

“Oli-Picker” a solution to detach olives from large trees?

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Summary

The “Oli-picker” harvester operates brushing the tree canopy inside or around the olive tree crown. The advantage of the “Oli-picker” relative to trunk shakers can be found in large trees common in old traditional orchards. In such trees trunk shakers are not efficient or simply impossible to use due to trunk diameter.

This paper aids up the work rates results and makes an attempt to present harvesting costs in olive orchards with trees unsuitable for trunk shaking.

Key word: olives; mechanical harvesting; spike rotor

Introduction

The “Oli-picker” harvester is commercially available, and operates brushing the tree canopy with a spiked cylindrical coomb (Figure 1) mounted on a hydraulic articulated arm, making possible operation, inside or around the olive tree crown.



Figure 1: Oli-picker spiked coomb.

Previous field observations, over a period of two campaigns (Almeida, 2007) revealed work rates of 10 to 25 trees per hour depending on the work methodology and canopy volume, which is a modest result compared to the 50 to 80 trees per hour of trunk shaker based harvesting systems (Almeida, 1999 and Peça, 2002).

However the advantage of the “Oli-picker” relative to trunk shakers can be found in large trees common in old traditional orchards of the Northeast of Portugal, Spain and Italy. In such large trees, trunk shakers are not efficient (Peça, 2002) or simply impossible to use due to trunk diameter.

This paper aids up the results of a third harvest campaign with the “Oli-picker” and makes an attempt to present harvesting costs in olive orchards with trees unsuitable for trunk shaking.

Material and methods

The *Oli-picker* is mounted in the back of a 59 kW agricultural tractor, which provides pto power for the hydraulic power pack of the equipment. A spiked cylindrical coomb which can turn round its axle provides the brushing action to detach olives. The coomb is mounted at the end of an articulated arm, allowing freedom to brush the canopy around or inside the tree crown (Figures 2 and 3).



Figure 2: *Oli-picker* can detach olives efficiently in large trees.

The *Oli-picker* was observed in traditional olive orchards of Trás-os-Montes. These are orchards without irrigation, some of them with large trees of three main cultivars: Verdeal Transmontana, Cobrançosa and Madural.

Large trees have tree crown volume between 100 m³ and 200 m³ and the trunk diameter between 2 m and 3,5 m.

Field observation showed two different methods of work organization. Work rates were measured for both methods.

Work method 1 - The *Oli-picker* is positioned in the field (station) to make possible to reach one or two trees (in a few occasions four trees) from that particular station (Figure 1). Different stations were required to complete the harvest of a single tree. At the same time four labourers shake the canopy with long wood poles, to complete the harvest of each tree.

Work method 2 – For a particular tree (sometimes a pair of trees), the *Oli-picker* is positioned in a single station. It will only be moved from that station after the tree had been totally harvested. To assist in the detachment of fruits out of reach three labourers shake the canopy with long wood poles while a fourth labourer operates a mechanical branch shaker (Figure 3).



Figure 3: *Oli-picker* and a mechanical branch shaker working simultaneously.

In both methods olives were collect on 10m × 10 m canvas placed under the canopy projection of each tree by more four labourers.

An average of 50 days at 7 hours/day of work is assumed to be the average within the harvesting season, which spreads from November till January.

To evaluate the annual total costs of the *Oli-picker* it was assumed a purchasing price of 24000 € and a 10 years of expected life.

The annual costs of other equipment and labour were also assumed as follows:

- 10 canvas (10 m×10 m) — 80 €/year;
- 3,5 ton trailer — 2,87 €/hour (300 hours of total annual use);
- Tractor 1 (59 kW) to support the *Oli-picker* — 30 €/hour (800 hours/year);
- Tractor 2 (40 kW) for trailer work — 25 €/hour (800 hours of total annual use);
- 8 men — 40 €/day/man;
- Mechanical branch shaker — 120 €/year.

Costs were evaluated for method 2, according the following equation:

$$C = \left(\frac{CT1+CT2+TC}{WR} + \frac{OC+CC+SC}{TNT} + \frac{8 \times LC}{WR \times HWD} \right) \times \frac{1}{OPT}$$

C - cost/kg of olives harvested

CT1 – Cost/hour of Tractor 1

CT2 - Cost/hour of Tractor 2

TC – Trailer cost/hour

OC – *Oli-picker* cost/year

CC – Canvas cost/year

SC – Mechanical branch shaker cost/year

LC – Labour cost/day

WR – *Oli-picker* work rate

TNT – Total number of trees harvested /year

HWD – Hours of field work/day

OPT – Olive production per tree

Results

The work rates found in field observations method 1 and method 2 are shown in Figure 4. The work rate is 10 to 15 trees per hour in method 1 and 13 to 24 trees per hour in method 2. The lower values of each interval are associated to observations in olives orchards with predominantly large canopy trees.

