

# Lost Vegetables, Lost Value: Assessment of Carrots Harvest and Post-harvest Losses in a Large Italian Producer Organisation

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## Abstract

Food loss (FL) quantification is still an open issue in the harvest and post-harvest phase. There is a lack of data from direct quantification on field, with few primary data available (Fernandez-Zamudio et al., 2020; Corrado et al., 2019; Corrado et al., 2018; Caldeira et al., 2019). There is evidence that the fruits & vegetables sector is particularly affected by FL, due to many reasons, such as agronomic practices, diseases, deteriorations, storage, humans' mistakes or defects (Ishangulyyev et al, 2019, Gustavsson, 2011). The aim of this research is to assess through an on-site direct measurement the quantity of the carrots FL in the harvest and post-harvest stages of the supply chain. The quantity of FL is assessed over two productive seasons (2022 and 2023) in terms of mass and percentage of product that has been downgraded due to non-compliance with private quality standards imposed by retailers, and therefore directed on alternative - less profitable - marketing channels. The quantification of carrots FL takes place in a large Italian Producer Organization (PO), for which carrots are the core business. Batches from different fields are considered as unit of measure, and the losses are measured from the field until the end of the processing at the warehouse. The quantification methodology consists of two steps. The first step is the quantification in the field, to assess the mass of non-harvested carrots due to their size or shape, mechanical damages during the harvest. The second step is held in the PO warehouse, to detect the FL during the selection and cleaning of carrots, before they are packed and delivered to the buyer. FL is quantified in mass and % of quantity that is sold for fresh market, food industry and that is lost. Data on the value of the product going to different marketing channels is also collected in order to assess the economic loss due to FL and downgrading of products. During the season 2022, the total quantity of carrots produced is 24,152 t, out of which 76% is sold for fresh market at an average price of 0.52 €/kg, 15% is sold to food industry (0.26€/kg) and 9% is lost. In total, 3,623 t of carrots are sold to the industry, among which 2,899 t are already foreseen, while 724 t are downgraded to this channel due to non-compliance with the cosmetic standards required by retailers for selling fresh carrots. This

corresponds to an economic loss of 188,266 € over one season. This situation is confirmed in the season 2023, with a more detailed assessment of the reasons of non-compliance. Although this is a first quantification for the Italian market of carrots, the results suggest that private quality standards - especially on cosmetic features of carrots - create a bottleneck at the harvest and post-harvest phase of the supply chain. As a result, huge quantities of carrots are lost, and farmers have to bear the related economic loss.

**Keywords:** food loss, food waste, post-harvest; fruit and vegetable value chain, direct measurement

### References

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