LAKE ERIE REGIONAL GRAPE PROGRAM
Vineyard Notes

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1. In-season on-the-go canopy sensing

In 2013 the research and extension group at CLEREL continued to work on the application of commercially available on-the-go canopy sensing systems in commercial vineyards. As a result there were over 1200 unique acres sensed in the Lake Erie Region with ~300 acres of this sensed at multiple stages during the year. There were three sensors available this year for deployment, with one system (a dual CropCircle sensor) mounted on CLEREL equipment (an all terrain vehicle) and two other systems (a Greenseeker sensor and a CropCircle sensor) available for grower use. These ‘grower available’ systems were mounted on a variety of vineyard equipment (tractors, sprayers, ATVs) with the help of CLEREL staff, to ensure correct mounting (Figure AA). With a little bit of operator training, they were then run and operated by the growers. Over half the acreage mapped in 2013 was from data collected by growers, and this was usually collected during another vineyard operation (spraying, inter-row seeding etc.). Grower data was collected across the belt from Harborcreek in PA to Lewiston in Niagara County, NY. The temporal (time series) data were collected on a 200 ac commercial farm (during spray applications from bud break to 40 days after bloom), at the Cornell Fredonia and Portland Laboratory vineyards (either weekly, bi-weekly or monthly dependant on the blocks) and at the vineyard blocks associated with the 9-sites study (30 days after bloom and veraison).

In addition to the work in the Lake Erie Region, CLEREL staff in 2013 supported the utilization of canopy sensors by early adopters in the Finger Lakes region, NY and the San Joaquin valley in California.

The objective of this work is to identify the best time (stage of growth) and orientation (sensor placement) to obtain information that relates to production, and principally to be able to spatially estimate (map) vine size. It is hoped that once pruning weights have been collected in 2013/14, this data can again be transformed from a relative sensor response into an actual vine size (mass per vine) value. The canopy data was also used to assist with stratification of the spatial brix sampling and the sampling sites for the mid-season crop estimation.

![Figure AA: Left – examples of the CropCircle canopy sensor mounted on two different pieces of farm machinery to obtain the correct orientation and position for mid-season canopy sensing. Right – an example of a vigor map displayed in Google Earth made from data collected by a grower during spraying operations (Whites – Brown = lower vigor; Greens – Orange = higher vigor)](image)

2. Calibration and validation of the canopy sensor data to vine size.

During the 2012/13 winter (off-season) there were over 600 geo-referenced pruning weight measurements (one measurement = one panel length in a vineyard or 3 vines) taken off-site at commercial vineyards. A protocol was developed and refined over the pruning season (Figure BB) to try to maximize information gained while minimizing the effort required to collect the data. To achieve this, sampling schemes were based on a stratification
of the 2012 in-season canopy sensor data. Approximately half the samples collected were taken by growers (predominantly 2 growers) with the other half collected by CLEREL technical staff. The pruning weights were strongly correlated to the canopy sensor data allowing the canopy data to be transformed into pruning weight maps.

The collection of pruning weights associated with the 2013 growing season has begun but is still in process. This year at least 7 commercial growers are engaged in on-farm data collection with sample sites again selected based on information from the within-season canopy sensing. CLEREL technical staff will also continue to collect pruning weight data on our vineyards and at the 9-sites vineyards.

As well as providing a means to relate (calibrate and validate) the canopy sensor response to pruning weights, this data will also provide a comprehensive survey of the variability of vine size (pruning weight) at a block, vineyard and regional scale.

**Post-season Canopy Size measurement**

![Image of canopy sensor data]

**Protocol for growers to validate sensor data.**
- Simplified maps, target a few rows,
- Panel sampling

Figure BB: The original canopy vigor map (Right) is simplified into zones of low, medium and high relative vigor (Center map). Rows that cross multiple vigor zones are selected and target panels (dots) identified. Growers navigate to these areas and take a single pruning weight measurements from an entire panel (usually 3 vines). These data are georeferenced and related to the canopy vigor data to form a regression equation to transform the canopy vigor map into a pruning weight map (bottom Left).

### 3. Yield monitoring at harvest in Lake Erie

Following the successful deployment of the grape yield monitor in 2012 on the CLEREL harvester, two more yield monitors were installed in July 2013 on commercial harvesters in the Lake Erie Region. The three yield monitors were run for the entire harvest with no operational issues (for the yield sensor) beyond some initial ‘teething’ problems on correct sensor maintenance. Some problems were encountered with data handling that can be linked to either operator error or minor flaws in the data logging software. However, these issues were minor in nature and did not generally impact data collection or processing.

The yield sensor was evaluated for precision and accuracy by CLEREL. For a given day, the response from the yield sensor was very precise (generally $r^2 > 0.95$ for repeated measurements); however from day-to-day there
was some drift in the yield sensor. This temporal drift may be due to differences in daily harvester operation, maintenance (cleaning), sensor maintenance and zeroing. The sensor (without daily correction with known crush weights) was within +/-10% of the delivered (crush) weight. However, the relative spatial error in maps is almost certainly less than this and can be further improved by correcting the daily sensor output to the delivered weight (Figure CC).

It is expected that several more yield monitors will be installed next year, with growers already expressing interest for 2014.

Figure CC: Results of comparing the sensor response to the actual weighted mass of grapes. Left - results from multiple sub-bin plots harvested as part of an experiment on the same day in 2012 (dots) and 2013 (triangles). These data were corrected against the daily delivered crush weight. Right – comparison of uncorrected sensor output vs. crush weight for delivered truck loads in 2012 (squares) and 2013 (dots).

4. Yield monitoring during thinning

The CLEREL yield monitor (2012 installation) and the first 2013 yield monitor installation were done in time to operate the yield sensor during mid-season crop thinning operations. Evaluation of the precision of the yield monitor when picking low masses of unripe fruit were undertaken by CLEREL. These results demonstrated that the sensor was able to correctly sense yield at this stage, although a different calibration coefficient mid-season was needed (relative to that used at harvest) (Figure DDa).

