic harvester
- Fruit and canopy mapping

# SNAP

Simple, Narrow, Accessible and  
Productive Canopies

Single, twin or multiple stem

Random or organized /  
narrow canopy = accessible

Uniform canopy/ Uniform crop

High early yields

High mature yields

Target fruit





**Pear**  
**V trellis**  
**Anjou/OHF87**



**Cherry**  
**UFO**  
**Sweetheart/Gi6**

# Uniform and Balanced Canopies





# Foundational Technology



**1-1.5 mph 35 acres/day**

**1.5-3 km/h 14 ha / day**





**Autonomous scout: soil sensing (Carnegie-Mellon Univ)**

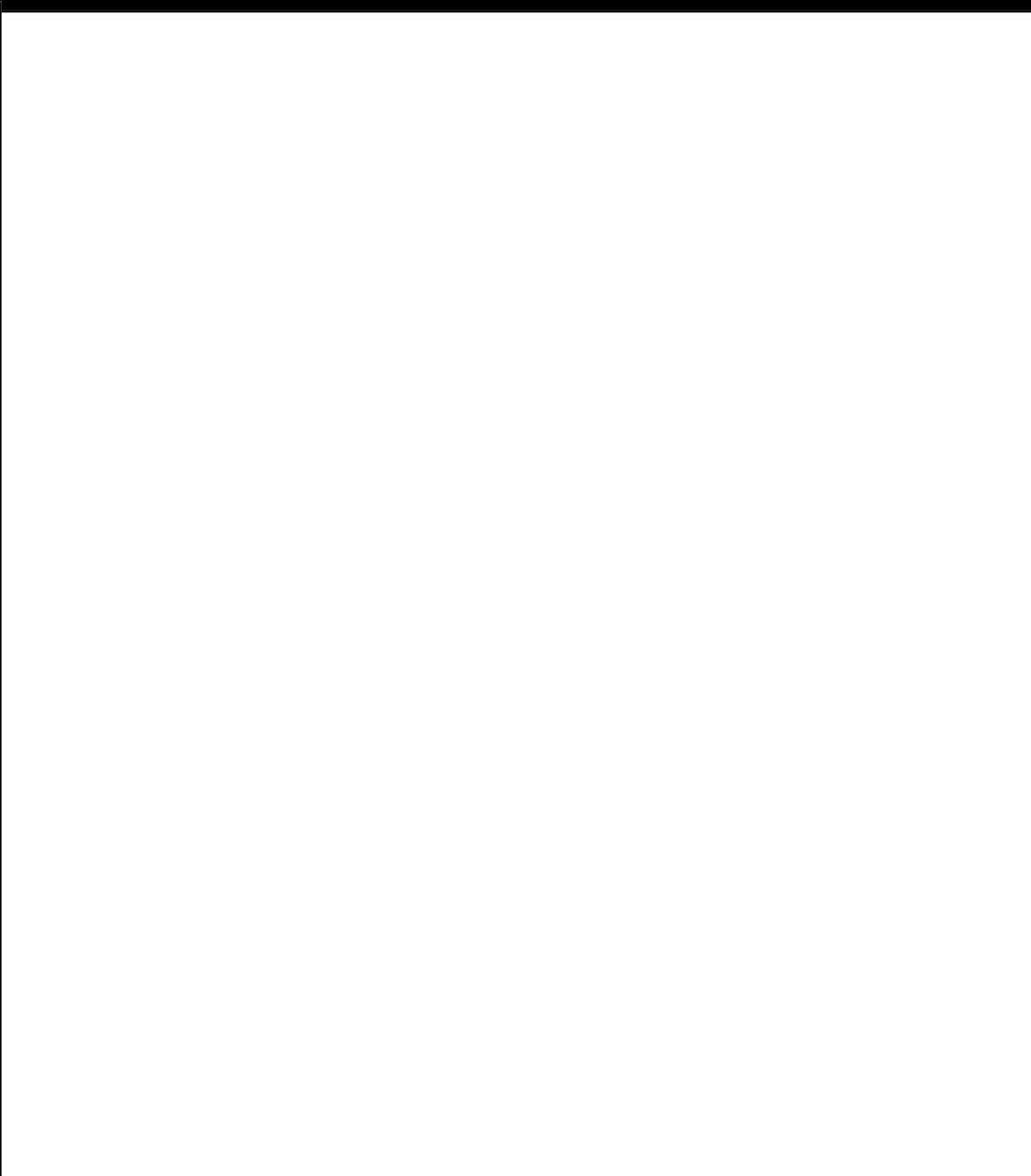
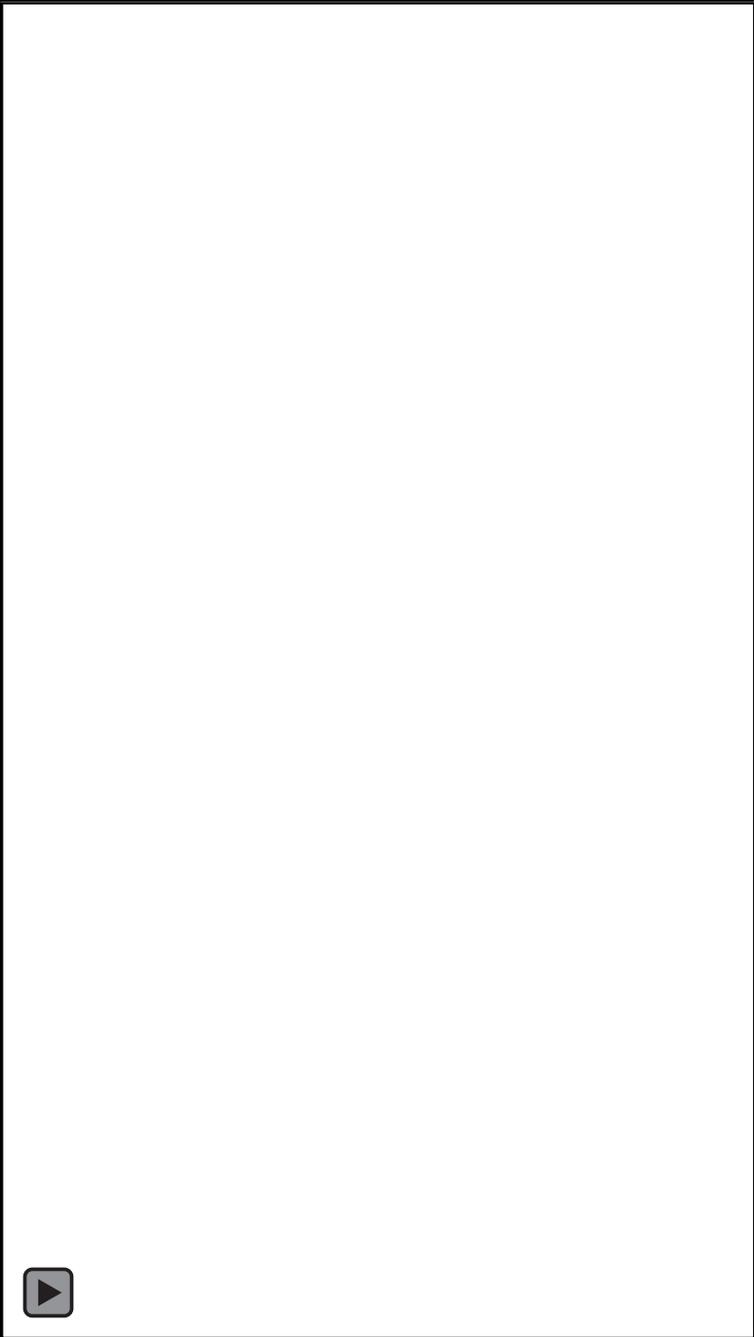
# Apple Mechanical Pruning



# Mechanical Thinning







Take the 2010 WSU DAS User Survey

The survey takes about 15-20 minutes to fill out. All survey submissions will be kept confidential and presented only as general summary reports on all collected data.

