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Achieving sustainable cultivation of tree nuts

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E-CHAPTER FROM THIS BOOK

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Developing hazelnuts as a sustainable and industrial crop

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1 Introduction

The European hazelnut (*Corylus avellana* L.) is a major species of interest for nutritional use and is the primary economically valuable commercial tree nut crop within the *Betulaceae* family. *C. avellana* is a temperate, diploid ($2n = 2x = 22$), monoecious, wind-pollinated, dichogamous species, exhibiting sporophytic incompatibility and a relatively small genome size (1C around 385 Mb) (Mehlenbacher, 2014). Its geographical distribution ranges from Asia Minor and the Caucasus region to Europe and North Africa (Boccacci et al., 2013). Approximately 660 000 ha of the world's surface is used to cultivate hazelnuts (FAOSTAT, 2018), with an average in-shell annual production of approximately 835 000 tons recorded between 2012 and 2016 (FAOSTAT, 2018). Production is mainly concentrated in two countries: Turkey (563 000 tons) and Italy (112 000 tons); however, other significant producers include the United States (34 000 tons), Georgia (32 000 tons), Azerbaijan (31 000 tons) and Spain (15 000 tons). This nut crop has recently been cultivated in the Southern Hemisphere in countries such as Chile, South Africa and Australia. In general, world production shows an increasing trend from the beginning of

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actions (e.g. to regulate the irrigation system) and to support the decisions of agronomists and farmers.

This system could be able to acquire information at the resolution of a single plant and could permit a drastic increase in the detection of possible limiting factors for each tree, such as lack of water or the presence of pests and diseases affecting plant health, and to react accordingly. Compared with the current state of the art in precision farming, the proposed SCADA infrastructures could represent a relevant step ahead in the context of hazelnut orchard management and the main advantages of this architecture would be:

- Increased hazelnut production;
- Decreased chemical input usage;
- Environmentally friendly water usage;
- Simplified orchard management.

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9 Where to look for further information

A standard introduction to the subject is in book chapter 17 by S. A. Mehlenbacher, *Hazelnuts* (see Mehlenbacher, 1991a), and in book chapter 11 by S. D. Sharma, Fiberts (*Temperate Fruits*, edited by S. K. Mitra, T. K. Bose and D. S. Rathore, Horticulture and Allied Publishers).

The best sources of information on hazelnut research and cultivation are available on the website of the International Society for Horticultural Science (ISHS) (http://www.ishs.org/). The Publications section contains the peer-reviewed series of the *Proceedings of the International Congresses on Hazelnut* published in the series *Acta Horticulturae* (ISSN 0567-7572; https://www.actahort.org/). The book series is under the Editorial of the section 'Nuts and Mediterranean Climate Fruits' and of the related 'Hazelnut Working Group'.

The most important centres of expertise include:

- Oregon State University (OSU) 'Hazelnut Breeding Program and related Extension Services' (https://plantbreeding.oregonstate.edu/plantbreeding/research/hazelnut-breeding-program)