Overview Production Efficiency:

General comments

All comes back to quality!

Many of these topics are inter-related and are difficult to separate (i.e. design and trellis systems, canopy management, crop estimation and crop load management) - systems approach is unavoidable

The solutions to many problems are regionally specific and often best handled by private industry

Reasonable length projects for ARS: Publish or perish? Consistent funding?

Mechanization mentioned from the DC meeting (March 2006) with the robotic systems may eventually require reworking of the trellis system, vineyard design, etc.

Assumed that ARS impact can be increased by being more efficient with existing resources

Outreach plan and tech transfer can be accomplished by usual methods: trade journals, extension, growing meetings etc. Encourage ARS to reward scientists for this outreach!

Vineyard design- defined as row orientation, irrigation layout, soil type, grape product type, slope, etc.

-**ARS Accomplishments**: none identified, however, M. Keller (WSU) working on vine spacing in 2 current research projects- one funded by USDA

-**Gaps:** -vine density/spacing over long term- 10 to 15 years is needed

-maybe best done by the ARS

-canopy management ID'd as gaping hole

-minimize labor inputs-see mechanization

-remote sensing to evaluate land for pre-planting

-**Future work and Suggested Researchers:** potential collaboration between Keller and Tarara; remote sensing Lee Johnson

New Training/Trellis systems- has every imaginable trellis system has been tried?

Raisin & juice ideal= max yield, high quality and ease of mechanization

- **ARS Accomplishments:** none identified; most done by industry

-**Gaps:** -little to do in terms of the system itself

- obvious gap- everything except pest management and breeding

- Raisins: a trellis that facilitates cane cutting at harvest (quality)-too applied for ARS?

Canopy Management Systems

- **ARS Accomplishments:** -"Squid" project- Tarara's work combines trellis design and canopy management- good; measuring the effect of diff environmental factors on canopy management

- **Gaps:** -reduction of labor;

-employ mechanization to improve efficiency of shoot thinning; should ARS be working on mechanization?

-Table grapes need (size and color) to be included for this work?

Yield Estimation

- **ARS Accomplishments:** -Tarara load cell project; Eileen Perry (WSU)- image sensing (side scan system)

- **Gaps:** -apply load cell work in multi-wire systems and the hort requirements for management

-develop the coefficients for load cells in different systems- combine with physiological markers

-crop estimation is problematic

-estimating crop potential with alternative to bud dissection (e.g. dye or infra-red)

-need for basic research on physiology of fruitfulness as it enhances production efficiency

Future work: -apply load cell technology to other grape crop systems

Suggested Researchers: Industry collaborators

Crop Load Management-important and varies for raisin, table, wine and juice grapes;

- **ARS Accomplishments**: none identified

-**Gaps**: -mechanization and/or robotics for crop thinning possible with the help of engineers and private industry (e.g. Vision Robotics)

-Load cell work needs application fine tuning

-chemical thinning (e.g. methyl jasmonates-Fidelibus)

Irrigation and Fertilization Requirement-

-**ARS Accomplishments**:

Irrigation-Shellie, Schreiner, McElrone, Tarara, Williams (UCD), Steenwerth, Baumgartner-various aspects of water use, irrigation efficiency, cover crop competition

Nutrients- Schreiner (both soil and foliar applications), Joan Davenport (WSU), Mycorrhizal work (Schreiner and Baumgartner)

-**Gaps**: -Sap flow sensors to better understand grape water demand?

-Cover crop interactions/competition experiments- long term

-Salinity problems with drip irrigation in low rainfall areas

-Timing of the sampling needs work based on dated studies that may not be helpful for making changes within a given season

-Research regarding foliar applied nutrients and timing of applications

-Irrigation management research (e.g. sap flow, dendrometer, pressure bomb, soil moisture, lysimeter)

-Develop nutrient standards correlated with irrigation management (e.g. deficit irrigation)

Mechanization and Automation Technologies

- **ARS Accomplishments**: None identified for 3 decades

-**Gaps**: -better mechanization of everything from pruning to harvest

-need engineers

-“MARS Rover” or “Roomba” for vineyards… can we automate it?