

Measurement of Harvest Dust Generation

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PROJECT SUMMARY

Objectives for current year:

- Compare dust emissions from conventional and reduced pass sweeping operations by measuring within canopy gravimetric dust.
- Assess harvest efficiency under different sweeping conditions such as estimated fuel use; nut counts prior to and after sweeping.
- Measure the relative differences of harvester separation fan speeds during windrow conditioning using opacity, gravimetric sampling and material size separation (sieve analyses) of windrows prior to and after conditioning operations.

Objectives for overall project:

- Develop an in-orchard dust sampling system.
- Assess different settings and modes of operation of sweepers and harvesters for dust emission reduction.
- Assess impact of changes in settings on harvest efficiency.

Background:

Visible dust is a nuisance to neighbors and drivers, and contributes to poor air quality. Starting in 2003 this project first focused on developing an in-line dust monitoring system as well as one based on opacity. With these systems along with in-orchard PM samplers relative amounts of dust generated inside an orchard have been monitored.

With the ability to measure relative dust emissions, the effects of different harvester speeds, fan speeds, sweeper head types and settings, sweeper passes/reduced pass sweeper have been assessed. The settings that showed the most promise were then tested in the PM₁₀ emission factor project by Capareda (09-AIR3-Capareda).

Discussion:

Reduced-pass sweeping showed the potential for reducing PM emissions and demonstrated nut recovery comparable with conventional sweeping. In addition, reduced passes saved time and some fuel.

Reducing the separation fan speed from 1080 to 930 rpm reduced opacity but not PM₁₀ emissions. In addition, foreign matter levels remaining were unacceptable.

The 6 years of research using relative dust emissions inside the orchard has shown that proper sweeper head height, separation fan outlet direction, slower ground speed of harvester, and slower separation fan speed of harvester can reduce the dust produced during harvest. The 2009 data confirm that reducing the number of sweeper passes with conventional sweepers or with reduced pass sweepers also reduces dust while maintaining harvest efficiency.

Project Cooperators and Personnel: Daniel Downey, Jim Thompson, Om Ponpesh University of California, Davis; Brock Faulkner, Texas A&M; Mike Flora, Flory Industries; Gerry Rominger

For More Details, Visit

- 2009-10 Annual Report CD (09-AIR1-Giles); or on the web (after January 2011) at AlmondBoard.com/ResearchReports
- Related Projects: 09-AIR3-Capareda; 09-AIR7-Faulkner