2027 Apple Horticulture and Postharvest Research Priorities: Request for Proposals (RFP)

Introduction:

The Washington Tree Fruit Research Commission (WTFRC) invites research proposals focused on advancing apple horticulture practices. For the 2027 funding cycle, we specifically request tree physiology-based projects linked to the "Apple Technology Roadmap" especially in irrigation and crop load management; these proposals may be comprehensive in scope rather than focused on isolated components of irrigation or crop load management. WTFRC will assist in helping to develop the overall framework and vision to encompass many aspects of a topic area. While WTFRC funding may help launch long-term projects with a systemic approach to these topics, we hope our initial investment will be leveraged into larger NIFA-type projects with external funding to complete the work. **Other priorities laid out in the 2026 RFP are still of high industry relevance but will not be considered for funding this year by WTFRC.**

For detailed background information, please refer to our Apple Technology Roadmap: https://treefruitresearch.org/about-us/technology-roadmap/

General Considerations:

- **Field Trial Design:** Horticultural field trials should comprehensively document seasonal climate, water, and nutrient management effects. We encourage researchers to analyze naturally occurring mineral and nutrient levels in soil and irrigation water, as these factors significantly impact trial outcomes and facilitate comparisons with applied research.
- **Economic Viability:** Maintaining profitable and sustainable tree fruit operations is paramount. Therefore, all project designs must incorporate economic considerations.
- **Organic Practices:** While not explicitly stated in all priorities, we encourage the integration of organic practices where applicable.
- **Industry Outreach:** Proposals with outcomes that directly translate into management changes must include a robust industry outreach component.
- **Related projects:** before submitting a preproposal review the lists of currently funded projects.
    - https://treefruitresearch.org/technology-research-review/
    - https://treefruitresearch.org/apple-crop-protection-research-review/
    - https://treefruitresearch.org/apple-horticulture-postharvest-research-review/
    - https://treefruit.wsu.edu/?s=WTFRC+funding+2026

Contact WTFRC staff if applying from outside of the PNW area to ensure the proposal does not duplicate any ongoing efforts and for assistance to establish potential collaborators in the area.

Irrigation Implementation for Fruit Quality and Profitability

- **Extension**: Projects focused on extension should help the community understand how applying irrigation technology improves profitability and helps align future activities with current efforts. Examples include:
    - Educating growers on how to irrigate, available technologies, cost/benefit analyses of alternative tools, and how to transition.
    - Providing educational materials for operators, troubleshooting guides, infrastructure requirements, and water quality information.
    - Integrating irrigation practices with nutrient management and fertigation. BMP for sprinklers and drip irrigation by soil texture and irrigation format (example: sandy soils need more frequent but shorter sets)
    - Managing drought conditions during the growing season.
    - Offering training to drive technology adoption.
    - Demonstrating how to individually modulate modern irrigation monitoring systems (e.g., SWAN, AgWeatherNet, DAS, LUMO).
    - Creating or updating guides on instruments for monitoring tree water status, including how and when to integrate them into orchard operations.
    - Showcasing low-cost solutions.
    - Tying outcomes back to previously funded research.

- **Research:** collaborative and holistic multi-season projects integrating irrigation, fertigation, tree health (roots, shoots), and fruit quality. Aim to understand the whole tree physiology impacts of new practices and integration of sensors and other technology tools. Examples of questions to be answered below.
    - understand how water and nutrients move through the tree (relationships and physiological ramifications) fully integrating weather-based models derived from orchard data
        - controlling tree vigor, root growth, fruit growth rate or fruit size
        - frost control (some missed low RH this spring and underestimated the damage potential), what is the strategy and how do we manage effectively
        - timing of irrigation and fertilization
        - effect on bitterpit and heat stress sensitivity
        - how does bicarbonate content of irrigation water affect tree physiology?
    - water use efficiency especially when dealing with drought/less available water
        - differentiate productive and newly planted trees
        - example scenarios:
            - 14 days no irrigation (document water savings and all physiological ramifications), how do trees survive, crop, develop color, mature
            - Too much/too little/waiting too long
            - Past research to consider: https://treefruitresearch.org/report/towards-a-better-understanding-of-soil-moisture-deficits-on-shoot-root-physiology/

- Determining BMPs for pesticide efficacy under prolonged evaporative cooling and/or shading considering water quality (see Byron Phillips study). Explore cycling, fogging, shade net, and preharvest fungicide timing. Determine microclimate implications. Develop an early alert system for reduced pesticide efficacy (especially for decay management) and integration with autonomous controls. Integrate with postharvest performance data. Varieties of special interest: WA 38, Honeycrisp.

Crop Load Management

- **Extension**:
  - Up-to-date information on the evolution and utility of commercial vision systems (Vivid, Aurea, Orchard Robotics etc.)
  - How does a grower know what an optimal crop load is for maximum revenue in a particular growing system?
  - BMP for best color development by variety x rootstock (leaf to fruit ration, fruit/TCSA, anthocyanin synthesis, leaf nitrogen content, novel methods)
  - Documents integrating Hort 101 and up-to-date information on plant hormones, cost effective bitterpit management, fruit quality variability esp. related to bloom timing (ID early and respond)
  - Develop a matrix of tree physiology combining all factors and effects together
- **Research**:
  - Pruning: develop a tree physiology-based pruning timeline for robotic pruning integration (consider tip-bearing vs. other apple varieties). Investigate hedging (timing in fall/winter) and leaf removal for maximum color and reduced pruning cost (40-60% less than hand pruning).
  - Biannual bearing: understand mechanisms that regulate floral initiation/development and biannual bearing in a tree and develop steps to take on an individual tree basis to alleviate biannual bearing
  - Pollination: Understanding pollination biology/fertility and developing Best Management Practices (BMPs) (including new pollinizer performance, using pollination to optimize crop load, and weather integration).
  - Fruit Abscission: Understanding fruit abscission physiology for precision harvest management (cross-link with cherry and stone fruit RFP).
  - Sanitation/floral initiation: Reduce decay pressure postharvest by preharvest orchard management and optimize floral initiation and flower quality.
    - Establish which orchard sanitation measurements lead to reduced decay pressure (taking off fruit not harvested, mulching orchard floor etc.) and establish clear economic numbers to use for benefit analysis.
    - Based on most effective sanitation measures, seek to automate that task while providing ROI numbers.

Consideration in all projects should be given to fruit overcolor development optimization (esp. if that can lead to the reduction in the amounts of picks) and management of bitterpit. The effect of

seasonal weather extremes needs to be considered also (keeping in mind the current SCRI led by Kalcsits).

Novel Ideas and Assistance during the Proposal Process:

We encourage **novel ideas** beyond the listed priorities. For projects outside the 2027 Request for Proposals (RFP) priorities, please **contact Ines Hanrahan** (hanrahan@treefruitresearch.com) for a discussion before submitting a pre-proposal. **WTFRC staff** are also **available** at any time to discuss your ideas, provide feedback, and offer guidance **to help** you **craft a successful proposal.**