



Crop Estimating in Vineyards

Many growers in Eastern vineyards do not perform this essential annual chore. Before you even make an estimate, sit down and figure out why you are estimating and what your objectives are for the vineyard and wine. Crop adjustment, along with canopy management, are two of the most important viticulture practices growers can use during the current growing season to influence wine quality. For that reason make sure you include the wine maker any decisions regarding crop levels For this paper, I am assuming that our goal is grow the highest quality grapes possible.

The method of choice for most novice growers is to guess crop size. This is not a satisfactory method because it relies more on luck than skill to achieve an accurate result. Gazing at clusters from the tractor seat while spraying is not a crop estimation method. Instead, a statistics-based system is the best way to gauge crop size. Later, after many years of experience, a grower may be able to estimate crop visually, but even experience has its lapses. There is too much at stake financially and in wine quality to suffer a lapse.

Crop estimates are important for a variety of reasons, both to the vintner and the grower. Growers are concerned with producing high quality fruit so that they can get the highest price possible for their grapes. Practical considerations influenced by crop load include harvest costs and logistics, such as trucking, picking payroll and timing of the harvest. Crop load can also affect vine health. Overcropping a vine has many well documented negative impacts on fruit and vine quality including reduced and delayed fruit ripening, potential vine stress that may lead to increased susceptibility to winter injury, disease problems especially late season rots and other significant problems. Undercropping can also affect wine quality as well as cheat you of valuable revenue.

Wineries need to know how many grapes they will be expected to process in a vintage. This affects their logistics, from tank and barrel space to scheduling of grapes. It also impacts their finances – both in terms of the amount of grapes they expect to pay for, and the amount of wine they will produce and sell. Growers need to be sensitive to these winery issues.

For each block of grapes in the vineyard, the grower should have an idea of a target yield based on vineyard performance and the desired wine style and price point. The wine maker must be intimately involved in these decisions. Setting target yields may be difficult in young vineyards, but as the vines mature, it is possible to predict the crop load the vines will ripen. We all dream of a vineyard with consistent yields from year to year, but in fact, this is rarely the case. In any given year, many factors can affect yields. These include poor

weather at set, nutrient imbalances, disease, birds, deer, poor thinning quality and many more, both within and outside of our control. As growers, we strive to achieve a crop load, in the framework of a particular season that will reflect our quality goals.

The timing of crop estimates is a much debated issue. The question is, when is the best time to thin a crop if it is too heavy? In Oregon, where I grew grapes for 16 years, we performed lag phase estimates and thinned about halfway between bloom and veraison. Many people are doing estimates and thinning earlier – right after fruit set – believing that this produces riper and more intense fruit. The French argue that this just causes berry size to increase. I will adhere to the lag phase thinning formula, if only because it was successful for me and is the method I am most familiar with. You may wish to experiment with timing in your own vineyard.

Lag phase is that period in a berry's development when it takes a bit of a rest. After fruit set, cell division is responsible for the berry's increase in size. About 50 days after first bloom occurs, the berries enter a quiescent phase for about 10 days, before they begin their final push into veraison and on to final size and ripeness. Lag phase is indicated by a hardening of the seed coat of the grape. At this moment, a pocket knife blade will encounter true resistance to cutting through the seed. It was determined by Dr. Porter Lombard, a viticulturist at Oregon State University, that at this point in time, the berry has achieved approximately half its final harvest weight. Since crop estimates are all about predicting weights, this fact is both consistent and measurable, and it becomes an invaluable tool for estimating harvest yields. Take your cluster samples at 90% seed hardening.

Doing crop estimates is hard and tedious work which is probably why so few growers do it. But the information it provides is valuable and it's a chance to get into your vines and get to know them very well two times during the growing season. It is necessary to get a count of the average number of clusters on each vine. This can be done as soon as the flower clusters on a shoot appear. I preferred to wait until after set, at which time I could see if the clusters were affected by early bunch stem necrosis or any other problem. Reliable cluster counts are vital to crop estimate accuracy. Do not count second crop.

