Engineering Solutions for the US Grape & Wine Industries

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National Grape and Wine Initiative

National Grape and Wine Initiative

Objectives

- Create a common vision for the US grape and wine industries
- Identify strategic research and extension priorities
- Build a partnership among public and private sectors for sustained investment in research and outreach activities to drive industry growth

US Grape & Wine Industry

Top line metrics

	Acres	Farm-gate value
Wine grapes California Washington New York	600,000	4.0 Billion
Raisin grapes	200,000	0.5 Billion
Table grapes	125,000	1.2 Billion
Juice grapes Washington New York	60,000	0.1 Billion

US Grape and Wine Industry
Engineering solutions

- Publicly funded programs not focused on the grape industry
  - Land grant universities
  - USDA
- Innovation has been driven by vendors and growers
- Production efficiency = competitive advantage
- Fruit quality driving industry growth
- Aging farm labor workforce in US

US Grape and Wine Industry
Engineering solutions

- *Robotics, mechanization & automation*
- Precision agriculture
- Sensors and sensor networks
- Information systems & decision aids
- Human and social dimensions and enterprise
- Education and workforce

Robotics, mechanization and automation

- Largest labor savings = pruning and harvest
  - Mechanical harvest of wine and juice grapes employed since the late 1960's
  - Mechanical harvest of raisin grapes increasing rapidly since the mid-1990's
  - Machine pruning (or pre-pruning) of wine grapes employed since the mid-1980's
  - No mechanization for table grapes to date
- Vision for the future – fine tuning and sophistication
  - Artificial intelligence
  - Robotics


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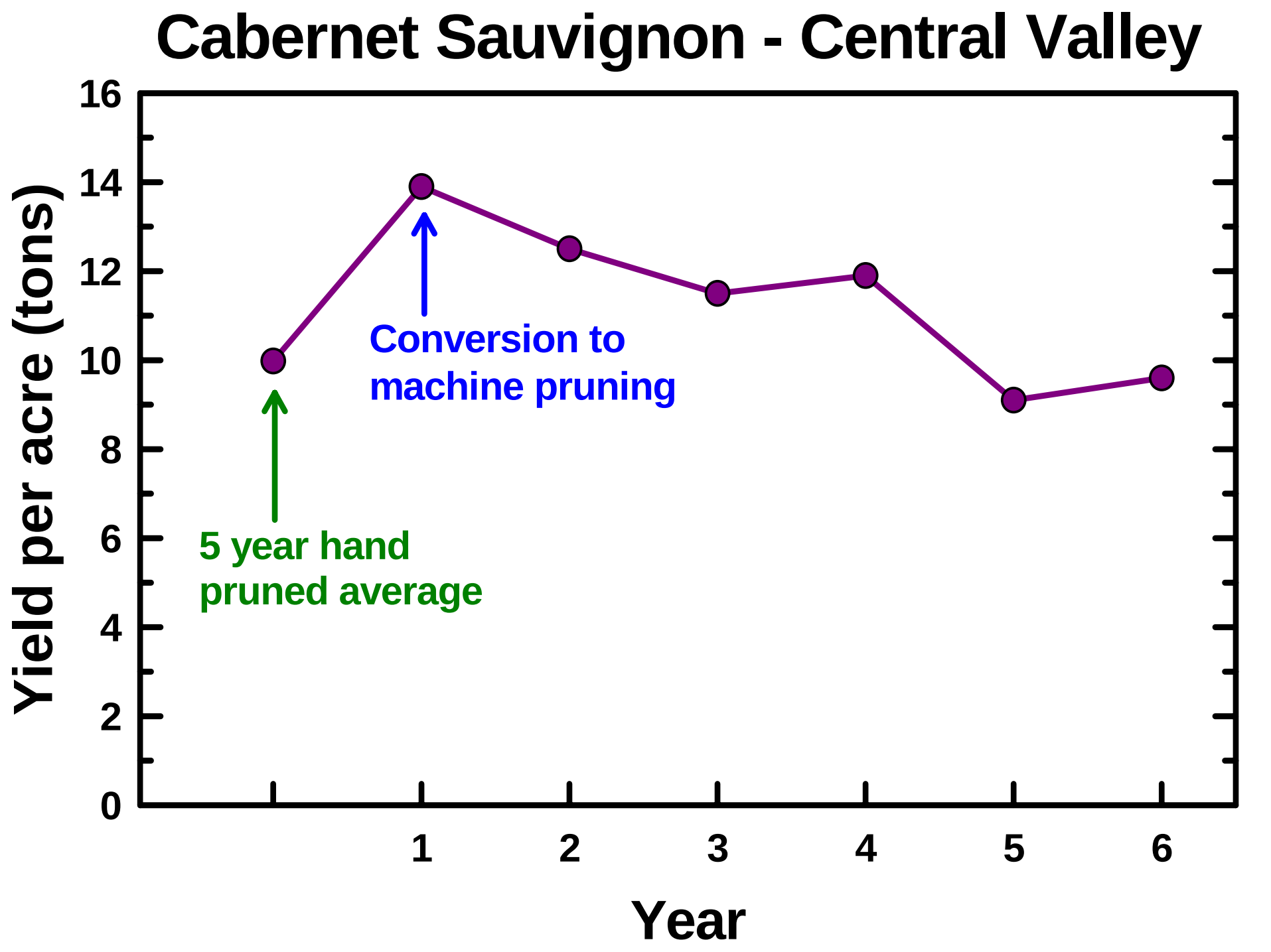
Cabernet Sauvignon - Central Valley
Yield per acre (tons)
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
Year
Conversion to
machine pruning
5 year hand
pruned average