[Start the survey](#)

[Close](#)

View by Station

Weather Stations

- N Cashmere
- WSU TFREC

Viewing Models for N Cashmere

**N Cashmere Station**

Weather Forecast | View Organic

**Codling Moth**

View Data Grid

Last Updated: 08-18-2010  
 Degree-days since Jan. 1 = 1869  
 (old: after biofix = 1694 DD)

**Current Conditions:**  
 Most, 91%, of the 1st summer generation CM adults should have emerged. 66% of the 2nd summer generation eggs have hatched. Moth flight should decline after 1615 DD (1440 DD after biofix). The total of 1679 DD (1504 DD after biofix) on August 10th predicts a total of 2587 DD (2412 DD after biofix) for November 1st which would result in an estimated 17% egg hatch of the third generation at that time.

**Management:**  
 Repeat insecticide applications should be based on the residual activity of the product used and if moth captures continue to exceed treatment thresholds. If a 3rd summer generation of CM is predicted, egg hatch would be expected to start by 2195 DD (2020 DD after biofix) and appropriate action should be taken to protect the crop if CM moth flight was high in the 2nd generation or injury was observed.

**Projected Forecast:**  
 +10 days Sat Aug 28, 2010 : 2073 DD

**Conditions:**  
 100% of the 2nd summer generation adults have emerged. Eggs of the 3rd summer generation will start being laid by 2195 DD (2020 DD after biofix).

**WSU Mini Sprayguide**

Possible **Conventional** materials for **Apple** crops.

Crop Type:

Crop Stage:

**Acetamiprid** (Assail 70WP)  
**Carbaryl** (Sevin 4F)  
**Petroleum Oil-summer** (Saf-T-Side)  
**Spinetoram** (Delegate 25WG)

Degree Days since Jan. 1	Larvae	Larvae +10 Days	Adults	Adults +10 Days
0	0	0	0	0
500	10	0	50	0
1000	85	0	10	0
1500	30	0	40	0
2000	0	75	10	0
2500	0	0	0	75

Powered by  
 AgWeatherNet

# Mobile platforms



# Efficiencies in Apple

- **Tree Training** +40-60%
- **Bloom Thinning** +25-45%
- **Green Fruit Thinning** +35-45%
- **Pheromone Placement** +75%
- **String Tying** +65-120%
- **Trellis Construction** +15-20%

