



WASHINGTON STATE UNIVERSITY  
EXTENSION

# **Agricultural Industrial Symbiosis: An Applied Research Project as an Alternate Approach to Reduce / Eliminate Emissions from Agricultural Burning**

## **Project update**

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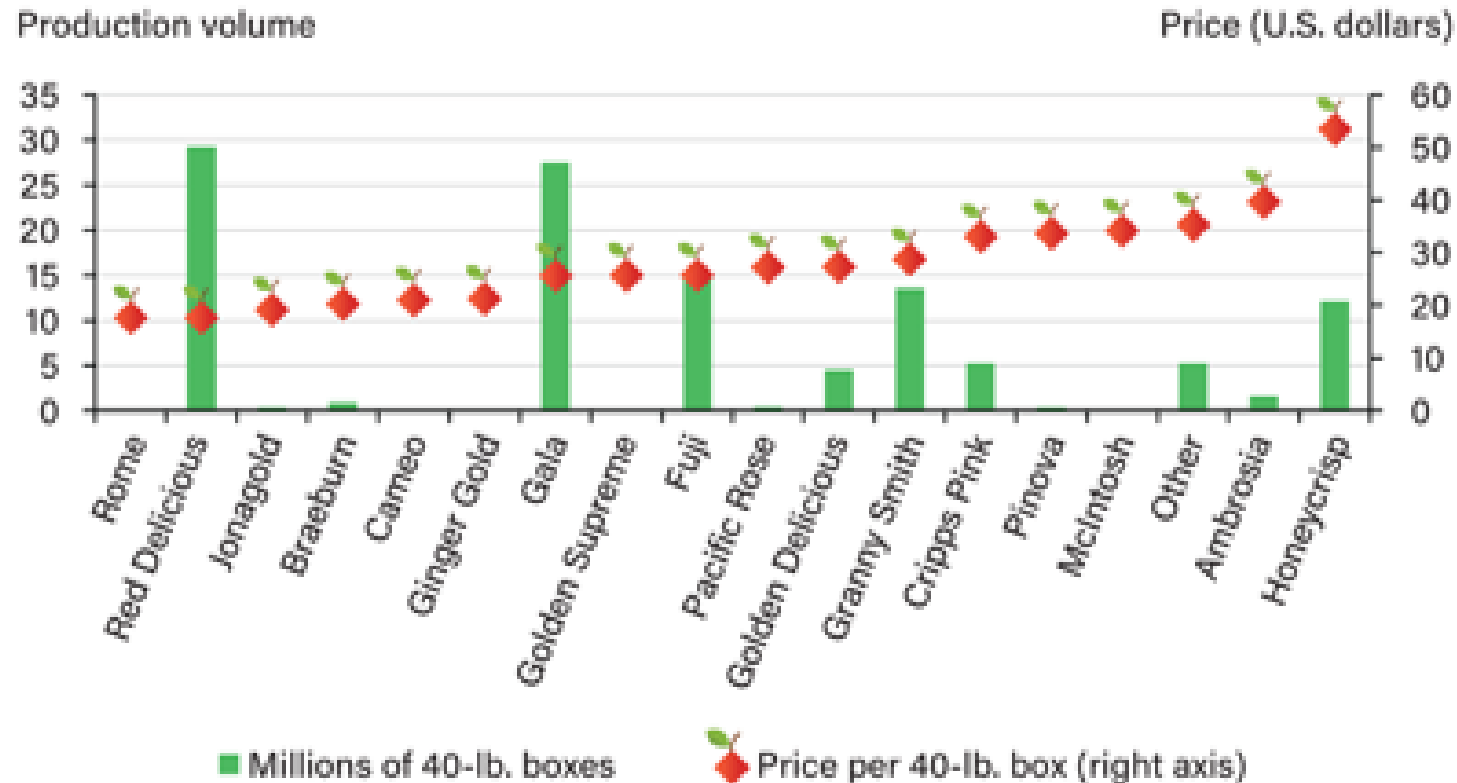
# Project Economic Objectives