Operation of the yield monitor during crop thinning provides spatial information on the amount of fruit being removed at each location in the vineyard. Yield is known to vary, and despite the harvester parameters being fixed during thinning operations, the amount of fruit thinned at each location in the vineyard was also shown to be variable. Work is on-going to relate the thinned yield map to harvest yield maps and vine vigor maps to better understand how crop thinning varies spatially (and the drivers of this variation) (Figure DDb). Interrogating a thinned and final yield map (ideally with a brix and pruning weight map as well) should provide information on the efficacy of thinning (from a production and fiscal perspective) and help with future thinning decisions.
Figure DDa: Left – Plot of the fit between the sensor output (with the harvest calibration) and scales from crop estimation and yield thinning measurements in July 2013. The fit deviates from the 1:1 line indicating that a different calibration coefficient is needed mid-season but the fit is strong indicating that this can be easily achieved. Right – images showing the hard unripe green concord berries being collected (top) and being weighed (bottom).

Figure DDb: The thinned yield map (July 2013 – top left) and final harvest yield map (October 2013 – bottom left) from the yield monitor for a block of Concord grapes at Portland, NY. These two maps are combined to show the total fruit load map (before thinning) (top right). Also shown are the canopy vigor maps from the canopy sensor late in 2012 and early in 2013 (red is relatively low vigor; blue is relatively high vigor). There are distinct differences between the thinned and harvested maps and these differences are also apparent in a comparison of the late 2012 and early 2013 canopy vigor.
5. Crop estimation using canopy and yield sensors.

Crop estimation is a key tool for vine and production management, but is one of the more difficult and subjective measurements that is made in viticulture. Accurate crop estimation is particularly important in years where fruit set is higher than desired and thinning is required. Without an accurate estimation of the fruit load, a correct thinning level cannot be determined, leading to either a loss of production (profit) from over thinning or maturity problems (unripen grapes) from insufficient thinning. Crop estimation was undertaken this year using the yield monitor and early season canopy sensor data. The intent was to try to incorporate these sensing systems into the crop estimation process to improve the accuracy of the estimated yield and to minimize the cost and time associated with crop estimation.

Our studies showed that the yield monitor could be easily calibrated to accurately collect yield information mid-season and this information is then automatically georeferenced. This means that once the sensor is calibrated, the collection of the information can be done by a single person – the harvester operator. The georeferencing means that site-specific information as well as a vineyard total can be gathered.

Furthermore, by using the early season imagery to stratify the crop estimation samples into areas of high, medium and low canopy vigor, an improved estimation was achieved compared with a random selection of the same number of points. For a 30 ac vineyard the estimated yield (from 30 samples) mid-season was 12.2 tons/ac. Randomly sampling at a lower rate (6 sites that approximates the current grower approach) produced a mean yield estimation of 11.4 tons/ac (from 100 possible iterations). Incorporating the sensor information (canopy sensor and yield monitor) into the process produced a more accurate mean estimate of 12.4 tons/ac (derived from 6 stratified sites iterated 100 times) and with considerably less labor. By having georeferenced data, the fruit load information could also be regressed against the canopy vigor (or potentially any other spatially available data e.g. soil maps or previous yield maps) and used to transform the early season vigor maps (or other layers) into a predicted yield map mid-season (Figure EE).

6. Spatial brix sampling

During the period from veraison to harvest a stratified sampling for brix was done at most of the 9-sites vineyards, on several blocks at the CLEREL Portland vineyard and on several commercial vineyards (where growers had undertaken in-season canopy sensing). Stratification was based on the July/August canopy sensing. The intent was to improve our understanding of the spatial variation in brix within fields and to see if there was a relationship between brix and vine size (assuming that vine size is proportional to yield). In total there were 340 brix samples taken across the production fields. Samples were taken in the field and processed in the lab (brix and berry weight). Results are still being analysed.

A more spatially intensive survey of the variability in brix in a commercial vineyard was also performed. Measurements were taken at 214 sites using a hand-held refractometer (and GPS for geo-referencing). These data were used to make an at-harvest map (Figure FFa) of brix. The map shows that there are strong spatial patterns in brix (maturity) in the field with a range of ~ 2° brix. This may have implications for differential harvesting approaches, especially in years where ripening (maturity) is problematic. The brix (maturity) map is also an important layer in understanding spatial crop load mapping.

In addition to the manual sampling, a prototype on-harvester brix monitor was also installed and run during the harvest on a commercial harvester (this was not in conjunction with the yield monitor). This system was built from on-the-shelf components, including an in-line refractometer, and measured the soluble solid content of the free run juice from the conveyor belts within the harvester. This prototype sensing system showed broad changes and trends in brix during daily harvest operations (Figure FFb), with a reasonable correlation between the sensor measurements and the measured brix at the crush. The sampling system however was not sensitive enough to
collect ‘site-specific’ data suitable for mapping purposes. The main objective this year was to run the system and gain further insight into how to construct a more responsive sample collection system and the limitations associated with the use of off-the-shelf in-line refractometers in this environment. This knowledge will be used in coming seasons to modify and redevelop an on-harvester brix sensor.

Figure EE: Left – Two early season vigor maps (Pre and Post Blom) compressed into a relative vigor maps (3 zones) that was used to select crop estimation points (dots) in areas of low, medium and high vigor (bottom left). Right – The predicted yield map derived from the early season canopy sensing and stratified crop estimation data (top right) and the actual harvest map (bottom right). This field was thinned after crop estimation so the final yield is lower than the predicted yield, but there is a strong similarity in the spatial patterns between the predicted and actual yield maps.
Figure FFa: A brix map of commercial vineyard derived from 214 point measurements immediately prior to harvest. This is the same field (slightly truncated) to that shown in Figure EE.