**Still have to pick the fruit!!**  
**20+ Billion times**  
**1 apple/ 2 seconds**



# Harvest Assist

Removes ladders

Bin to the worker

Pick in bags

Right fruit in/ right fruit out





# Huron Fruit Systems



# Littau Harvester



# Bandit Xpress Automated Ag Systems



# Cyclone Automated Ag Systems





ORSI group



# Zucal and Pluk-O-Trak



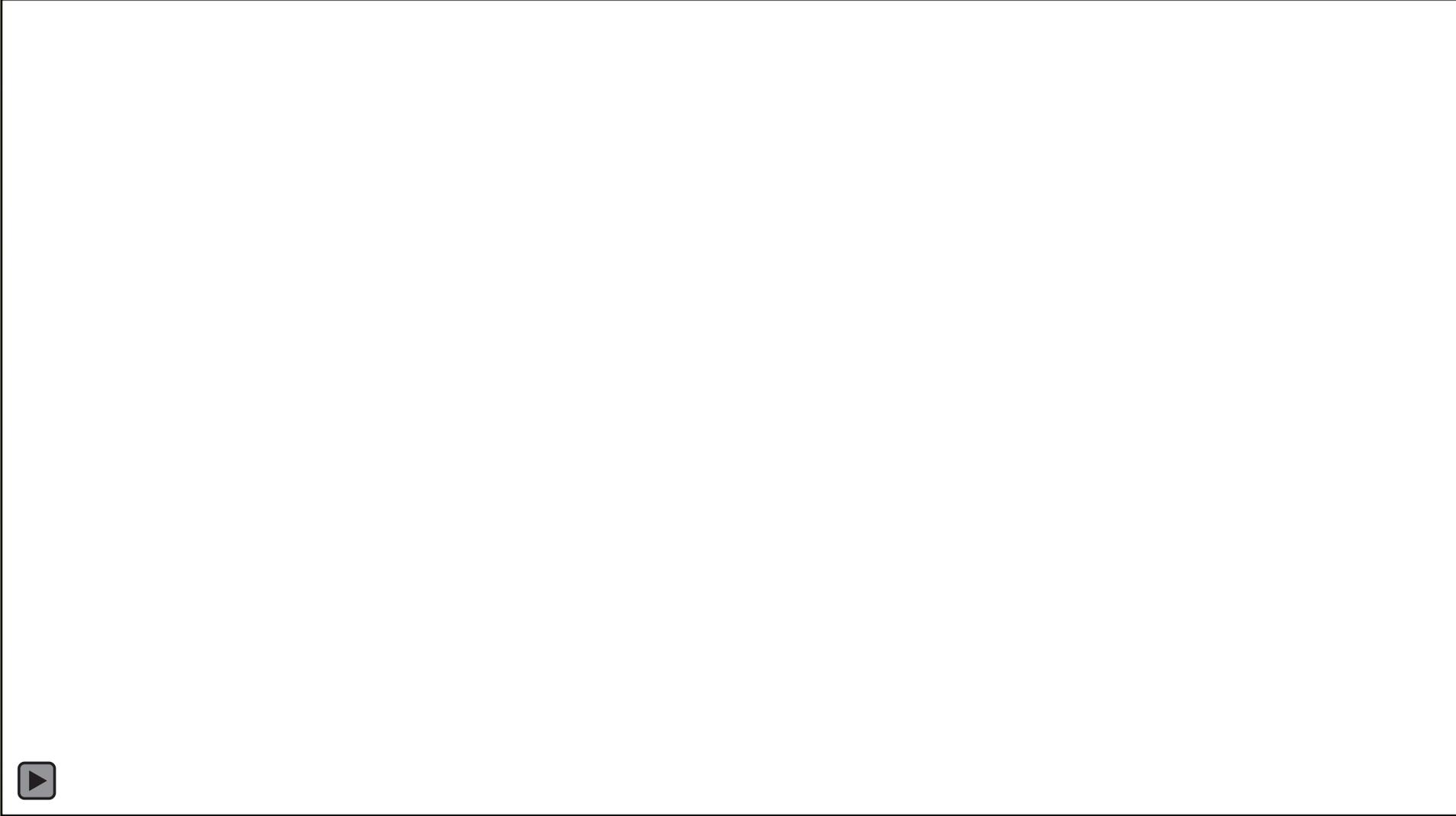
# Night time is the right time





# Automating Orchard Agriculture

**Abundant  
Robotics**







# AND MORE

## Localized data collection, data analysis and data driven management decisions

- Tree growth and development
- Bloom density – fruit set
- Fruit color
- Internals – Sugar/acid, aroma
- Fruit size
- Storability
- Soil X 10

# All tree fruit sectors confront labor shortages

- **Nursery** (management, production, breeding, sales)
- **Orchard** (management, production, equipment operators and mechanics, fabricators)
- **Harvest and post-harvest handling** (management, QC, equipment operation, IT, marketing, sales)

- *Extension – science translation and application, outreach*
- **Field Horticulturists**
- **IT**
- *Scientists - Genetics, Entomology, Pathology, Horticulture / Plant Physiology, Soils*
- *Engineers – Bio Systems, Computer, Mechanical*

**Importance of agriculture service company or consultant expertise for guidance and implementation by apple growers in Washington, New York, and Michigan (Gallardo et al. 2019).**

<b><u>Importance</u></b>	<b><u>%</u></b>
<b>Extremely important</b>	<b>35</b>
<b>Very important</b>	<b>34</b>
<b>Important</b>	<b>21</b>
<b>Neutral</b>	<b>8</b>
<b>Unimportant</b>	<b>2</b>
<b>Very unimportant</b>	<b>0</b>
<b>Extremely unimportant</b>	<b>0</b>

# Small businesses as a driver (SBIR)

## Basin Business Journal

### Shaking the money tree in Moses Lake



Charles H. Featherstone/Basin Business Journal

Automated Ag owner and founder JJ Dagorret leans on the cooling rack outside the oven where his company bakes the powder coat on its products.



Charles H. Featherstone/Basin Business Journal

A worker welds a part on an Automated Ag assisted harvester.

