2023 Apple Horticulture and Postharvest Research Priorities

Request for Proposals (RFP)

The Washington Tree Fruit Research Commission (WTFRC) is seeking apple research proposals in the following priority areas.

Achieving sustainable production and consistent fruit quality for profitable orchards:

Optimization of yield potential in ***the orchard*** via development of integrated systems and interrelated models:

- understanding of pollination biology/fertility and development of Best Management Practices (BMP) as resource for growers (incl. artificial pollination, pollen tube growth, integration of weather)
- water and nutrient management (balance tree growth and development to maximize cropping potential of premium fruit, i.e.: manipulate for newly planted trees, then switch to encourage fruiting)
- managing soils: how to measure, manage, and maintain soil fertility
- systems approach for understanding and managing the root cause of bitter pit & calcium-related disorders under Washington conditions
- Determine BMP's for pesticide efficacy under prolonged evaporative cooling conditions (crosslinked with ACP).
- utilization of genetic/genomic and other tools to understand the inherent mechanism that guide cropping system performance
- best practices for pre-harvest decay pathogen reduction strategies for conventional and organic orchard systems

Enhanced ***postharvest*** efficiency to promote sustainability and long-term economic viability of pome fruit businesses by increasing packouts. We seek projects that aim at understanding/managing/reducing decay and physiological disorders while maintaining/enhancing food safety and avoiding fungicide resistance development. The entire continuum from orchard to table should be considered.

- next generation maturity indices as risk assessment tools to manage fruit quality and physiological disorder prevention
- Establish BMP's for sanitation practices and application of sanitizers with focus on decay pathogen reduction for bin sanitation and storage rooms (RA & CA).
- Develop a training program for postharvest process water management strategies to manage decay and foodborne pathogens
- Determine efficacy of drench versus fog application of post-harvest fungicide
- Industry practice to apply one type of fungicide (active ingredient) as a post-harvest drench or fog and a different fungicide (active ingredient) on the production line if fungicide applied. This is primarily due to concerns with exceeding the Maximum Residual Level (MRL) by applying the same fungicide twice. What is the impact of this practice on fungicide resistance within the industry?
- Assess effectiveness of new biocontrol agents or other novel agents for decay control in conventional or organic production

- Food safety and sanitation (practical approaches to be implemented directly into operations, when appropriate in conjunction with pathology and fruit quality management):
    - Evaluate and compare current protocols (product used, interval, method of application, etc.) for cleaning and sanitizing brushes, including a review of existing research on this topic. Investigate novel methods of cleaning and sanitizing brushes.
    - Evaluate environmental monitoring best practices for assessing brush bed brushes (cleaning, drying and wax application). Compare and summarize type, efficacy, sensitivity, and cost for testing that minimizes the risk of listeria cross contamination or harborage.
    - Develop best practices for drenching and fogging to avoid bacterial and fungal growth
    - Organic approaches to packing line food safety
    - Estimate the potential financial benefit of optimized sanitation protocols on packouts for high value varieties, such as Honeycrisp. Cost-benefit analysis of food safety controls.
    - Metrics for water sanitation esp. dumptanks

Abiotic stress management and ***climate change***:
- Systems approach to understanding the basis of fruit over color development to enable harvest of fruit at optimum maturity and to reduce the number of picks needed (high priority in 2021):
    - Genetic, biochemical, physiological, environmental factors
    - Develop best practices to manage and increase over color
- understanding chilling requirements for apple trees
- understanding maturation patterns and storage potential based on in-season climate (examples: smoke, frozen fruit protocol, heat damage of fruit, dramatic temperature drops in season, abnormal maturation patterns)
- understand carbon footprint of apple orchards (LCA/ESG; ID efficacious/viable approaches) (crosslinked with ACP).

COSMIC CRISP®
- Determine detailed protocols for use of ethylene action/synthesis inhibitors/promoters for best eating experience and maximum packouts.
- Develop comprehensive best practices document (Decision Tree) for the entire production chain by integrating all existing work with background information to allow for informed decision making.

Technology projects for apples alone or across several different crops are encouraged. Of special interest are proposals addressing methods assessing labor utilization and/or for the reduction of manual labor needs in orchards. Those projects may be moved into the technology committee. Specific priorities:
- Cost-effective high-density systems for automation (example: hedging (put #'s on timing/fruit quality downstream)
- Non-destructive crop stress modeling
- Water management
- Real time fruit growth measurement
- Smart Orchard Project
- Economic analysis: for available and novel technologies (how to make the economics work), focus on Key Performance Indicators (KPI's)

Some of the priorities listed do not specifically ask for organic options. We are interested in having organic practices considered in all proposed work when appropriate. Also, proposals are expected to include an industry

outreach component if the sought-out project outcomes are anticipated to directly translate into management changes.

Horticultural field trial designs should consider documenting the water and nutrient management effects. Naturally occurring mineral and/or nutrient levels can influence the outcome of field trials and these water quality aspects are generally not documented. This makes comparisons of results to applied research difficult. Maintaining profitable and sustainable tree fruit companies is of utmost importance to our industry, and economic considerations need to be included in project designs.

Novel ideas in areas not listed as priority are encouraged. It is suggested to contact Ines Hanrahan (hanrahan@treefruitresearch.com) to discuss any ideas outside of the priorities identified by the 2023 Request for Proposals (RFP), before submitting a preproposal.