Figure FFb: Left – the prototype brix monitor mounted on-harvester and being tested prior to use. Right – output from the sensor (in mA that relates to brix) that shows the variation and changes in brix over the course of 3 hours of harvesting.
Educational Programming
Tim Weigle, Andy Muza, Kevin Martin, Terry Bates, Rhiann Jakubowski and James Taylor

The Lake Erie Regional grape Program Extension team organized 29 meetings during 2013 with over 932 attendees. Pesticide recertification credits were obtained for both New York and Pennsylvania for 25 of the meetings resulting in the opportunity to receive 27 NYS DEC recertification credits and/or 54 PDA credits, including the highly prized core credits - 6 (NY) and 12 (PA).

State Cooperative Agricultural Pest Survey (CAPS)
Tim Weigle, Alice Wise (CCE Suffolk County,) Hans Walter Peterson (Finger Lakes) and Steve Hoying (Hudson Valley Lab).

For the third straight year grapes were selected for inclusion in the State Cooperative Agricultural Pest Survey. The purpose of this survey is to protect New York State’s ability to freely export agricultural commodities. By trapping for potential invasive species that have been found in other areas of the United States, or that have the potential to make their way into New York from foreign soils, we compile the negative data necessary to ensure that we are not shipping a targeted invasive species with a commodity from a specific region. The CAPS survey is conducted in conjunction with NYS Ag & Markets, the NYS IPM Program and Cornell Cooperative Extension grape programs in the main growing regions of New York State: Lake Erie, Finger Lakes, Long Island and the Hudson Valley. The four target moths included in the survey this year included; European Grapevine Moth, European Grape Berry Moth, Summer Fruit Tortrix and the Egyptian Cottonworm. 360 traps were placed in 5 nurseries and 20 vineyards across the state. Prescreening of the traps showed no evidence of any of the target species.

Japanese Beetle Management using Persistent Entomopathogenic Nematodes
Greg Loeb, Elson Shields and Tony Testa, (Department of Entomology, Cornell University) and Tim Weigle

This research project is looking at the use of native entomopathogenic (insect attacking) nematodes to manage Japanese beetle populations in the sod row middles of grapes in the Lake Erie and Finger Lakes regions of New York State. A mixture of entomopathogenic nematodes, which are native to New York, have been used by Dr. Shields’ program to effectively manage Alfalfa Snout Weevil in alfalfa fields since 2007. It is thought that Japanese Beetle, another member of the white grub complex, may also fall prey to these nematodes as the larvae move up and down in the vineyard soils. Two vineyards in the Lake Erie region are involved with this project. This project has been hampered due to a limited Japanese beetle population since the start of the project. Examination of soil cores found little evidence of Japanese beetle larvae in either treated or control sections of the vineyard, and the same held true when sampling for the presence of adults and their feeding.

Testing of a Phenology Based Degree Day Model for Grape Berry Moth Management
Tim Weigle, Andy Muza, Mike Saunders and Jody Timer (Department of Entomology, Penn State), and Greg Loeb

In the last year of this multiyear project, testing of the Phenology based (wild grape bloom is used as the biofix date to start accumulation of degree days) degree-day model the Grape Berry Moth Risk Assessment protocol moved from small test plots in grower vineyards to being available for implementation across the Lake Erie grape belt. This was accomplished by having the model available on the NEWA (Network for Environment and Weather Applications) website http://newa.cornell.edu. Model results for 13 weather stations in the Lake Erie region were also distributed to Lake Erie grape growers on a weekly basis via the LERGP electronic newsletter “The Crop Update”, at Coffee Pot meetings, and at other grower meetings during the growing season. While we saw an uptick in the amount of late season grape berry moth damage in 2013, a survey conducted after the 2013 season showed that a majority of growers who used the model felt they were able to better time their insecticide applications aimed at grape berry moth which had a positive impact on their profitability.
Hopyard at CLEREL

Tim Weigle

A research/demonstration hop yard was planted in 2011 at the Cornell Lake Erie Research and Extension Laboratory (CLEREL) in Portland, NY to provide the resources needed to conduct applied IPM research projects and serve as a hand-on demonstration hopyard. The hopyard consists of both short (9 foot) and tall (18 foot) trellis heights with each containing a row of variety trials (10 different varieties) with four 18 foot rows (one variety per row) used as the production portion of the hopyard where applied research can be conducted. Weed management has been rated as one of the biggest pest management challenges by New York growers. To address this issue, a project looking at 4 methods of weed control; 1) straw mulch, 2) rotary hoe, 3) black plastic mulch and 4) pre and post emergence herbicide, was started in 2013.

In conjunction with the Chautauqua County Visitors Bureau, the Lake Erie Regional Grape Program and Steve Miller, Hops Specialist with Madison County CCE, the NYS IPM Program held the first annual Hops Production in the Lake Erie Region Conference at CLEREL on June 15, 2013. The conference was attended by 130 participants from across the Northeast who were either currently growing hops, or were looking to get into the business. Speakers from New York, Pennsylvania and Maryland provided talks on all aspects of hops production in the morning and in the afternoon the hopyard at CLEREL served as the hands-on classroom for participants.

The ability to quickly harvest a crop is another concern often voiced by those just getting into hops production. Once a hops plant, or hill, reaches maturity (often in its third year) it takes approximately 45 minutes to hand pick. A prototype small plot research harvester was designed, built and utilized during the 2013 harvest season. It’s use allowed for a quick response to a request from Dan Minner, Head Brewer at Ellicottville Brewing Company, Ellicottville, NY for 60 pounds of locally produced wet hops for his harvest ale, Hopicity. The quick turnaround time would have been difficult, if not impossible to accomplish with hand picking.

Working in cooperation with Wayne Wilcox (Plant Path), Greg Loeb (Entomology), Andrew Landers (Application Technology), Steve Miller and Mike Helms, PMEP, a Cornell Pest Management Guidelines for Hops is being developed for release in 2014.
Crop Thinning: The Results of Good Decision-Making

Luke Haggerty & Kevin Martin

As a crop load management tool, thinning certainly has its economic advantages. Crop load decisions made at pruning time involve far more guesswork and weather related assumptions, compared with crop load decisions made thirty days post-bloom. Even at that time, of course, the unknowns loom large.