By CHARLES H. FEATHERSTONE  
For the Basin Business Journal

MOSES LAKE — JJ Dagorret doesn't look like a man who is changing the world. But he is. One fruit orchard at a time. The California native builds machines to help apple growers — and other fruit tree farmers — pick their fruit faster and more efficiently. "It's not real super new tech," the founder of Automated Ag said. "But it's a recipe that works well. And that was the difference." Dagorret was no stranger to orchards, to long hours of tending trees

See **AUTOMATED**, Page A7

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## Basin Business Journal



Charles H. Featherstone/Basin Business Journal

Automated Ag owner and founder JJ Dagorret.

### AUTOMATED:

and picking fruit in prune and pistachio orchards in California. So he's learned a thing or two along the way, and started tinkering early, building machines to make the work easier, more efficient, and go faster.

"He's grown up shaking trees," his wife and business partner Kelly said. "His dad had a harvesting crew."

In fact, the move from Northern California to Florida was an attempt to take advantage of longer harvesting seasons. JJ said a typical prune and pistachio season will last 40 days, while citrus in Florida grows and can be harvested for eight months.

"These are \$200,000 machines," he said. "So we said let's go to Florida and shake orange trees. We just thought that would be great."

However, the citrus farmers of Florida were not as interested in changing their ways as JJ and Kelly hoped.

"Some people will go broke before they change," he said. "That's just how they think."

So the couple looked around for other ways to use their machines, and saw a use in the apple industry.

"We figured out pretty fast," he said, "that if we want to be serious about apples, we need to be in Washington."

It was nearly 10 years ago that the Dagorrets relocated to Moses Lake and started their business Automated Ag, which builds a number of motorized platforms to help tend, prune, harvest and move tree fruit.

Little has changed in the fruit tree industry since people first started cultivating tree fruit, Dagorret said. Someone climbs a ladder, pulls fruit off of trees, puts it in a bag and then when the bag gets full transfers the contents of that bag to a bin.

"I just designed a machine that people stand on," Dagorret said.

# USDA Transformational Investments

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## Specialty Crop Block Grant Program

- Overview
- How to Apply
- How to Administer the Award
- SCBGP Awarded Grants
- SCBGP Final Performance Reports
- SCBGP Contact Information
- State Contacts
- Specialty Crop Definition
- Specialty Crop Multi-State Program
- Return to Grants and Opportunities



### Specialty Crop Block Grant Program

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- 03/05 USDA Announces Opportunities for Local Performers During 2018 Farmers Market Season on the National Mall

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The purpose of the Specialty Crop Block Grant Program (SCBGP) is to solely enhance the competitiveness of specialty crops. Specialty crops are defined as "fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)."

The agency, commission, or department responsible for agriculture within any of the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands is eligible to apply directly to the U.S. Department of Agriculture for grant funds. Organizations or individuals interested in the SCBGP should contact their state department of agriculture for more information.

#### Additional Information

- What AMS grant is right for me? (pdf)
- Definition of a Specialty Crop
- Evaluation Plan (Performance Measures) (pdf)
- SCBGP Templates and Performance Measures Q&A (pdf)

USDA United States Department of Agriculture  
National Institute of Food and Agriculture

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## Specialty Crop Research Initiative (SCRI)

**Program:** [Specialty Crop Research Initiative \(SCRI\)](#) | [Organic Agriculture Program](#) | [Horticulture Programs](#) | [Environmental & Resource Economics Programs](#) | [Sustainable Development Programs](#) | [Sustainable Agriculture Program](#) | [Markets, Trade & Policy](#) | [Crop Protection and Pest Management Program](#) | [Weed Science](#)

The purpose of the SCRI program is to address the critical needs of the specialty crop industry by awarding grants to support research and extension that address key challenges of national, regional, and multi-state importance in sustaining all components of food and agriculture, including conventional and organic food production systems. Projects must address at least one of five focus areas:

- Research in plant breeding, genetics, genomics, and other methods to improve crop characteristics
- Efforts to identify and address threats from pests and diseases, including threats to specialty crop pollinators
- Efforts to improve production efficiency, handling and processing, productivity, and profitability over the long term (including specialty crop policy and marketing)
- New innovations and technology, including improved mechanization and technologies that delay or inhibit ripening
- Methods to prevent, detect, monitor, control, and respond to potential food safety hazards in the production, efficiency, handling and processing of specialty crops.