1. Determine chipping production costs and yield
  - Data being developed with the chipping pilot study
  - Evaluate orchard tear out and pruning chipping economics
  - Evaluate scale and scope
2. Evaluate orchard chip supply using Tree Fruit Survey
3. Determine chip transportation costs
4. Conduct market review of PNW hardwood chip supply
5. Evaluate economics of wood chips in dairy vermifiltration system



# Evaluating Orchard Chip Supply

- Price and profitability driving orchard reestablishment decisions
- Note differences between Red Delicious, Golden Delicious and Honeycrisp



Note: Marketing year begins in August. Prices reflect the price received by the grower upon shipping their product.

Source: USDA, Economic Research Service using data from Washington State Tree Fruit Association.



# Objectives Summary

- The increase and decrease in orchard acreage

	2011	2017	Change	Acres Out	Avg /year
Ambrosia	695	1,528	833		
Breaburn	4,009	1,298	(2,711)	(2,711)	
Cameo	2,431	509	(1,922)	(1,922)	
Cripps Pink Lady	4,810	8,923	4,113		
Early Fuji	1,432	592	(840)	(840)	
Fuji	27,683	28,718	1,035		
Gala	32,780	41,036	8,256		
Golden Delicious	14,852	7,760	(7,092)	(7,092)	
Granny Smith	18,585	16,267	(2,318)	(2,318)	
Honeycrisp	9,098	22,616	13,518		
Jazz	1,317	872	(445)	(445)	
Jonagold	1,450	360	(1,090)	(1,090)	
Red Delicious	43,379	39,207	(4,172)	(4,172)	
Other	4,998	9,458	4,460		
	167,519	179,144	11,625	(20,590)	(3,432)



# Available Tree Estimate

- Change in acreage by tree type
- Preliminary estimate is 2.4 to 2.8 million apple trees available annually in dairy regions
- With the pilot project evaluate tree density, size, and trellis complexities

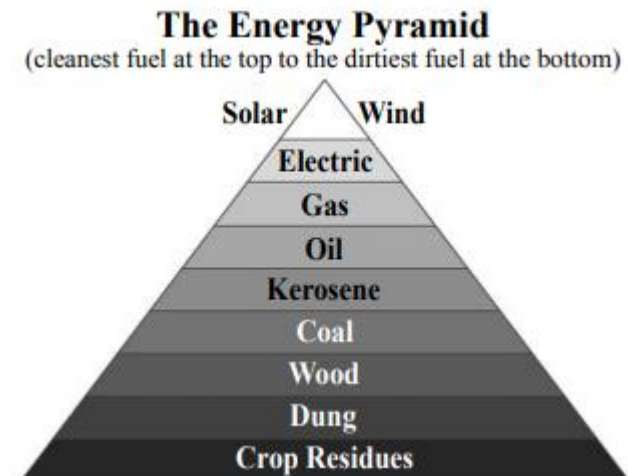
	Apples	Cherries	Pears	Peaches	Other
Total	-20,590	-4,298	-2,718	-419	-757
Per Year	-3,432	-716	-453	-70	-126

Trees Per Acre			
		Sweet	
	Apples	Cherries	Pears
Yakima Valley	690	306	272
Wenatchee	517	256	240
Columbia Basin	825	230	201
Washington	706	270	251



# Measuring Apple Smoke Pollutants

- Objective is to estimate the potential amount of apple orchard smoke compounds not released by burning
  - Use existing literature – extensive body of literature
  - Applewood for BBQ, and International use of orchard wood as fuel
  - Health “dis-attributes” of wood smoke with tables of compounds
  - Carbon monoxide (CO), Carbon dioxide (CO<sub>2</sub>), Nitrogen dioxide (NO<sub>2</sub>), Ozone, (O<sub>3</sub>), Sulfur oxides (SO<sub>x</sub>), Particulate matter, and toxic air pollutants e.g. benzene
- Given complexity I asked for help with WSU air quality scientists
  - Small pilot experiment to burn pre-chipping samples to measure directly
  - To explore pilot experiment, they also wanted to review literature
- Literature statement that burning orchard wood is carbon neutral, because releasing carbon in smoke is balanced from carbon sequestered by the tree