Millions of dollars in crop loss, or in this case, sugar loss was avoided by the collaboration of grower, industry, Dr. Terry Bates, and Lake Erie Regional Grape Program (LERGP) extension specialists. Outreach efforts helped spread information on how to manage the extremely large 2013 Concord grape crop. The encouragement from processors and new brix standards combined with LERGP’s timely newsletters and thinning meetings, helped growers get these research-based tools they needed. The efforts behind crop thinning helped growers set record high crop yields, reach quality standards set by the processors, and maintain vine size for 2014.

Many factors aligned to create the ‘perfect storm’ that led to one of the highest yielding Concord grape crops the Lake Erie region has ever seen. Widespread frost damage in early 2012 devastated the region’s Concord crop. However, last year’s frost events were followed by a better than average growing season, leaving extremely fruitful buds going into 2013. The exceptional fruit set brought on by ideal weather conditions during the bloom period put this year’s crop load over the top. While there were expectations that vines would be over-cropped; these conditions resulted in crop load exceeding expectations.

The goal is to find a balance that maximizes yield and sugar levels for the current crop while maintaining vine health for next year’s crop. Over-cropping grape vines can result in delayed sugar accumulation and poor wood maturity. Multiple research projects conducted by Dr. Bates at the Cornell Vineyard Laboratories in Fredonia and Portland have looked at ways to achieve both high crop potential and fruit maturity. In these efforts, crop estimation and thinning tables were developed by Dr. Bates to allow growers to calculate crop size throughout the growing season that could be paired with moderate fruit thinning to match vine crop load.

Some growers have adopted the concept of crop thinning and incorporated it into their yearly production practices. Other growers typically rely on pruning to manage crop size. Even aggressive pruning was sometimes ineffective at managing the crop load this year. However, with the extremely heavy crop this year the consensus was, “something needs to be done”, and many growers turned to Dr. Bates and the LERGP extension specialists for advice. Multiple newsletters were sent out and special twilight meetings were scheduled in conjunction with National Grape Cooperative to demonstrate how to use the crop estimation and thinning tables created by Bates.

The reaction of growers, in light of the financial pressure created in 2012, was nothing short of impressive. More than half of the growers thinned a portion of acreage. Approximately 40% Concord acreage was thinned. The average grower removed between 3-4 ton per acre, and there were some that removed more than ten. Despite that, crop size was a record and average brix were in the area of 16.0 (discounting early harvest Concords). Rich Erdle, Director of Grower Relations for National Grape Cooperative, said “Results of crop thinning this year may be the best we have seen”.

Trying to illustrate the importance of thinning in July, we made some assumptions based on what we knew at the time.

• 50% probability (P) that a vineyard 4 tons above its average yield potential would ripen this year.
• 20% P it would ripen adequately for a secondary market.

• 95% P the product would ripen to at least a secondary market if 3 ton were removed

Late season sugar accumulation and significantly more thinned acreage than expected, left the secondary market with fairly high quality standards. Well over half of all growers thinned some acreage. Removing early season harvests for wine, major processors all averaged significantly above 15.0 brix, regardless of standards. In other words, ripening potential was higher than average but so were minimum standards.

Tonnage contracts were fairly inflexible this year; there was little reason not to thin to 110% - 120% of your tonnage contract. The secondary market was fairly limited, and where it did exist, quality standards remained. Looking back, those with acreage contracts averaged over 8 ton per acre. It is likely, with no thinning, that average would have been 10 tons per acre. Much of this crop, by the end of the season, would have ripened to minimum standards. Despite that, the harsh economic reality is, growers were still better off thinning.

• Conservatively, 10% - 15% of the crop would have been lost due to late harvest

• Average brix would have been lower, likely impacting profitability of Cooperatives or payment size to individual growers

• While return crop is a bit of a wild card, much of the un-thinned acreage looks bleak.

Despite the fact that October could not have gone much better, economically, growers improved their situation by 9-11 million dollars. This includes the cost growers incurred by thinning. Without thinning or with less thinning, some growers would have had slightly higher yields. Net income, however, would have been lower.

Most growers were very happy with their thinning outcome, but as thinning is not yet widely used in the grape belt, there were some mixed results. Accurate crop estimation helped, but did not eliminate struggles. Understanding variables that impact the performance of a machine harvester are particularly important. The amount of crop being removed is highly dependent on ground speed and shaker speed. Given the high value of crop, relative to low labor costs, investing time in accuracy is particularly important. Only a very few machines have cruise control, electronically adjustable shaker heads, and yield monitors. Without that technology, checking blocks and checking unique areas within blocks is essential. Unique areas include slopes and vine size variability identified by NDVI sensors.

Thinning did this industry a world of good, but technology, practice and research have not reached their limits. Continuing the efforts of growers, processors, research and extension will improve thinning results in the future. Wood maturity and vine health are two important contributors going into next year’s crop, so the complete results of the 2013 thinning efforts are yet to be seen. LERGP Farm Business Management Specialist, Kevin Martin, foresees an uptick in the 2014 revenue and possibly beyond, because of the future vine health benefits that go along with thinning over-cropped vineyards.
Materials and Methods
A foliar nutrient spray trial was established in an own rooted and well maintained Concord vineyard south of Route 20 in Portland, NY (Mobilia vineyard – Chenango gravelly-loam soil). The vineyard was observed to be in a healthy state and showed no signs of nutrient deficiencies. The four treatments consisted of an unsprayed check, a high H, and NPK application, and a combination of high K and NPK mixture application. Sprays were applied by the grower on whole rows. Spray treatments were in six-row plots except for the unsprayed control which was a three-row plot.

Figure 1: Aerial image of vineyard location with NDVI overlay.

