

Datalogging harvest snips make easy work of cluster counting

Mark C. Battany
 Viticulture/Soils Farm Advisor
 San Luis Obispo & Santa Barbara Counties

University of California Cooperative Extension
 2156 Sierra Way, Suite C; San Luis Obispo, CA 93401 USA
 mcbattany@ucdavis.edu

Abstract

The number of grape clusters per vine or per vineyard block is one of the most fundamental parameters used to predict, adjust, and evaluate crop yields. However, the common methods for counting clusters, either in one's head or with a manual hand counter, are generally regarded as being inefficient and very often inaccurate, particularly when the individual performing the task is fatigued or distracted. To improve both the efficiency and accuracy in making field cluster counts, datalogging harvest snips were developed which automatically record each open/close cycle of the snips, and hence the number of clusters harvested by an individual using the snips. The devices consist of a standard pair of harvest snips, with a magnetically-activated reed switch and miniature datalogger attached to one handle, and a magnet attached to the opposite handle; each open/close cycle of the snips is recorded as a unique time event on the datalogger. Ten identical devices were then assembled for harvesting three large winegrape field trials in the fall of 2007. Harvests were conducted by two different commercial labor crews, which were both trained beforehand in the proper use of the snips. This produced comprehensive records of the total number of clusters harvested in each individual research plot, acquired with very little additional effort beyond tabulating the output of the dataloggers later that same day. These types of devices could be very useful in both research and commercial vineyard activities for acquiring accurate and reliable cluster count information with relatively little effort.



Figure 1. The datalogging harvest snips consist of a standard pair of Bahco® snips, outfitted with an Onset® Pendant™ Event datalogger and a magnetically-operated reed switch. The total materials cost per unit was about \$110.

Introduction

The manual counting of clusters is not a very interesting or stimulating task for most people, making it a challenge to acquire trustworthy data. This project sought to improve the efficiency and accuracy of cluster counting by taking advantage of an activity which is already taking place with each cluster at harvest, namely the deliberate act of cutting the individual cluster free from the vine with a pair of hand-held harvest snips. By attaching an automated counting mechanism to a pair of snips, one should in theory be able to count each individual operation (opening/closing cycle) of the snips, and therefore the number of clusters harvested by an individual over time.

Testing of the first prototypes of the datalogging harvest snips in the summer of 2007 indicated that the devices would reliably record all cycling of the snips, provided that 1) the snips were opened at least 0.5 cm for each cut, measured at the tips of the cutting blades, and 2) that the time between cuts was not less than one second. Neither of these limitations is of significant concern during a normal hand-harvest operation.

Of much more concern is that the inadvertent cycling of the snips by the operator, e.g. using the snips to cut away shoots, or snipping purposelessly in the air, can lead to errors in the cluster count. Therefore the training of the crews in the proper use of the snips was deemed to be very important in order to gather accurate data. Crews were instructed to follow the fundamental rule of "one cut, one cluster" and reminded to never cycle the snips unless they were actually picking a cluster. Because "phantom" cluster counts can be generated easily by a worker with an incentive to do so, it is probably not prudent to use such devices to gauge worker performance.



Figure 2. The number of workers using the snips ranged from 4 to 10 per research trial harvest. Feedback from the crews indicated that the additional bulk of the dataloggers did not prove to be a hindrance.

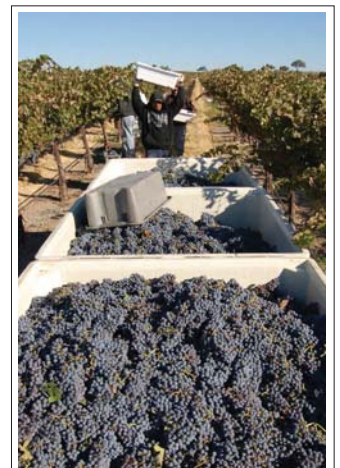


Figure 3. As the recorded data values only tell us *when* each cluster was harvested, it was important that the person overseeing the harvest keep track of *where* the crew was working during each time period.

