## CROP ESTIMATION: THE BUSINESS OF GROWING GRAPES

By Wade Wolfe, Ph.D. Thurston Wolfe Winery Prosser, WA

# HISTORICAL PROSPECTIVE

- 1976: Graduated UCD (2<sup>nd</sup> time)
- 1976-1978: Four Corners Wine Grape Feasibility study based out of U. of Arizona
- 1978-1985: Director of Vineyard Operations at Ste. Michelle in WA
- 1985-1991: Northwest vineyard consultant
- 1987-present: Thurston Wolfe Winery
- 1991-2004: GM at Hogue Cellars

#### YAKIMA VALLEY – SOUTH BOUNDARY HORSE HEAVEN HILLS

#### YAKIMA VALLEY – NORTH BOUNDARY RATTLESNAKE HILLS



#### YAKIMA VALLEY

## 09.01.2009 15:20

## Introduction

- Accurate crop estimation is critical
  - Matching grape commitments to winery capacity
  - Hitting quality targets through yield adjustments
- Crop estimation techniques:
  - Eyeball
  - Crop history
  - Measuring yield components

# FAN TRAINED VINES-1978



## **Collecting Yield Components**

- Need to have accurate yield components for accurate yield estimation, including:
- Block size, planting density, percent vine stand
- Clusters/vine: counting versus harvesting
- Final harvest cluster weight: forecasting challenges

### Predicting Harvest Cluster Weights

- Steve Price's work in OR (early 90's)
- Berries follow double sigmoid growth pattern
- Lag Phase: Growth slows between the two rapid growth stages
- Berry (and cluster) weight at Lag Phase is 50% of harvest weight
- Lag Phase occurs 50-55 days after bloom

#### CLUSTER DEVELOPMENT YAKIMA VALLEY CHARDONNAY



## Predicting Harvest Cluster Weights

- Doubling Lag Phase cluster weight gives accurate forecast of harvest weight
- Useful tool for making PN crop estimates in Willamette Valley

## Adopting Lag Phase Method to WA State

- Adopt modified Lag Phase procedure at Hogue
- Challenges: 12 plus varieties, 40 plus growers, 200 plus blocks, short time between Lag Phase and veraison
- Reference blocks: Determine Lag Phase for major varieties
- Heat Units: Do HU's affect Lag Phase?
- Crop estimation sampling procedure: Modify to get earlier, more accurate information
- Cluster weight 'growth factors' (ratios): working outside of Lag Phase

### Procedures – Lag Phase Reference Blocks

- 5 Varieties: Chardonnay, Merlot, Riesling, Sauvignon blanc & Cabernet Sauvignon in Yakima Valley
- Blocks: Mature, BLC, typical soils, standard practices
- Sampling: Weekly between early July and mid-September
- Data: 50 cluster weights, 250 berry weights, Brix & Heat Units
- Growth factors: Calculate by dividing final cluster & berry weights by each sample date's weights

### **Results: Reference blocks**

#### Data for 3 representative years

- 1998: 2877 HU (hot year)
- 1999: 2244 HU (cool year)
- 2000: 2492 HU (average)
- Importance of HU range

Data collected for 5 representative varieties:

- Chardonnay & Sauvignon Blanc (early season mid Sept.)
- Merlot (mid season early October)
- Cab. Sau. & Riesling (late season late October)

### **Results: Cluster and Berry Growth**

- Clusters & berries show double sigmoid growth
- Lag Phase occurs third week of July through first week of August depending on season and variety
- Overlap between varieties, Chardonnay earliest, Cabernet latest
- Lag Phase dates identical for clusters and berries

# FIGURE 1 1999 CLUSTER WEIGHTS



POUNDS



# FIGURE 2 1999 BERRY WEIGHTS





GRAMS

### **Cluster Weight Growth Factors**

- Calculate cluster 'growth factors' (ratios) by dividing final cluster weight by earlier sample date weights
- Helps clarify Lag Phase dates
- Lag Phase occurs at a growth ratio of ~2, i.e. when weight is half of final weight
- Final weight (ratio of 1) occurs ~4<sup>th</sup> week of August, shortly after veraison complete
- Brix readings at ratio 1 = 15-17
- 1998 Lag Phase Heat Units = 1205-1620





#### Lag Phase Dates & Heat Units

- Dates & HU's calculated for beginning of Lag Phase
- Dates expressed in Julian days, 200 = July 19th
- Lag Phase onset dates do not vary much, for either year or variety, average July 20 -24
- Lag Phase starts 45-50 days after bloom
- Lag Phase Heat Units do vary, especially for cool seasons
- Lag Phase occurs at about 50% of season's total HU's





### **Commercial Crop estimating**

- Sample blocks between early July and July 23
- Sample 'typical' vines in each block on grid
- Harvest vines, record clusters/vine and total cluster weight
- Calculate yield using cluster 'growth factor' (assume 2 at lag phase) to calculate final cluster weight
- Communicate thinning recommendations to growers prior to July 21 based on each block's 'target' yield

## Crop Estimation Using Growth Ratios Outside Lag Phase

- If sample one to three weeks before Lag Phase, growth ratios are 2.5 to 4
- With experience, growth curves in this period are quite predictable
- Can sample post Lag Phase using ratios of 1 to 2 (useful for post-thinning yield verification)
- Veraison ratio is 1.2 to 1.4



#### FIGURE 8 CABERNET SAUVIGNON RATIO POINTS



## Cluster Growth Factor (Ratio) Summary

- Early July = 4-6
- 2nd week July (pea size) = 3-4
- 3<sup>rd</sup> week July = 2-3
- 4th week July (Lag Phase) = 2
- $1^{st}$  week August = 1.5-2
- 2st week August (Veraison) = 1.2-1.40
- 3rd-4th week August (15-17 Brix) = 1

#### 2000 Hogue Crop Estimates Versus Actual Tons



#### 2000 Hogue Merlot Crop Estimates Versus Actual Tons – Individual Blocks



### Conclusions

- Grape clusters express double sigmoid growth pattern
- Yakima Valley Lag Phase occurs between 7/16-8/6, ~50 days post-bloom
- Lag Phase lasts about 7 days with overlap between varieties
- Lag Phase occurs at ~50% final cluster weight
- Growth ratios outside Lag Phase are predictable and useful for extending crop estimation time
- Lag Phase yearly HU's variable, but occur at about 50% of total HU's.



Questions?