Data collection and Analysis:
An NDVI reflectance sensor was used to map relative canopy vigor across the vineyard. Using NDVI sensor data, four vigor zones were identified. Thirty-two sample locations (8/treatment) were stratified across the four vigor zones and data was collected from sample panels (3 vines/panel) at each sample location. Petioles were collected near veraison for tissue nutrient analysis. Fruit was collected at four time points between veraison and harvest to measure berry weight and juice soluble solids. At harvest, a yield monitor sensor was used to spatially collect fruit weight in the vineyard block. During post-processing of the spatial data, yield could be determined at each of the sample locations to match manually collected fruit data with yield information. The data was analyzed with JMP statistical software with a one-way analysis of variance of treatment grouped by vigor classification.
2013 Results

There was little numerical or statistical difference between any of the treatments in 2013. All of the vines yielded around 8.9 tons/acre except for the NPK treatment which was a little less, yielding 8.4 tons/acre. There was also little difference in the accumulation of juice soluble solids from veraison to harvest (Table 1 and Fig 2). Final berry weight ranged from 3.1-3.3 g/berry which was consistent with surrounding vineyards. With respect to tissue analysis, treatments which received the NPK spray tended to have higher tissue concentrations of N and P. Interestingly, tissue K was lowest in the High K spray treatment – but it was not at deficient levels.

Table 1: 2013 Yield, Brix, and Berry Weight

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Table 2: Tissue Nutrient Analysis

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Figure 2: Juice soluble solids accumulation from veraison to harvest
Fertilizer Prices

Kevin Martin

Relative to prior years, farmers timing fertilizer prices as a tax management strategy will find significantly lower prices than prior years. While some fertilizer purchases may already have been made, growers are likely to continue timing purchases and deliveries throughout the winter months. While there is risk involved in trying to time the fertilizer market, there is more risk in ignoring the markets and buying these commodities on demand. This article concentrates on prices at major markets, typically ports. Retail mark ups are generally reflected in USDA data, which is shown in the graph below. Likely due to the government shutdown, data for the last year has not been made available.

Nitrogen

Urea prices continue to fall, though retail prices across major markets vary widely. Price at the Gulf is $331, a 25% decline since last January. That should place retail prices below $500. It should be noted that recent demand for Urea has surged. Late fall prices were as low as $400 retail. Corn prices have now stabilized, as markets have not yet begun to heavily speculate on the 2014 crop.

Potash

Competition is back, low prices and meager profits helped to break up potash cartels in Belarus. No longer worth its weight in gold, the slow trend back toward reality continues. Potash prices have continued to fall from their extreme highs of $900 per ton. $400 was thought to be a fundamental floor in the market, prices stabilized at that level. Prices have slowly and successfully tested $400 and now stand at $370. This puts the retail prices under $500. With the large crops last year, buy potash. Some growers have been reluctant to make adequate investments in soil health. If anything less than $500 retail still seems expensive, I urge you to forget everything you knew about fertilizer prices before 2002. Like $80 oil, the world now considers $370 to be the relative bottom of the potash market, at least for the foreseeable future.

Lime

Not much to say here. Like always, lime is extremely inexpensive. Trucking lime typically costs at least three times as much as the lime itself. Growers cannot afford to mismanage lime applications. Too much or too little decreases the efficiency of the aforementioned and relatively extremely expensive soil nutrients.

![Avg U.S. Farm Prices of Fertilizers](image)
Penn State Research Viticulturist:
Andy Muza

It is a great pleasure to announce the hiring of Dr. Michela Centinari as the new research viticulturist at Penn State. She will be joining the Department of Plant Science on January 15, 2014, and based in Tyson Hall at University Park. Her appointment is 75% research and 25% extension. Dr. Centinari received her education in the Department of Fruit Tree and Woody Plant Sciences at the University of Bologna, Italy, where she studied several aspects of grape management practices including cluster thinning, semi-minimal pruning and pre-flower leaf removal on vine physiology and grape quality. She also evaluated vineyard floor management practices and studied vineyard water use. Dr. Centinari is completing a three-year post-doctoral study at the New York State Agricultural Experiment Station in Geneva, which is affiliated with Cornell University. In New York she studied the effect of grapevine training systems and environmental factors on cover crop water use and evaluated the spatial interaction between grapevine and cover crop roots. She also participated in experiments to determine the effects of water stress and crop load on potted Chardonnay whole canopy photosynthesis and studied the shoot autonomy theory on Concord vines. The hiring of Dr. Centinari is the result of a partnership between the Penn State College of Agricultural Sciences and the Pennsylvania Wine Marketing and Research Program. I would like to thank three PWMRP research chairs, Ed Jansen, Carl Helrich and Brad Knapp for their tireless efforts to make this position possible. ASEV members can access a research note in which Dr. Centinari is the lead author titled Cover Crop Water Use in Relation to Vineyard Floor Management (AJEV 64:4, 2013). It investigates the effects of mowing on cover crop transpiration and comparing evapotranspiration of cover crops and soils.

GIS Mapping Project
Rhiann Jakubowski, Tim Weigle, Terry Bates, Kevin Martin

During the 2013 growing season, the GIS Mapping Project gained several new participants. Most of these growers were part of the National Grape Cooperative initiative to have their members create individualized GIS maps of both their contracted and non-contracted acreage. The production of these maps remains free of charge for all members of the Lake Erie Regional Grape Program.

These maps have become the backbone for implementation of current research-based information, as well as cutting edge tools such as NDVI sensing, canopy mapping, and on-the-fly yield monitoring. National Grape Cooperative (better known for its marketing arm, Welch’s) has teamed up with the Lake Erie Regional Grape Program by providing funding for a half time position to provide GIS maps for all its members. Currently, 204 grape growers in the Lake Erie region (150 National Grape Growers) have taken advantage of the maps offered by the Lake Erie Regional Grape Program. As a result, growers representing 43% of the 31,727 grape acres in the Lake Erie grape belt have access to GIS acreage maps and can make better informed decisions on a block-by-block basis. Growers have found these maps particularly helpful when calculating spray and fertilizer inputs for each block, rather than estimating their total acreage. Some growers have also benefited by having a more specific acreage calculation when their harvest costs are associated with acreage rather than tonnage.

