NEW YORK JUICE INDUSTRY PRIORITIES
2008/2009

These are the recommendations on the key NY juice industry viticulture research priorities for funding consideration by the new Farm Bill Specialty Crop initiative. It should be noted that proposals for SCRI funding must meet the following criteria in order to receive favorable consideration:

- **Multi-state**
- **Multi-institution**
- **Trans-disciplinary (involve biological and physical scientists)**
- **Multi-crop (commodity)**
- **Strong focus on communication of deliverables to stakeholders (educational outreach)**
- **Provide solutions to the highest priority industry needs**
- **Partnerships with end-users**

The New York juice industry is undergoing a severe financial crisis due to low prices for most juice varieties. In order for NY producers to be competitive in the world marketplace they must be low-cost producers at the quality demanded by the market.

To address the need Cornell viticulture researchers have developed a Crop Load Management System for Concord grapes which make up about 80% of the production in the State. The focus of the System is on maximizing yields each year at the quality demanded by industry processors and wineries. Given the considerable variability of sites and climates the System must be flexible enough so that site, crop load, and climatic conditions can be monitored, measured, and then utilized in a decision support system to maximize yields of acceptable quality.

New York State is "blessed" with highly variable weather conditions from year to year. Since the year 2000 we have had the best (2007) and the worst (2003) growing seasons. Viticulture research conducted by the late Dr. Nelson Shaulis of Cornell showed that balanced pruning of Concord grapes at 30+10 would result in a cropping level that assured the crop would reach 15.0 ss every year regardless of the weather conditions. However, it resulted in under cropping of vines in years with good weather and a long growing season. In other words the balanced pruning system did not enable the grape producer to take advantage of higher yields in these superior, climate wise, growing seasons.

The late Dr. Robert Pool, Cornell viticulture researcher, started a process of developing the basis for predicting potential Concord yields at 1200 GDD which occurred at about 30 days after bloom. He also developed a method, utilizing a

grape harvester, to reduce crop yields in vineyards whose crop potential was predicted to be too large to properly mature.

This crop load management research has continued to be developed through the research conducted by Dr. Terry Bates. Dr. Bates has developed a chart showing crop prediction based upon the number of days from bloom in conjunction with the weight of the crop at various points from bloom to veraison. Dr. Bates has also identified that crop adjustment could actually be accomplished over a wider window of opportunity from 30 days post bloom to veraison.

To develop fully the capability that would enable grape producers to monitor and manage crop yields and quality in grapes there remains a number of additional system components identified by stakeholders which are listed below:

- **Develop mechanical pruning equipment that will perform 90% or more of the necessary pruning while maintaining the vine and canopy structure essential to producing the highest possible sustainable yields of ripe fruit.**
- **Develop harvester-based yield and quality monitoring equipment that will provide producers with real-time, within-block yield information. This is essential information needed to identifying yield and quality variability within vineyard blocks. This information will enable producers to identify specific practices designed to overcome within-block limitations – nutrient, water, soil structure, etc.**
- **Electronically measure and assess grapevine canopy capacity (size). Initial research has demonstrated the potential for using side-visioning sensors in conjunction with GPS data logging and GIS processing to construct Normalized Difference Vegetation Index (NDVI) vineyard maps. This is important to enabling producers to measure within-block leaf area needed to determine vine capacity.**
- **Understand the effect of environment and horticultural factors on grape berry development. We need to understand better the berry development process and those factors that influence this process. Collection of data on berry development over time and the relationship with environmental and horticultural influences will provide needed information essential to more accurately predicting potential crop size. This capability is important to determining the maximum crop load that can be carried in any vineyard block that will mature to industry standards.**
- **Further refine crop adjustment procedures that will limit the impact on vine growth, berry development, and minimize crop damage during the adjustment process. A new machine has been developed to adjust the crop with minimal damage. This equipment and other techniques need further development and testing.**
- **Adapt micro sensors applied to grapevines to elucidate pre-symptomatic plant stress. There is a great opportunity to utilize this emerging technology in viticulture. The potential to understand plant health through the use of micro sensors and relate this to irrigation scheduling, amount and timing of nutrition, crop yield estimation, and the impact of pests – weeds, diseases,**

and insects is now within the grasp of reality. Research is needed to determine the number and placement of sensors needed within a vineyard in order to generate reliable data. In addition, how the information will be utilized in database management will be needed in order to provide useful information to producers. This area has great potential to enable producers to manage vineyards in a more cost-effective sustainable way. Effective vineyard management decision-making can be greatly enhanced using sensor technologies leading to improved yields of high quality fruit. Additionally, the use of sensors will enable producers to manage pests more efficiently and nutritional inputs in a sustainable cost-effective manner.

We believe that a research proposal addressing these needs should be highly desirable by those administering the SCRI program. An initial proposal containing the elements listed above was developed for SCRI funding for the 2008 funding cycle, but was not submitted due to one of the partner's inability to provide the necessary materials required by the CAP grant RFA. This proposal was entitled "Vineyard Mechanization for Enhanced Economic Sustainability: Existing Technologies, Mechanical Crop Load Management, and Sensor Networks."

We believe that the proposal has value for all grapes produced for all purposes in the US. Some parts of the proposal associated with sensors and senor technologies have likely application to other specialty crops.