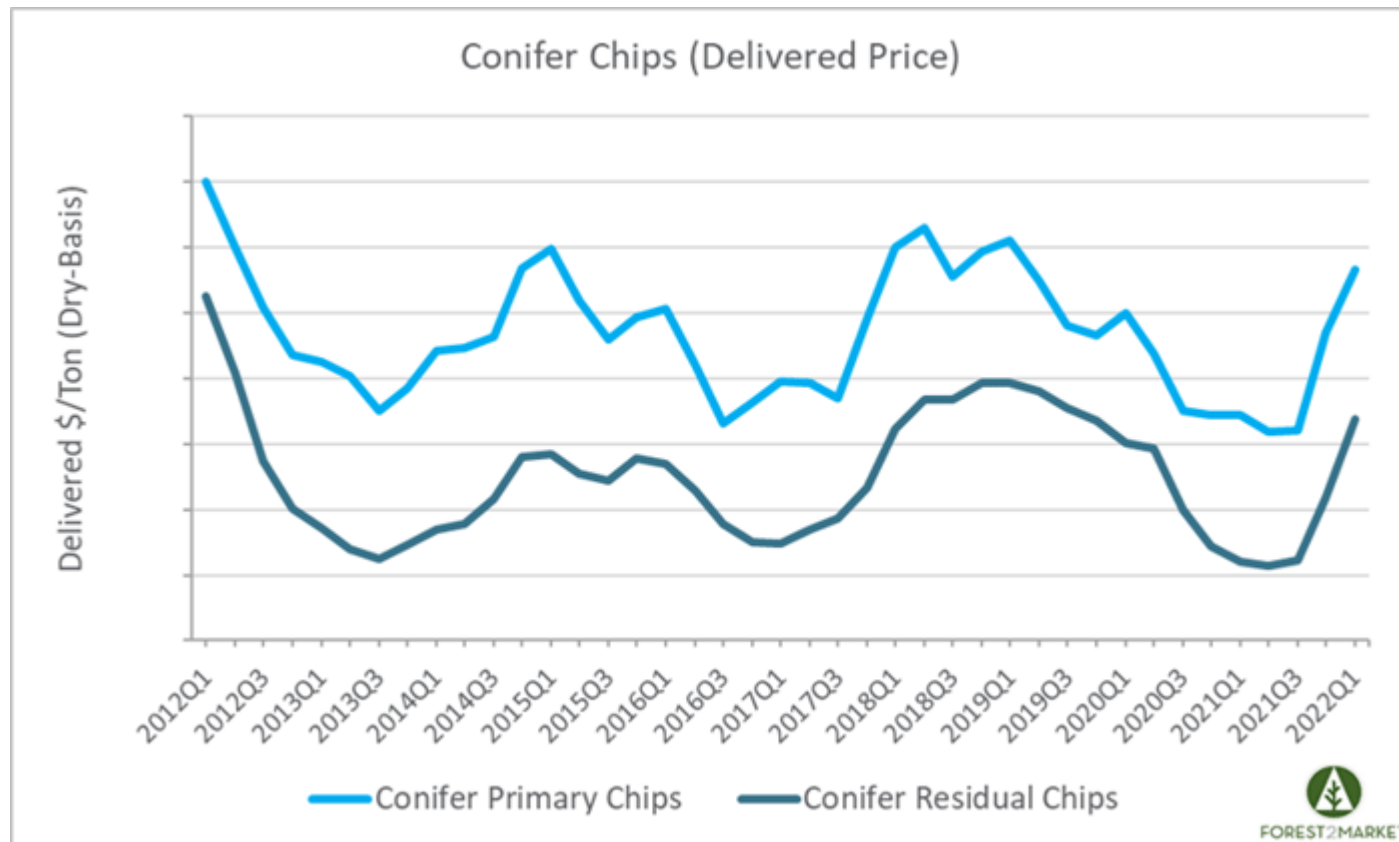
# Chip Trucking Costs

- Detailed chip trucking survey study in the South
  - Dated but identified important factors
    - Distance, Loading characteristics, private vs contract hauling
- Internet review of freight costs
  - National average trucking \$3.07 per mile
  - West October Flat Bed Rate was \$2.53 per mile
- Interview specific WA trucking rates for local deliver and chip vans