Special funding for this project is provided by the Northeast Center for Risk Management Education and National Grape Cooperative.
Efficacy testing of new fungicides. Each year we conduct fungicide trials at the Lake Erie Regional Grape Research and Extension Center (North East) to determine efficacy against the major diseases of grapes. In 2013, we wrapped up three years of testing of an ‘alternative’ material called Regalia SC that is not marketed as a fungicide, but rather an inducer of the plant’s defenses against pathogens. Our results have shown that it provides modest control of powdery mildew on Concord grape, but little control of other grape diseases like downy mildew and black rot and so would probably be best positioned ‘outside’ the critical period for fruit protection (not for immediate pre-bloom and first post-bloom sprays) or to augment a synthetic program. Funding for this project was provided by Marrone Bio Innovations.

Evaluation of the Effects of Disease and Insect Management Strategies in High Brix Niagara Grape Production. Delaying harvest of Niagara grape acreage in the Region allows for increases in sugar solids and value. However, it also raises the potential for additional pest and disease problems that could lead to increased crop loss. We are wrapping up 3 years of examination of different pesticide treatment strategies for efficacy on late season fruit rots at early and late harvest. We are comparing a standard insecticide/fungicide program currently used by growers to an IPM program that stresses control of early season Phomopsis on shoots, and extends control of Phomopsis fruit rot infections that occur during the post bloom period but remain latent or dormant, until ripening. For grape berry moth control, the trial compares the risk assessment model that many growers currently rely on, to the newer degree day model (accessed on the NEWA website) to improve timing of insecticide applications against this pest. During the past 3 seasons, damage from grape berry moth and the resulting fruit rot was the greatest concern for late harvest Niagara. The degree day model generally provided better control of berry moth than the risk assessment model, though the differences in resulting fruit rots, were not always significant. However, fruit rots at harvest, mostly from Botrytis, increased with delay of harvest regardless of fungicide/insecticide program. Very little Phomopsis fruit rot was seen in the samples in any of the treatments at either harvest timing during the course of the trial. However, an early mancozeb application at 3-6” of shoot growth left shoots with less carryover inoculum the following spring, reducing the potential for economic damage by this pathogen. Field inoculation of Niagara clusters with the Phomopsis fungus shortly after bloom, resulted in losses to fruit rots during ripening and increased with delay of harvest. Bottom line: Losses to fruit rots increase with delay of harvest, but the IPM program was more effective at reducing losses than current standard pesticide program. Funding for this project was provided by the Lake Erie Regional Grape Research and Extension Program, Inc. and the NY Wine & Grape Foundation.

The development of new cultural and chemical control options for wine grape harvest rot management. Harvest fruit rot development is closely related to the compactness of fruit clusters and treatments that reduce compactness in varieties with compact clusters (Chardonnay, Pinot Gris and Noir, Riesling, Vignoles) reduce the susceptibility of those varieties to bunch rot, improve the penetration (and by extension, efficacy) of fungicides into clusters, and improve crop quality for winemaking (healthier grapes). A thorough evaluation of early (pre-bloom) leaf removal in the cluster zone in commercial and research wine grape vineyards in Pennsylvania has shown that consistent improvements in late season bunch rot control can be achieved with this practice without affecting yield or juice quality. This practice also offers potential for reducing reliance on synthetic pesticides.
without sacrificing disease control. Recent research in Italy offers the prospect of mechanizing pre-bloom leaf removal to reduce labor costs. **Funding for this project was provided by Valent BioSciences Corporation and the Pennsylvania Wine Marketing and Research Board.**

**NE-1020: Multistate Evaluation of Wine grape Varieties and Clones.** In its fifth year, this project involves 17 states and is providing valuable information regarding the viticultural characteristics and wine quality potential of a multitude of grape cultivars and clones of economic significance throughout the eastern U.S. The Pennsylvania portion of this project is headed by Dr. Rob Crassweller of the Horticulture department at Penn State. The planting at the Lake Erie Regional Grape Research and Extension Center, North East, includes 18 varieties (10 hybrids and 8 of *Vitis vinifera*) and will provide valuable information for wine grape producers in the Lake Erie region. Among the V. vinifera varieties, Gruner Veltliner, Pinot Gris, and Cabernet Franc are thriving, while Syrah and Muscat Ottonel are struggling. Malbec, which suffered severe dieback through our winters, has been removed from the trial and replaced with Dornfelder. Several Minnesota hybrids are also being evaluated and are doing well in our Lake Erie climate (not surprisingly). These varieties tend to open early in spring and mature early in late summer. Their juice is typically characterized by high brix and acid. Penn State also has a planting at the Fruit Research Lab in Biglerville PA, a region with a milder mid Atlantic climate, and one of the most significant grape growing regions within Pennsylvania and the Northeast. **Funding for this project was provided by the Pennsylvania Wine Marketing and Research Board.**

**Penn State Research Viticulturist:** It is a great pleasure to announce the hiring of Dr. Michela Centinari as the new research viticulturist at Penn State. She will be joining the Department of Plant Science on January 15, 2014, and based in Tyson Hall at University Park. Her appointment is 75% research and 25% extension. Dr. Centinari received her education in the Department of Fruit Tree and Woody Plant Sciences at the University of Bologna, Italy, where she studied several aspects of grape management practices including cluster thinning, semi-minimal pruning and pre-flower leaf removal on vine physiology and grape quality. She also evaluated vineyard floor management practices and studied vineyard water use. Dr. Centinari is completing a three-year post-doctoral study at the New York State Agricultural Experiment Station in Geneva, which is affiliated with Cornell University. In New York she studied the effect of grapevine training systems and environmental factors on cover crop water use and evaluated the spatial interaction between grapevine and cover crop roots. She also participated in experiments to determine the effects of water stress and crop load on potted Chardonnay whole canopy photosynthesis and studied the shoot autonomy theory on Concord vines. **Funding for this project was provided by the Pennsylvania Wine Marketing and Research Program.** I would like to thank three PWMRP research chairs, Ed Jansen, Carl Helrich and Brad Knapp for their tireless efforts to make this position possible. ASEV members can access a research note in which Dr. Centinari is the lead author titled *Cover Crop Water Use in Relation to Vineyard Floor Management* (AJEV 64:4, 2013). It investigates the effects of mowing on cover crop transpiration and comparing evapotranspiration of cover crops and soils.
Insecticide efficacy and cost effectiveness of new and sustainable insecticides for control of the grape berry moth

