

## AN INVESTIGATION OF THE MOBILE PICKER'S PLATFORM APPROACH TO PARTIAL MECHANIZATION OF CITRUS FRUIT PICKING<sup>1</sup>

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Picking citrus fruit by hand is an expensive operation and one which entails a large portion of the cost of production and harvesting (3) (5). It is becoming increasingly difficult to find suitable labor to perform this strenuous task (1). At present citrus picking is limited to people of sturdy physique, regardless of intelligence or dexterity. The job is shunned by anyone who can find almost any other job at the same money. Adequate mechanization would make the job less strenuous, thus opening up a new source of labor not now available.

Previous studies (4) (2) indicated that the pickers' productivity could be increased and the work made easier by using a mobile picker's platform which would position the picker in the tree under conditions similar to those found when picking from the ground. A study of the design requirements and expected performance of such a machine are presented in this paper.

### PROPOSED PICKER'S PLATFORM

An analysis of the design requirements of a proposed picker's platform for use under current grove conditions revealed that it would have to transport two pickers to and from the grove, position them individually in the tree with a minimum of lost time, collect and store the picked fruit in bulk containers and discharge these containers when full.

The mechanics of the machine requires that its use be limited to positioning the picker so he can pick the fruit above a point six feet up on the tree. The fruit below the six-foot level would be picked by a picker standing on the ground (Figure 1). Efforts to enable the picker on the platform to pick all the

fruit complicated the design of the machine beyond the practical point.

It was felt that the proposed machine should consist of a transport unit, two pickers' baskets<sup>3</sup> with independent positioning mechanisms and a fruit removal system. The transport unit should be built low to the ground with adequate under carriage to assure good floatation in sandy soils. Power should be ample for rapid mobility in these soils. Controls should be within reach of the pickers from their baskets.

The picker's basket should be constructed to provide adequate room for a man to move around freely and to provide a smooth exterior shape. Mechanical means should be provided to move the baskets horizontally, vertically or rotate them through 270 degrees. The horizontal and vertical movements should be accomplished with a retracting type mechanism such as a telescoping tube or pantograph linkage. This would enable operation in close groves. Controls should be either of the throttling or modulating type for smooth starts and stops.

A batch type fruit removal system should be used to assure positive removal. The fruit would be collected in a bin on the picker's basket and emptied onto a conveyor as the basket passes over it in the normal picking operation. The conveyor would in turn empty the fruit into bulk containers which, when full, would be automatically discharged from the machine.

In operation, the proposed machine would require a crew of two — one picker for each of the two picker's baskets. The fruit below the six-foot level would be picked by a separate crew picking from the ground. This crew would not necessarily be co-ordinated with the platform's operation. The procedure of operation is shown in the lower part of Figure 2. The machine would be spotted between four trees. The picker located on the front of the machine would pick one-quarter of each tree on each side while the picker on the rear would pick the equivalent of the trees

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<sup>3</sup>"Pickers' basket" refers to the individual platforms located on the transport unit.

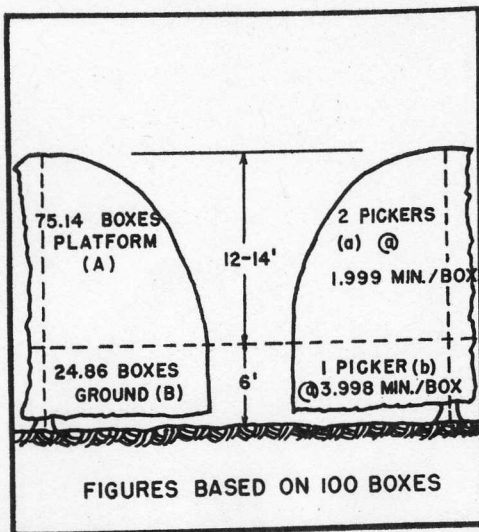


Fig. 1. Sketch of trees showing the area picked from the picker's platform and picked from the ground. Also, the adjusted time required per box and the quantity of fruit picked (based on 100 boxes) from each area are given.

to the rear. In the event one picker finished first, he would be free to swing over and help the other picker. This would offer flexibility to the system and tend to offset the variation in tree production and in the picker's work rate. When all the fruit has been picked the machine would be positioned between the next four trees by one of the pickers. The picked fruit would be collected on the picker's basket and emptied into an automatic fruit removal system as the basket passes over the transport unit. Fruit collected by this system would be stored in bulk containers such as bins or trailers which would be discharged when full from the machine. Suitable methods for moving the fruit from the grove to the packinghouse have been developed (6).

The machine should increase the picker's productivity by eliminating non-productive time, by reducing the necessary productive time per box, and by improving the picking crew organization. It should eliminate the need for ladders, a separate truck to haul pickers and equipment, and for "boxing" the grove.

#### INVESTIGATION

Factors affecting the design and performance of the proposed picker's platform are numerous and complex. The man is still necessary with all the physical and psychological

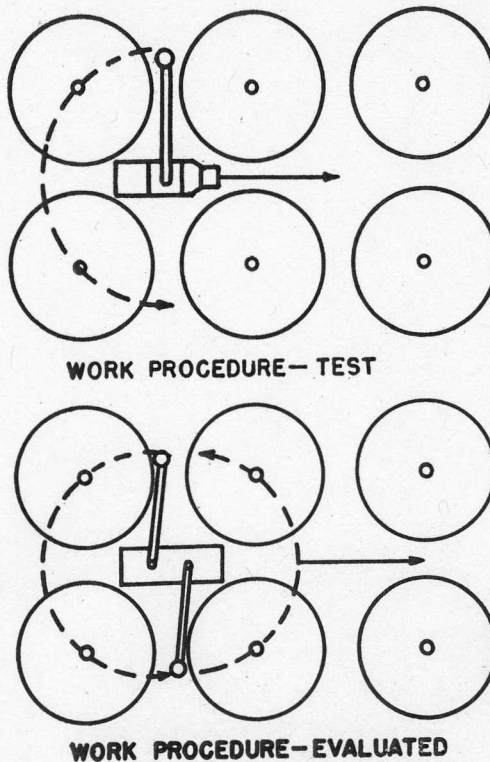


Fig. 2. Flow diagram of work procedure used in test and the work procedure for proposed picker's platform (evaluated).

factors that this entails. It is impractical to evaluate all these factors separately. An experimental mobile picker's platform was designed and built, so that many of these factors could be studied as a unit. The machine was not intended as a prototype of the proposed machine, but rather as a research tool.

*Experimental Picker's Platform.*—The experimental picker's platform shown in Figure 3 consists of a picker's basket attached to a boom-type positioning mechanism which enables the picker to move in and out vertically or rotate through 180 degrees. The positioning mechanism is mounted on a truck chassis. An 18 box, power-dumped bin is provided on the truck chassis for storing the picked fruit and for emptying this fruit into bulk containers or vehicles which can be moved to this roadside or to the processing plant. The picked fruit is first collected in a container on the picker's basket and emptied into the dump bin as the basket passes over the bin in the normal process of picking.

