

# Keeping the debris out of mechanically harvested loads

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## Abstract

Mechanically harvested citrus have various percentages of plant materials (debris) within their harvested loads that are transported to processing facilities. Most debris consists of leaves, wood, small and bad (e.g., rotten and damaged) fruit. Sometimes non-plant materials such as bottles, cans, sand or animal-related items are included. The non-fruit materials are not desirable for citrus processing plants because they could damage equipment and they also need to be removed from the facility, which could add to the processing costs. In addition, loose plant materials can blow out of the trailers during transportation, which could increase the risk of spreading infectious diseases such as citrus canker, black spot and other potential fungal diseases to other citrus orchards along the route. A mobile in-field debris removal and fruit quality sensing research platform was developed to quantify the amount and remove debris in a harvested citrus load. The mobile research platform is a mechanized citrus fruit and debris separating system, along with the capability of measuring fruit quantity and quality via means of non-contact machine vision and laser-based technologies. It is a pull-behind implement that utilizes a tractor's power takeoff (PTO) to run the hydraulic system. The system consists of five major sections: (i) input hopper, (ii) large branch conditioning and small fruit removal, (iii) small branch and leaf removal, (iv) fruit quantity and quality sensing and (v) output conveyor. In addition, this system has the capability of being converted into a mobile grading system. Preliminary in-field tests indicated that the amount of debris and distribution of the type of debris varies significantly depending on the machine type, the variety of the citrus tree, orchard conditions, harvesting time and operator experience level. The mechanically harvested loads contained between 1.2 and 3.7% debris in comparison to 0.3 and 0.9% for manually harvested load.