The majority of insecticides applied to the vineyards of the eastern United States are targeted at the grape berry moth. Their damage causes yield loss and this damage is the leading avenue to late season bunch rots. Cost effective control of this pest is needed to avoid significant economic injury. Due to declining profitability, many growers are substituting less expensive or generic insecticides for more widely recommended insecticides. We have been testing these less expensive insecticides against the more costly insecticides to determine efficacy. If the insecticides are not effective in controlling the grape berry moth the cost effectiveness of the less expensive insecticides would be negligible. This research is on-going and results will be added to the annual Lake Erie Grape program spray recommendations. Newly released insecticide testing is also on-going to determine efficacy against grape berry moth as well as Japanese beetles and leafhoppers.

Brown Marmorated stink bug (BMSB) research

Determining the distribution and extent of invasive species is paramount to developing proper control techniques. The brown marmorated stink bug has caused significant crop damage in southeastern New York and Pennsylvania and also in the Pittsburgh, PA area starting in 2010 and continuing through 2013. This insect has also been a problem for homeowners when they enter homes to overwinter. We are exploring the most efficacious trapping methods for this invasive pest, which has included being a part of the testing of a new pheromone lure developed by USDA research. Our goal is to determine the severity of their presence in the Lake Erie Grape growing region. We have determined that although BMSB are increasing in numbers each year, they have not yet increased to the density which poses problems for grape growers. Our second goal was to determine the risk and impact of Brown Marmorated stink bugs to the Concord grape juice industry. Our work at Lake Erie Regional Grape Research and Extension Center is concentrated on the probable damage to the Concord grape crop if their numbers in this area continue to increase. In order to determine feeding injury of BMSB on Concord grape berries, adult bugs were caged onto clusters using fine-mess nylon bags. Clusters were analyzed at harvest to determine the amount of insect damage and rot. Given no other food source, at this concentration of insect, the damage to the grapes was extensive. We have also determined that they are able to survive through at least two generations fed primarily Concord grapes. Our third goal was to determine the taint to grape juice if BMSB were harvested in the grapes, specific numbers of BMSB were processed into grape juice and a panel of testers was employed to determine if a taste was detectable. Small batches of juice were hand processed with known numbers of BMSB added to the juicing process. Numbers of BMSB were increased with each batch until a taste in the raw juice could be detected by over 50% of the tasters. During year one it was established that taint was detectable at concentrations of 10 BMSB /lug in pasteurized juice and detectable at 5 BMSB/lug in raw juice. This year the food science laboratory at Penn State University is processing grape juice according to Welch’s procedures and testing the detectable taint with a panel of juice testers. Research is being done to develop a phenology model of the adult female BMSB using dissection of the reproductive system this being done in hopes of formulating a better degree-day model for this insect. This model would determine the best control times for lessening crop damage.

The spotted winged drosophila research

Spotted wing drosophila (SWD), Drosophila suzukii, is an invasive vinegar fly that was recently introduced into the United States. It was first found in California in 2008 and has since been rapidly colonizing fruit producing regions in most other states, including Pennsylvania and New York. SWD differs from other vinegar flies in that...
females can lay eggs with a serrated ovipositor that cuts into healthy and mostly immature fruit, consequently, SWD larvae can be found in fruit that is just ripening. During egg-laying, sour rot and fungal disease can also be introduced, further affecting the fruit quality. In the northeast, SWD has been most problematic on fall raspberries and blackberries, late season peaches, and grapes. We have been trapping SWD in the region since 2010 and have found that they are appearing in traps earlier each year and also in increasing in numbers. This year we have bagged SWD on Concords to determine if they are able to penetrate the skin with their ovipositor, we have also conducted choice and no-choice tests with the wine varieties common to the area to determine which, if any, these insects prefer. This research will be continued throughout next year’s season. Conclusions so far have been that SWD prefer ripe fruit, and they can definitely penetrate the Concord grape skins to deposit eggs, however, they also appear to prefer thinner skinned grape varieties to Concords.

**Improved timing of control for the grape berry moth using a degree-day model**

The grape berry moth is the most destructive insect pest in the Lake Erie grape growing region. It has three to four generations per year. Once the moth’s eggs have hatched and the larvae burrow into the berry they are protected from insecticide sprays. For these reasons, a degree-day model was developed to time the insecticide applications for each generation. During the last five years we have tested this model in small and large plot situations comparing it to the standard risk-assessment spray protocol, with very positive results. This results in improved control as well of economic savings to the growers. We have also investigated various means of determining the first flight of female moths to develop a biofix for the model. After trying a number of biofixes based on degree-days we have settled on the bloom of the wild grape. The degree-day model is now incorporated into the NEWA system and is being used by many growers for spray timings.