Sensors and Sensor Networks

- Traditional sensor technology currently employed
  - Climate characterization for water, pest and disease management
- Next generation
  - Wireless and real-time
  - More sophisticated, physiologically based
    - Vine physiology parameters
    - Pest populations and disease incidence
    - Fruit development and composition


South


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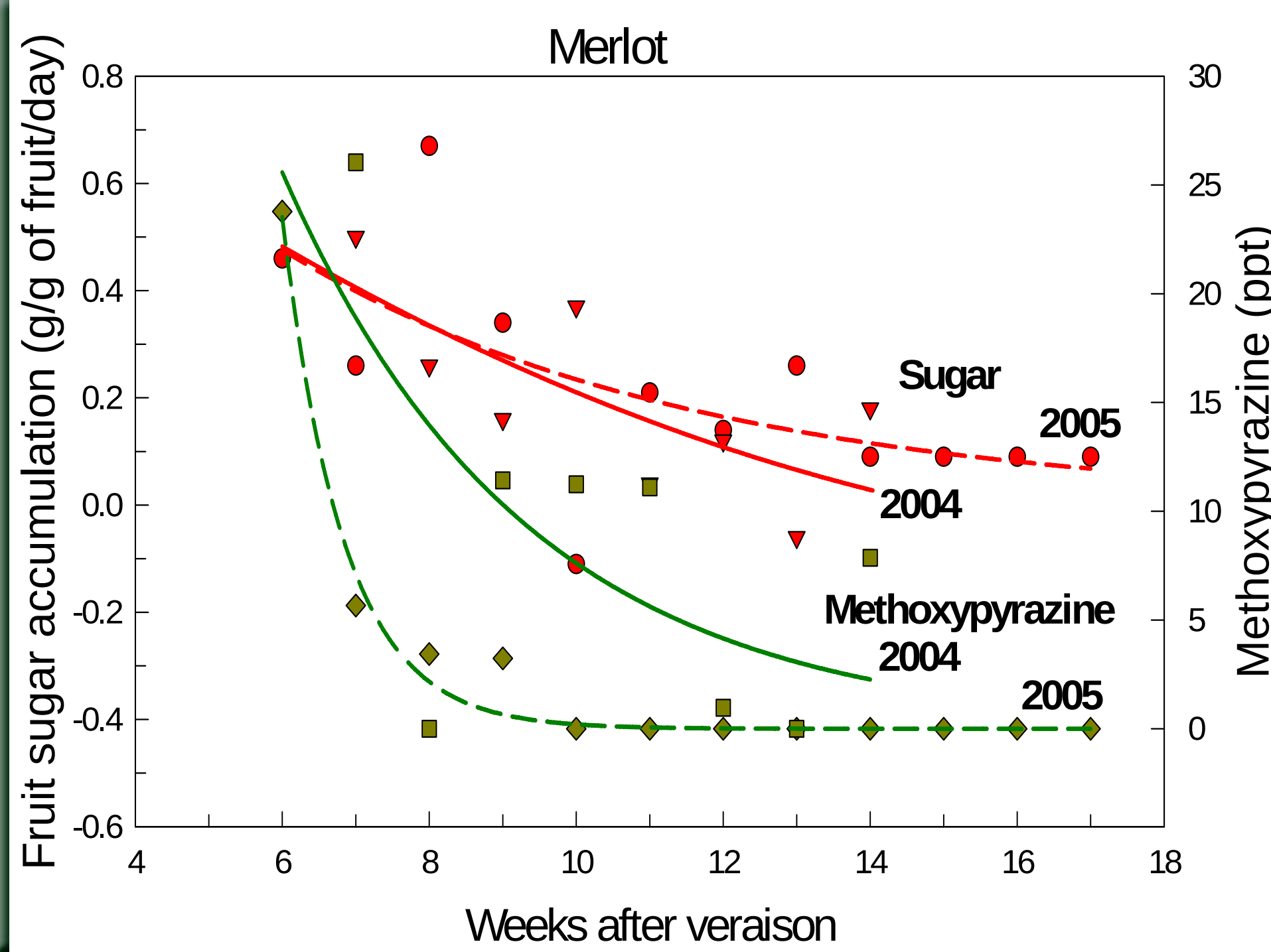
Merlot
Fruit sugar accumulation (g/g of fruit/day)
Methoxypyrazine (ppt)
Weeks after veraison
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
30
25
20
15
10
5
0
4
6
8
10
12
14
16
18
Sugar
2005
2004
Methoxypyrazine
2004
2005


JOHN DEERE

Precision Viticulture

- Research and adaptation in the US grape industry lagging significantly behind other regions
  - Spatial variability management
  - Input and resource management
- Need focused research and education effort to demonstrate the potential value of the technology
  - Harvest variation
  - Water and fertilizer applications
  - Pesticide applications

Information Systems

- Current systems improving but not widely employed
  - How can we make real-time data available for decision making?
    - Crop development
    - Water and fertilization needs
    - Pest and disease management
    - Harvest timing


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