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Mechanical Harvesting  
&  
Handling Systems  
of  
Fruits and Nuts



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ABSTRACTS

## **A Historical Timeline of Research Efforts to Implement Mechanized Pear Harvest in California**

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Efforts to implement mechanized harvest in California pear orchards have historically been motivated by actual short- or perceived long-term labor shortages. The Bracero Program brought in Mexican migrant labor in 1942, and was extended biannually via Public Law 78 from 1951 through 1964. Harvest mechanization research programs were initiated by the mid-1950s utilizing two major strategies: fully mechanized (e.g. knocking, shaking) or labor-assist (“man-positioning”) systems designed to increase worker productivity and reduce labor need. The advent of bulk bins, fork lifts and brush mowers facilitated engineering design and enabled once-over harvest and machine topping and hedging to create “fruit walls” ideal for platform picking. Pear fruit sensitivity to bruising eventually guided research toward the labor-assist strategy, where it remains today. As the end of PL 78 loomed, University and USDA engineers, horticulturists, post-harvest specialists, economists, and extensionists were enlisted to both test existing commercial machines and develop new ones. From 1960 through 1969, grower-, commercial-, and university-built machines were developed and tested side by side with the goal to simulate “short reach” picking from the ground with the least investment in equipment. Generally, 1) inexperienced workers could successfully harvest from platforms; 2) multi-level, multi-worker platforms were preferred over single-man towers; 3) productivity could increase 9-30% versus less experienced ladder crews, but less versus very experienced crews; and importantly, 4) continuous hedgerow “fruiting walls” 1.7 to 2m wide were found necessary to achieve platform efficiencies (tree height was mitigated by multiple platform levels). Major effort tapered by the mid-1970s as the labor supply stabilized. Tried platforms were either abandoned or used strictly for pruning or cutting fire blight and none were permanently commercially adopted in California. Efforts resumed in 2006 over renewed concerns of limited labor availability stemming from restrictive immigration policy and enforcement as well as non-agricultural economic sector competition.

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### **POSTER PRESENTATION**

#### **[POSTER 26] Mobile Platform for Harvesting and Processing Fruits in Brazil: Evaluation Study for Reducing Impacts During Field Sorting**

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Brazilian agribusiness for fruits and vegetables has undergone several changes in recent decades, which led the country to great achievements in this area, making it one of the largest exporters of various products. However, harvest is still being held in a rudimentary way, using the same format of years ago, so in many cases using only hand labor, without any aid. Sorting and classification (processing), though often use sophisticated equipment, not yet fully integrates the system, with high losses of the harvested product and waste of energy and space. One alternative

is using harvesting aids platforms, which can give better work conditions to the pickers, lowering costs and also making harvesting and sorting in field more efficient. In 2008, it was generated a platform for harvesting fresh market tomatoes, differently from other countries, in Brazil tomatoes for fresh consumption are grown staked with multiple harvests. This platform was 6.65 m width, length of 7.60m and 3.71 m high and harvest, sorting and packing were concentrate in this unit. Fruits were handpicked from the plant and take by belts to the high part of the machine and then sorted. Field tests were performed. Actually, based on this concept, is being developed another platform that can harvest and processing not only tomatoes, but also oranges and apples. The main frame was reformulated in order to attend all those crops. Therefore, sorting process was reformulated and two systems were evaluated for impacts: conventional and a new one. The evaluation and quantification of impacts were performed using an instrumented sphere (760 mm), Techmark, Inc. Instrumented Sphere (Techmark, Inc., Lansing, USA). Initially results show that there is a potential to reduce the amount of impact caused using a new system for sorting fruits in field. Further studies are being developed to attest classification efficiency. Corresponding Author: Marcos David Ferreira, Researcher, Embrapa Instrumentation; E-mail: marcosferreira@cnpdia.embrapa.br; Phone Number: 55-16-3376-1578