# RosBREED 2

**RosBREED: Combining Disease Resistance with Horticultural Quality in New Rosaceous Cultivars**

*Four years \$10M*



**CASC**  
Comprehensive Automation  
for Specialty Crops

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**Announcements**

**AgTools™ Training**  
January 19, 26  
February 2, 9, 23  
March 1, 8  
Online

**Mid-Atlantic Fruit & Vegetable Convention**  
January 31 - February 2, 2012  
Hershey, Pennsylvania

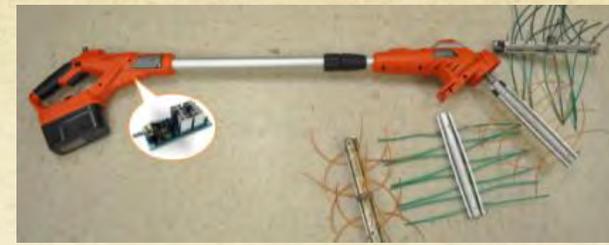
**American Society of Agricultural and Biological Engineers Annual Meeting**

Last Updated  
09.29.11



Comprehensive Automation for Specialty Crops (CASC) is a matching grant program funded by the USDA-SCRI and industry to develop comprehensive automation strategies and technologies for the specialty crop industry, with an initial focus on apples and nursery trees. We are a multi-disciplinary, multi-institutional group comprised of engineers, scientists, extension educators, growers, and industry representatives in universities, government labs, and companies.

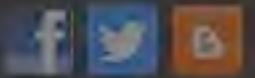
**4 yrs \$12M**



**Sanjiv Singh, Carnegie Mellon Univ**  
**Specialty Crop Research Initiative**

# Enhancing Western Orchard Biological Control

USDA-NIFRA SCRI grant #2008-04854



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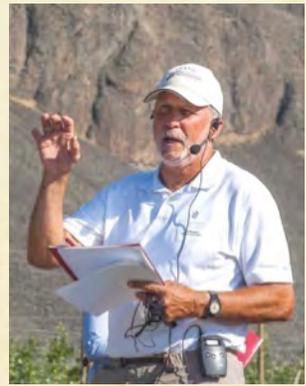
DECISION AID SYSTEM  
BETTER IPM THROUGH SCIENCE AND TECHNOLOGY



Vince Jones



Ute Chambers



AgWeatherNet

Tree Fruit Research & Extension Center  
**Orchard Pest Management Online**



Green Lacewing (adult)	Green Lacewing (larva)	Ladybird Beetle (adult)	Ladybird Beetle (larva)	Spider Mite Destroyer (adult)
Spider Mite Destroyer (larva)	Syrphid Fly (adult)	Syrphid Fly (larva)	Predatory bug (adult)	Predatory bug (immature)
Minute Pirate Bug (adult)	Minute Pirate Bug (immature)	Anthocoris Predatory Bug (adult)	Anthocoris Predatory Bug (immature)	Western Orchard Predatory Mite (adult)

**Z-TRAP** Automated and Connected Insect Monitoring  
powered by SPENSA

Spensa's Z-Trap automates the process of insect trapping and counting with our internet-enabled smart traps.

Monitor insect counts daily from your computer or smartphone to catch pest problems earlier, spray more efficiently, and save more crops.

# Fruit Logistica, Berlin

## *Circular Ag*





# Dutch Ag Ministry





**On behalf of  
Washington  
tree fruit  
stakeholders**

# Thanks



# GMOs



## USDA asked to approve GMO apple that won't brown

Associated Press

Posted November 29, 2010 at 12:48 p.m., updated November 29, 2010 at 12:48 p.m.

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## News & Events



### Plum-Pox-Resistant Forward

By [Kim Kaplan](#)  
July 25, 2007

Plum trees with resistance to plum pox virus, a pest that can devastate stone fruit production, are closer to reality, according to a new study.

2010 photo, a worker sorts through apples at Crunch Pak, an apple slicing company in Washington. A Canadian biotechnology company has asked the U.S. to approve a genetically modified apple that doesn't turn brown when sliced. (AP Photo/Shannon Dininny)

Wash. — A Canadian biotechnology company has asked the U.S. to approve a genetically modified apple that won't brown soon after its sliced, saying that could boost sales of apples for snacks, salads and other uses.