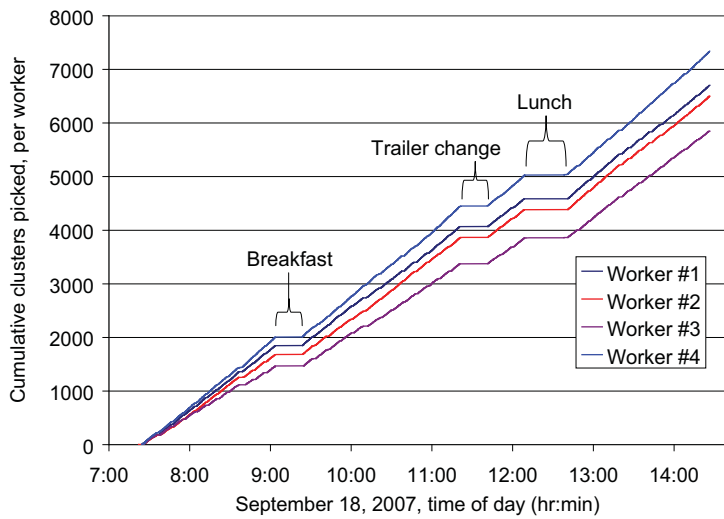


Figure 4. The cumulative number of clusters harvested at a large Pinot Noir rootstock trial in the Edna Valley (1200 vines, 40 plots). Each line shows the cumulative harvest of one worker. The three “flat spots” in the cumulative counts are from the pauses in harvest indicated in the figure.

Table 1. The average number of clusters per vine for each Pinot Noir rootstock treatment, as determined by the harvest snip data, and the average cluster weight, calculated from the plot yield and cluster number. In previous years there was no practical way to gather this type of data at the site, given the large size of the trial and the additional labor required to do the counting.

Average clusters per vine		Average cluster weight	
Rootstock	Number clusters/vine	Rootstock	Cluster weight (lbs)
110R	24.2 a	5C	0.283 a
101-14	23.2 ab	1616	0.273 ab
1103P	22.9 ab	110R	0.262 ab
44-53	22.8 ab	1103P	0.257 ab
5C	22.1 ab	44-53	0.255 ab
St. George	20.9 ab	Freedom	0.255 ab
1616	20.6 ab	101-14	0.234 ab
Freedom	19.7 b	St. George	0.225 b
<i>P</i> =	0.0171	<i>P</i> =	0.039

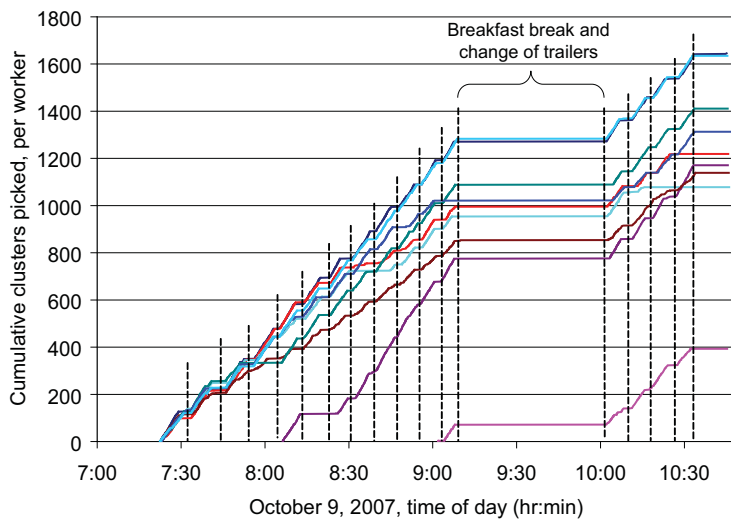


Figure 5. The cumulative number of clusters harvested by nine workers at a smaller Cabernet Sauvignon irrigation trial (224 vines, 16 plots); each colored line represents the cumulative number of clusters harvested by one worker. The vertical dashed lines indicate the time points when the crew moved from one plot to the next. Note that two workers arrived later in the morning.



Figure 6. In order to assign each count to the corresponding plot or block when multiple areas are harvested in rapid sequence, it is necessary to record the precise time when the harvesting of one area ends and the next one begins. A separate datalogger with a push-button switch records this time precisely. Because this datalogger is programmed with the same computer as the harvest snips, all devices have the exact same clock setting.



Figure 7. Another design uses an electronic counter with a numeric LCD screen; this device only tallies the total number of clusters harvested. The user resets the count to zero as needed with a button. The total materials cost per device is about \$20.

Conclusions

The datalogging harvest snips have performed as desired, and have greatly reduced the labor required to make accurate cluster counts. By counting all of the harvested clusters in large plots, the cluster count estimates are likely to be more accurate than estimates made from smaller sub-samples as is typically done. The devices appear to have useful applications in field research trials, and may also prove to be quite useful in commercial vineyard or tree fruit management, particularly for crop estimation tasks. Patents are pending for both versions of the snips.

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