No commercial grower is going to sample each vine. Therefore, we must adhere to certain principles of statistical analysis that will enhance accuracy. Sampling is all about reducing the amount of error in the sample, which calls for consistency and accuracy. It is also important to achieve a random sample. Fortunately, we have the ideal crop for random sample. Because it is laid out on a grid system, we can sample according to a prearranged pattern that will remove any personal bias from our method. Sample as large a segment of the population as you can tolerate. If you have a small vineyard of just a few hundred vines, you will want to sample about 25% of the vineyard. As vineyard size increases, your sampling population will decrease. For practical purposes, I will say that I tried to sample 2% of a five acre block of vines. To reduce sampling error, may I suggest that you always have the same person do the data collection, and that the same grid pattern be used. Margins of error are small. A few grams here, a couple of missing vines there – they all add up to sampling error and of your calculations will balloon to tons per acre off the mark. Be meticulous.

Sampling clusters can be done either by stripping crop from an entire vine, or randomly removing clusters from numerous vines. This is called destructive sampling for obvious reasons. Count the clusters, put them in a container, zero out the scale and get the average weight of each cluster.

Information you need for an accurate crop estimate include:

1. Vines per acre
2. Acres in a block or field
3. Average clusters per vine
4. Average cluster weights
5. Multiplier
6. Target yield in tons per acre or pounds per vine

Note: Knowing the number of vines per acre is critical to an accurate estimate. If there are many vines missing in your field, it will affect your accuracy. Please be sure to account for this variation.

The multiplier is important to accuracy. The number generally used at lag phase is two. However, this can vary according to the season, site, variety, clone and other factors. The best thing to do is to start with two and make adjustments over time, based on your experience with each variety and vineyard section. At the Hogue Cellars in Washington, they have developed multipliers for specific phenological stages of berry development.

The math is easy: Clusters per vine x Lag Phase Cluster Weight x Multiplier = Average Harvest Cluster Weight per Vine (AHCW)

$AHCW \times \text{Vines per Acre} / 2000 = \text{Tons per acre}$

Once you have your predicted tons per acre, subtract your target tons per acre to get the amount of fruit per acre that must be thinned (TAT). To get to clusters per vine...

$(TAT \times 2000) / \text{vines per acre} = \text{Pounds per vine (PV)}$, $PV / \text{Average Harvest Cluster Weight} = \text{Number of Clusters per Vine to be Thinned}$.

This example is in pounds. Be sure to convert all your units correctly throughout these calculations.

Now that you have your tons per acre, or pounds per vine, you can decide if you want to reduce the crop or add more to the vines. I suggest you consult with the wine makers at this point. Adding crop to the vines is quite complicated, as it involves a hot glue gun, long extension cords and many trips to the produce section of your grocery store. For safe use of hot glue guns, please check MarthaStewart.com for correct use of hot glue guns.

Thinning is a very subjective exercise. Thinning with accuracy may be more a matter of luck than skill, but you will get better with experience. After you have figured out how many clusters per vine you want to eliminate, remove the apical cluster on a shoot and an equal number of clusters on each side of the vine. Judgment is involved – vigorous vines may require less thinning, weak vines more crop removal. It's hard to instruct other to do this, especially if a language barrier is involved. In my first years of doing this, we never got close to the right crop level, our harvest weights were always too high. I figured out that our crew was reluctant to cut grapes off because that was literally their money at harvest time. We all have a sense of how a proper crop load looks when it is hanging on a vine. Follow your crew closely and look not only at the fruit on the vine but also at the number and size of the clusters on the ground.

Important: Follow up your crop estimates with accurate harvest estimates to confirm your accuracy. I always tried to achieve +/- 5%, but I have often been as close as 2% using the lag phase method. But I have been off by as much as 50%. It's not a perfect system, no matter how accurate your sampling is. As you get closer to harvest, many variables may interfere with you accuracy. Dry weather will dehydrate berries, rain will enlarge them, birds, deer, and disease will all affect crop levels. This is not an exact science, but each grower should attempt to reduce the variability as much as possible and try to be accurate. After 60-70 years of doing this, you will be able to stand back, look at your vines and say, "Looks like 3.134 tons per acre to me." And, you may be right on the money.

Reference resources:

1. *Predicting Yields in Oregon Vineyards* by Steve Price in the May/June 1988 issue of *Practical Winery* will give a detailed description of this method of crop estimating.

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