Since the *Oli-picker* can only compete with other mechanized harvesting systems in olives orchards with old large trees, work rates of 10 to 13 trees per hour will be considered to estimate harvesting costs.

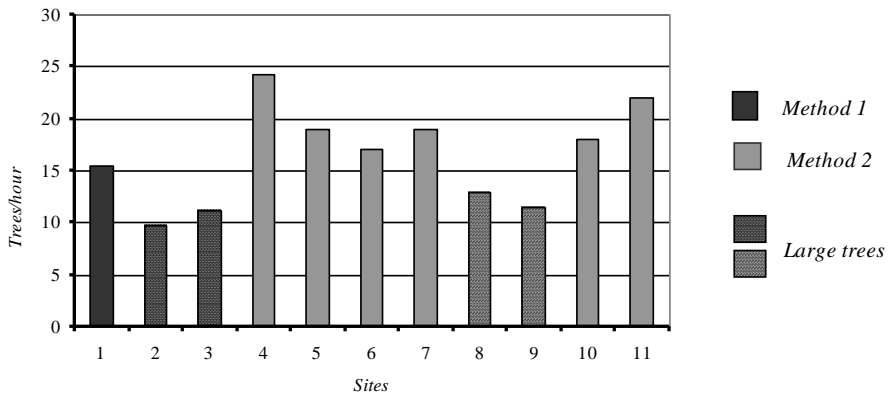


Figure 4: Work rates.

Taking into account the harvesting period of 350 hours and the above mentioned work rates, three scenarios of 500 trees; 2000 trees; 4000 trees were considered for the number of trees to be harvested annually.

In field observations the olive production per tree varied between 15 kg to 30 kg. Furthermore it was observed that either in method 1 or method 2, the team of men and machinery spread their action over the entire tree canopy, making work rates more influenced by the canopy size than by the quantity of olives present (olive production) Costs are presented in Figure 5.

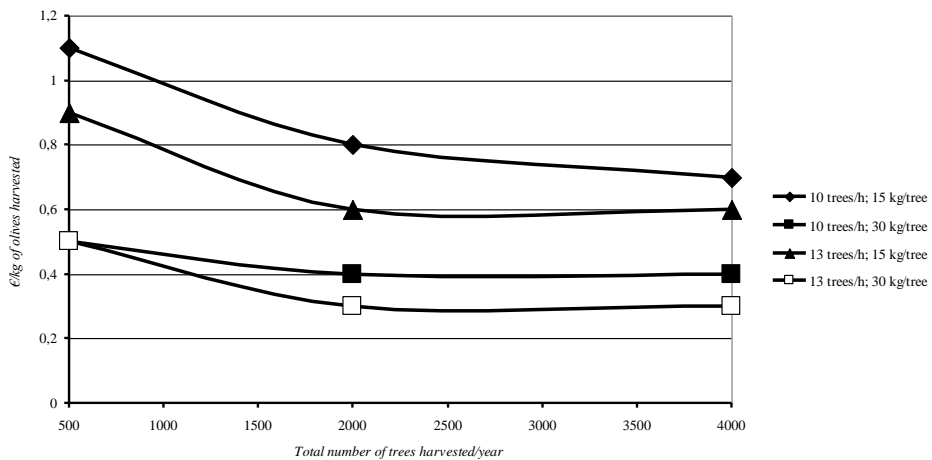


Figure 5: Cost/kg of olives harvested according to Oli-picker work rate and olives produced per tree.

Discussion

The *Oli-picker* in conjunction with hand shakers may be regarded as a useful tool for olive harvesting of trees with large canopies (volume between 100 m³ and 200 m³ and the trunk

diameter between 2 m and 3,5 m), bearing in mind that values close to 100% of detachment can be reached and that for such trees trunk shakers are inadequate. However, to make operational costs competitive it is important to improve work organization and above all to increase olive production on these traditional olive orchards. In the former aspect, the increase in the number of hand held shakers concentrated in lower branches should be envisaged in the near future.

Some of these old traditional olive orchards with autochthonous cultivars with large canopies are able to produce high quality olive oil, factor of a great importance in a so competitive market.

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