We intend to submit a proposal to the SCRI CAP area for funding this coming year. Dr. Terry Bates of Cornell will be the Project Director for the proposal. We intend to have the project be multi-state, multi-institution, and multi-disciplinary with a strong educational outreach component.

Potential Collaborators will include:
Dr. Keith Striegler, University of Missouri – educational outreach
Dr. Justin Morris, University of Arkansas – vineyard mechanization
Nick Dokoozlian, E.J. Gallo - funding and in-kind personnel and vineyards (CA)
Tom Davenport, National Grape Cooperative – funding
Hans Walter-Peterson – educational outreach
Julie Tarara, USDA ARS – sensor technologies and testing in WA
Dr. Richard Plant, University of California – site-specific analyses
Renfu Lu, USDA ARS – sensor technologies
Dr. Changying Li, University of Georgia – agriculture engineering
Dr. James McKinion, USDA ARS – precision agriculture
Dr. Reza Ehsani, University of Florida – mechanization and precision agriculture
Dr. William Whittaker, Carnegie Mellon University – robotics

OTHER POTENTIAL RESEARCH PROJECTS FOR FUNDING UNDER THE NEW FARM BILL:

"Control of Multi-Colored Asian Lady Beetles (MALB)"

MALB has been a sporadic pest of vineyards east of the Rocky Mountains. It has been determined by juice and wine analysis that very low MALB levels (one per vine) can cause off-flavors/odors in juice and wine. MALB was introduced into the US as a biological method for controlling the soybean aphid which is a major pest of soybeans. It has no natural enemies so has proliferated in recent years.

When soybeans begin to "dry down" or the plants are killed by frost late in the summer MALB seek other sources of nutrition and water. They are carried by westerly winds from major soybean producing regions in the mid-west to as far east as New York State.

While MALB do not feed directly on the grape foliage or fruit they will seek sources of nutrition and water from damaged fruit. We do not have the capability at this time to accurately determine when MALB will be a problem, but their appearance in large damaging numbers occurs typically during the grape harvest period – late September through October.

There are currently no registered pesticides in New York for controlling MALB. At a MALB Summit last year a team of researchers and grape industry personnel from the US and Canada came together to discuss what was known about MALB and, as well, identified a number of areas of needed research.

We believe that there is the need for a coordinated project to develop a method, or methods to determine when MALB will become a potential problem for the grape industry. In addition, control and/or repellant strategies need to be developed in order to protect the crop from damage.

We are planning a MALB Summit this fall/early winter with the key researchers who are working on MALB in the US and Canada. The goal is to develop a proposal for funding through the pest and disease funding mechanism within the Farm Bill. At this time we are not sure of which of the Farm Bill funded programs we will submit a proposal to.

"Overcoming or Reducing the Impact of Energy Related Cost Increases in Vineyard Production Systems"

We have estimated that the energy related cost increases during 2008 for vineyards has been between $150 and $200 per acre. These cost increases cannot likely be passed on to the consumer. So, producers need a way to minimize the cost impact on their operations. These cost increases are both direct and indirect. Direct costs

include those associated with fuel and other petroleum products used by tractors and other equipment essential to crop production. Indirect costs include significant increases in fertilizer costs, primarily for nitrogen and potassium products, the cost of pesticide products, and the cost of other input supplies essential to grape production.

While it is unlikely that all of these cost increases can be overcome, it is believed that practices can be developed to minimize these increases. Some new practices, particularly those associated with nitrogen application rate and timing, have been recently developed by Cornell scientists. However, they are not widely utilized by the industry due to concerns about the potential negative ramifications on vine size and productivity.

In addition, there are potential practices that could be combined, thereby reducing the number of trips through the vineyard and saving fuel. Other methods to reduce the impact of these cost increases need to be identified and, where researchable, be incorporated into a research proposal.

We would recommend that a meeting of producers, processors, interested researchers and extension educators, economists, and agriculture engineering be brought together after this year's grape harvest to identify potential energy related savings opportunities. Based upon this a proposal for funding could be developed among those researchers and extension personnel who have interest and the expertise to address the opportunities.

<u>Maintaining and Improving Juice Quality in Concord and Niagara Grapes</u>:

With continuing economic pressures on the juice grape industry in New York State grape producers are seeking ways to reduce input costs with a primary emphasis on reducing the cost of labor. With the development and use of mechanical pruning techniques less precise management of individual vines is a result. This can lead to greater vine to vine variability affecting both yield and quality. Of particular concern is the impact on quality and the components of quality. In order to remain competitive in the juice market high quality is a must.

Food scientists need to identify the impacts on fruit quality associated with vineyard mechanization practices, and to identify critical practices to enhance fruit quality when and where needed. To do so will require close working relationships between viticulture researchers and food scientists at Cornell in order to address the need to maintain a high quality raw product while at the same time recognizing the need to reduce labor inputs.

We would suggest that a juice industry Summit be organized during the winter of 2008/2009 to fully identify the critical components essential to high quality and how the impacts of mechanization might affect these critical quality components. Invited to the Summit would be juice grape producers, viticulture researchers, Cornell and

other university food scientists, and processor representatives including field and key internal quality assurance personnel.

Tom Davenport
Jay Hardenburg
John Walker
Tim Moore
Tim Weigle
Jodi Creasap Gee
Terry Bates
Harold Smith