



A life cycle assessment of non-renewable energy use and greenhouse gas emissions associated with blueberry and raspberry production in northern Italy

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HIGHLIGHTS

- LCA is a system for evaluating the environmental sustainability of products and processes.
- The disposal of the packaging material is taken into account.
- The LCA methodology has been applied to quantify the emissions of berry fruits.
- Species index: blueberry and raspberry

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ABSTRACT

This study examined the emissions produced during the *pre-farm*, *farm* and *post-farm* phases of the production cycle of raspberries and giant American whortleberries (blueberries) cultivated in one of the best-adapted areas in northern Italy.

The *pre-farm* phase included the greenhouse gas emissions from the production of plants in the nursery and the transportation of the plants to the production farms. The *farm phase* involved the emissions of greenhouse gases from chemical products, the water used for irrigation, the generation of waste, and the consumption of electricity and other energy. The *post-farm* phase comprised the transportation of the products to the distribution centre (DC) and their storage in the DC. The use phase is not included in the system, nor is transportation from the supermarket to the home of the final consumer, but the disposal of the packaging is nevertheless taken into account. Indeed, the use of traditional plastic materials during both the field phase (nursery and cultivation) and the post-harvesting phase (*packaging*) produced the greatest estimated impact.

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1. Introduction

In Italy, the cultivation of raspberries (*Rubus idaeus* L.) and blueberries (*Vaccinium corymbosum*) has become a dynamic industry in recent years, as demonstrated by its consistent growth between the 1980s and the present day (Bounous et al., 2009). Because of the increased interest in these small fruits, it has been possible to develop their marketing beyond the stereotype of a niche product. In the Alpine valleys of northern Italy in particular, raspberry and blueberry production systems (beginning in the 1970s) have grown into consolidated industries. Italy currently ranks as Europe's 7th largest producer of blueberries, with 1500 tons of production (FAO, 2010), after the main northern European states (Germany, Poland, the Netherlands, Sweden, Romania, and Lithuania). With regard to raspberries, Italy now produces approximately 2000 tons on a land surface of approximately 350 ha (FAO, 2010).

A portion of these products reaching the Italian market comes from eastern European states (Serbia and Montenegro), from countries that are able to supply fruit for industrial processing at prices that are not feasible for Italian companies. In addition, the need to extend the buying season has clearly influenced the decision of certain commercial agencies to begin importing from countries outside of Europe (50%), such as Chile and Argentina. However, the fact that the early years of the last decade saw a significant increase in the export of these small fruits to the affluent markets of the U.K. and Germany should also be noted (Bounous et al., 2009). The import–export system relies mainly on production in the Piedmont and Trentino–Alto Adige regions, which are equipped with proper structures for managing production, organisation, and distribution; while in other areas the sales process is generally handled directly by the farms that cultivate the plants. In Italy, interest in these small fruits is still limited compared to the other main fruit types, and consumption per capita remains low (FAO, 2010). The price element is certainly a limiting factor for the consumer, who regards raspberries and blueberries as a treat for special occasions and not as an everyday foodstuff. These fruits are, however, associated with a wholesome, healthy image, both because

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