Tart Cherry

**Objective**
Investigate and develop alternative approaches to overall tart cherry production systems that address economic and environmental sustainability challenges through a combined/integrated approach of automation and orchard production systems.

**Drivers**
- Market utilization, including pit presence.
- Returns to growers.

**Fruit quality**
- Productive land (real estate).
- Spray drift / noise.
- Yield / Acre.
- Uniformity.
- Time to commercial production.

**Economic**
- **Land usage**

**Evaluated concepts**
Traditional / current systems
- Canopy harvest (Bramble & Citrus)
- BEI, Inc. dual spindle harvester

**Orchard variables – Optimize harvester & yield**
- Genetics
  - Tree size (Small & compact).
- Trunk type (Multi-stemmed vs. single trunks).
- Growth type (Spur vs. Willowy).

- High density planting (1.5 m x 4 m).
- Single with multiple branching.
- Multi-stem / bush.

- Canopy structure / pruning:
  - Shape.
  - Branch recycling.
  - Hedging.
  - Trellising.

**Horticultural practices**
- Pruning:
  - Gentle – Can work with plants in 2nd leaf vs. 4th–5th leaf after planting.
  - Less fruit drop height.
  - Decrease trunk damage & diseases.
  - Increase harvest efficiency through continuous harvest.
  - Increase fruit uniformity & overall quality.

**Concerns/Questions:** Some tree/limb damage; potential for sweet cherries?; handling/logistics of harvested fruit.

---

Chestnuts

**Objective & drivers**
Develop a cost effective alternative harvest concept and system for small to moderate scale producers in the United States of America.

**Drivers**
- Currently only commercially available in Europe (Italy).
- Potentially not cost effective.
- Difficult & expensive to maintain.
- Optimized for larger production settings (> 10 acres).

**Self propelled and trailed harvesting system (FACMA)**
- Optimized for small production settings (< 4 acres).
- Uses suspension and disruption of material within air flow, which can collect and separate chestnuts and undesirable material (e.g. debris).
- Less components = Less cost & less maintenance.
- Minimal physical handling = Minimizing internal and external damage.

**Small scale single-stage harvesting system**
- Fluidized Bed:
  - Effective / unique concept but moderately difficult to implement in a continuous flow system. Significant components required.

- Saltation Sieve:
  - Multiple flow/velocity disruption concepts trialed.
  - Very simple concept with minimal components.
  - Minimal aesthetic damage to chestnuts.
  - Effective separation, up to 80+ percent.

**Concerns/Remaining studies:**
- Cost effectiveness of vacuum.
- Some issues of human ergonomics of overall system remain.
- Direct discharge of material through fan or use of cyclone separator?
- Optimization.