**Integrated Disease and Insect Management in Organic Grape Production**

Many new OMRI pesticides have been introduced in recent years. Although there is a bewildering multitude of commercially available pesticides for organic crop management, thorough testing of these products by universities is very limited and the efficacy of many of them is largely unknown with respect to grape insects and diseases. The pest management guidelines available to conventional grape growers have evolved through years of research and experience, and are essential to the sustainability of the industry. On the other hand, organic growers may have to rely on limited information sources, such as pesticide companies’ sales force, rather than research-based information and previous grower experience in organic grape production to make management decisions. We have tested many of these organic insecticides this year to determine efficacy against grape berry moth, as well as Japanese beetles and leafhoppers. We have also tested some of these insecticides in trials with conventional insecticides to determine comparable efficacy. This year we installed a SemiosBio pheromone puffer system in a five acre commercial vineyard. This newly developed system is controlled by a computer which can monitor infestations and increase output of the pheromones accordingly. In this project Copper formulations, which are the most effective organically acceptable fungicides, were tested for rain-fastness on Concord leaves.
Thank you to all of the growers who hosted Coffee Pot meetings in the 2013 growing season. Coffee Pot attendance was up this year, as the topics of conversation were a bit brighter than the prior year. We saw close to 300 attendees at meetings at various farm locations throughout the LERGP service area of Niagara, Erie, Chautuaqua and Cattaraugus counties in NY and Erie county PA. There were 22 meetings this year with highlight speakers in the months of May and June.

These meetings provide a very casual, comfortable atmosphere for LERGP staff to present current information and to address concerns of the growers. They also provide multiple opportunities for DEC credits to be obtained.

We truly appreciate the growers who have opened their barns, homes and farms to us, to allow for the continuation of these meetings. Going forward, we would like to request that you all would give some thought to hosting a coffee pot in the 2014 growing season. It is nice to be able to have new locations from year to year, so more people can be involved. If you have any questions, feel free to give Katie a call at the office at 716-792-2800 extension 201 or e-mail me at kjr45@cornell.edu.
2014 LERGP
WINTER GROWERS CONFERENCE

MARCH 20, 2014
AT SUNY FREDONIA, WILLIAMS CENTER

Full Day Conference, 8:00am-3:30pm, with morning and afternoon talks, Buffet Lunch and Trade-Show!

Agenda is being developed now, but possible topics include:

• Management Strategies for High Yield
• GIS and Sensor Technology
• GPS Sprayer Technology
• GBM
• Cover Cropping
• Grape Rootworm/Japanese Beetle

Including Discussion panels with input from local growers who have experience in each related area

THE ENTIRE EVENT WILL BE HELD IN THE WILLIAMS CENTER—NO TRAVELLING FROM ONE BUILDING TO THE NEXT ON THE ICE IN THE COLD!
LAKE ERIE REGIONAL GRAPE PROGRAM
2014 GRAPE GROWERS’ CONFERENCE REGISTRATION FORM
to be held at SUNY Fredonia Williams Center
on March 20, 2014
Deadline for registration is March 6, 2014.

Name (1st attendee) ____________________________________________ $__________

Farm Name ________________________________________________________

Address, City, State, Zip Code __________________________________________

_____________________________________                   

Phone__________________________________ E-mail_____________________________

Are you enrolled in Lake Erie Regional Grape Program (LERGP)? Yes_______ No______

REGISTRATION FEES

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<td>LERGP Member 1st attendee</td>
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Additional Attendees:

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*Please add a $25.00 late fee for each reservation received after March 6, 2014

TOTAL $________

Please make check payable to LERGP (Lake Erie Regional Grape Program) and mail to: Kate Robinson
LERGP
6592 W Main Rd
Portland NY 14769

Name ____________________________ NY DEC/PA PDA NUMBER ____________________________

Date Ck. Rec’d Amount

Call Kate at 716-792-2800 ext 201 with any questions.
Enrollment is under way!

We officially have begun the enrollment process for 2014, and it seems to be going fairly smoothly. We have noticed a few glitches due to the changes we made in process from enrolling through Chautauqua County CCE office to enrolling directly through the LERGP office. These are addressed below.

There is no option to sign up for the Grape Program on the CCE form. The small berry line is not for grapes. As previously stated, enrollees are responsible for paying the CHAUTAUQUA COUNTY BASE FEE only one time. When you enroll in the LERGP Grape Program you are already paying that fee, so please do not send an additional $25.00 to CCE.

In fact, to enroll for the LERGP Grape Program, NOTHING should be sent to the CCE Office in Jamestown! The form should be mailed directly to the LERGP office in Portland. You can obtain this form at our web-site at https://lergp.cce.cornell.edu/. Under enrollment, you have the option to print a hard copy pdf form or enroll on-line. If you opt for printing and mailing, you will notice that the address and who to make the check to are noted on the form. I am including a hard copy registration form in this newsletter for convenience to anyone who might be interested.

If you have any questions, please do not hesitate to call me at the office. I am always happy to help in any way possible. (716) 792-2800 Extension 201 or email me at mailto:kjr45@cornell.edu.

Wishing you the very happiest of Holidays!

Katie
2014 Lake Erie Regional Grape Program Enrollment

**This form is for NY Growers ONLY- PA Growers call 814-825-0900 to register**

**Fees:**

$70.00 $________ GRAPE Program - Chautauqua county landowner  
($45.00 program fee, $25.00 Chautauqua County Base Fee)

$65.00 $________ GRAPE Program - Cattaraugus, Erie, NY or Niagara  
($45.00 program fee, $20.00 County base fee)

$100.00 $________ GRAPE Program - Out of Program Region Resident

$25.00 $________ 2014 Cornell Guidelines for Grapes

$25.00 $________ Hardcopy mailing of Newsletters***

Total $________ (Please make check payable to LERGP)

I am interested in the educational work of Cornell Cooperative Extension in Niagara, Chautauqua and Cattaraugus County. Any current recorded enrollee 18 years of age and older shall have voting and nominating privileges to hold office in the Association of their local county.

( ) I am 18 years of age or older and signed______________________________________________________________

( ) New      ( ) Renewal

Farm Name:____________________________________________________

Name:_________________________________________________      Spouse’s Name: ___________________________

Address:______________________________________________   City:___________________________________________

State:_____________________________________  Zip Code____________________________________________

Home phone:____________________________________  Cell Phone :_________________________________

***Due to budget constraints, all correspondence will be conducted through e-mail. Please provide your e-mail address below. If you would like to receive hardcopies, mark the $25.00 additional fee line above and include with payment.***

EMAIL ADDRESS________________________________________________________________________

Please return form and payment to:                                       Feel free to call w/ questions:
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