# Chip Market Review

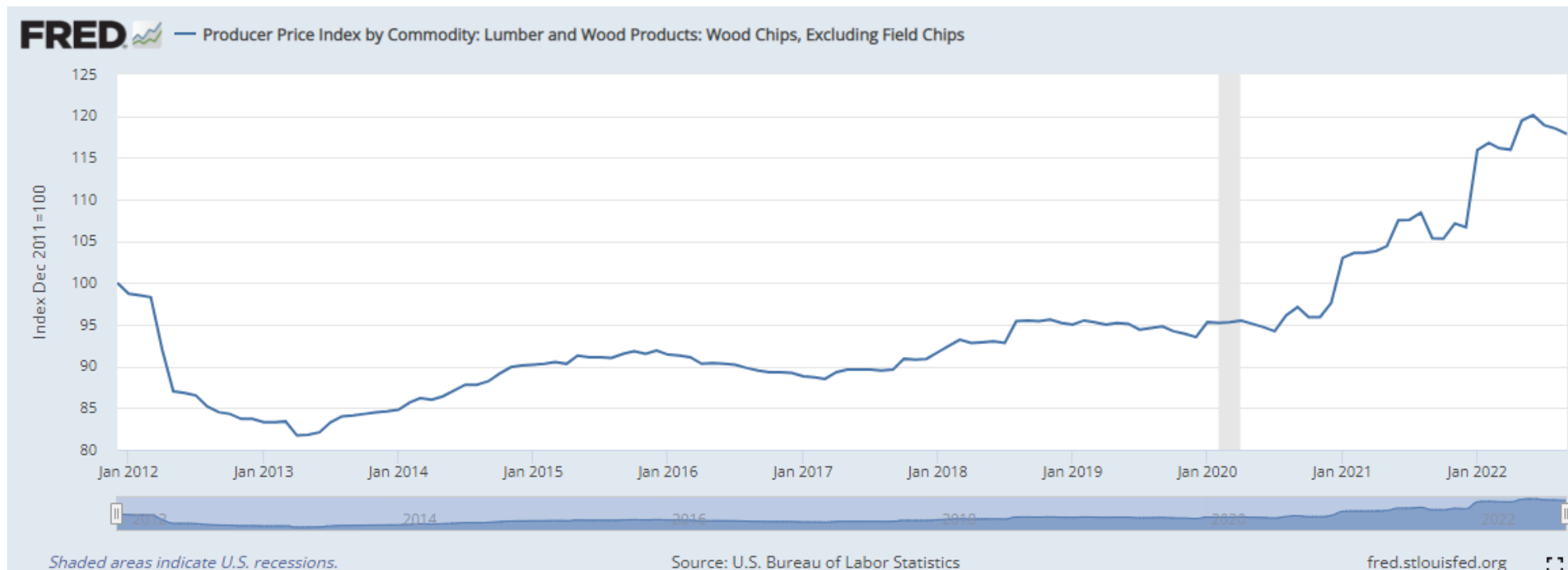
- Initial findings are that wood chip prices are not public data
- Chips in high demand for fuel pellets and pressed board wood products





# Chip Market Review

- Wood chips used for production of fiberboard, pulp, paper and particle board, landscape
- Reduced logging, international demand, lumber demand (housing starts), dedicated market channels all together indicate challenges in sourcing wood chips
- “It is getting tougher and tougher to located chips in the US PNW – which is already lean on supplies.” [Wood Chip Supplies Diminish and Prices Soar in the Pacific Northwest \(forest2market.com\)](#)
- World Resource Quarterly, [Pulpwood Price Indices - Wood Prices](#), 2019 and FRED data



# Discussion and Questions

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