Overview Production Efficiency (Session 2):

General comments

Again all of these topics are inter-related and are difficult to separate (i.e. design and trellis systems)

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

Vineyard design- row orientation, irrigation layout, soil type, grape-type; slope

-ARS Accomplishments: not much by ARS, however, M. Keller 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; gaping whole for canopy management viticulture (Nick Dokoozlian left for Gallo)

-Future work: potential collaboration between Keller and Tarara

-Suggested Researchers: Keller and Tarara

-How to improve money-use efficiency: see comments breakout session 1

-How will work be extended: see breakout session 1 comments (trade journals and extension)

New Training/Trellis systems

- ARS Accomplishments: No work being done currently; no past work ever done by ARS; most done by industry

-GAPS: not much left to do in terms of the system itself; obvious gap- everything except pest management and breeding

-Future work: west vs. east side ripening- could potentially develop modified training/trellis systems- to get the grapes on both sides of the canopy to mature at the same time??

-Suggested Researchers:

- How to improve money-use efficiency:

-How will work be extended?

Canopy Management Systems

- ARS Accomplishments:

- GAPS: Reduction of labor; employ mechanization to improve efficiency of shoot thinning; should ARS be working on mechanization? YES—see mechanization below and reference to the DC meeting (also see session 1)

- Future work:

- Suggested Researchers:

- How to improve money-use efficiency:

- How will work be extended?

Yield Estimation

- ARS Accomplishments: Tarara load cell project-industry priorities have been met

- GAPS: 1) commercialize the load cell system; load cell work in multi-wire systems and the hort requirements for management; data gaps that would make use of the load cell system more universal; linking the continuous stream of data from the load cell- develop the coefficients for load cells in diff systems- combine with the hort measurements/correlates (i.e. veg growth parameters, life stage, cluster info) that are needed to make better predictions based on the load cell- WILL require more man-power
2) crop estimation is a huge problem
3) crop potential estimates(predicting bud fruitfulness)- by fine tuning/improving bud dissection and maybe developing a dye technique- would help to make better pruning management decisions- incomplete understanding/predicting bud fruitfulness- alternative to bud dissections (infer-red, dying techniques)
4) need for basic research on physiology and reproduction
- Future work: apply load cell technology to other systems and to develop co-efficients for multiple systems; applicable across all grapes-currently working on juice grapes, but good for wine, table, raisin, too.
- Suggested Researchers: Industry collaborators would be the best to work with, but could be open to anyone with the
- How to improve money-use efficiency:
- How will work be extended?

Crop Load Management-important for table, wine and juice grapes
- ARS Accomplishments:
-Gaps: similar to those listed for yield estimation; mechanization of crop thinning- with the help of engineers→ only if they hire the staff to do this work of mechanization (e.g. Vision Robotics); strategies to avoid crop thinning especially as labor becomes more expensive
-Future work:
-Suggested Researchers:
- How to improve money-use efficiency:
- How will work be extended?

Irrigation and Fertilization Requirement
-ARS Accomplishments: Tarara, Shreiner, Shellie, McElrone, Steenwerth, Baumgartner-various aspects of water use, irrigation efficiency, cover crop competition and water use; Nutrients: Schreiner (both soil and foliar applications), Joan Davenport (WSU)?? Mycorrhizal work (Shreiner and Baumgartner)
-Gaps: Cover crop interactions/competition experiments- especially those that are long term to really develop the competitive rooting systems; site specific/regional vineyard floor management; sustainability of drip in low rainfall areas- problems with salinity associated with this because of the lack of leaching because so little water input; regional needs for all irrigation needs; irrigation technology will probably address by industry;
How nutrition affects physiology and how to utilize the plant nutrient analysis to manage vineyard systems? Need for collaboration between soil scientist and

physiologists; trials on all the major soil types in each region and track nutrient uptake throughout the various life stages; correlate nutrient status (i.e. leaf blade, petiole) with fruit quality; GAP: maybe use green fruit analysis (other tissues other than petioles) to track nutrient status and how it is linked with final wine quality; timing of the sampling needs work based on dated studies that may not be helpful for making changes within a given season; need for info regarding foliar applied nutrients- chemical industry is selling lots of product, but not much knowledge behind the chemistry; more info needed on biodynamics;
-Future work: work that addresses the gaps above; sampling alternative tissues for nutrient status; see comments above
-Suggested Researchers: build collaborations within a given area because of the site specific aspects
- How to improve money-use efficiency:
- How will work be extended?

Mechanization and Automation Technologies

- ARS Accomplishments: None
-Gaps: better mechanization of everything from pruning to harvest; need engineers that can do this work
-Future work: not overly technical equipment- robotics that break down will not be that useful to the growers; chemical applications to ease harvesting
-Suggested Researchers: new personnel needed
- How to improve money-use efficiency:
- How will work be extended?