

The Chestnut Orchards in the Bolognese Apennines: A Vanishing Socio-ecological Habitat

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15.1. Introduction

Castanea sativa Mill. (sweet chestnut) is a characteristic and iconic tree of the southern European mountain landscape. Its presence has always been tightly linked to human activities and the rural populations who cultivated the chestnut adopting different management options (orchards, high forests and coppices). The first evidence of a large-scale spread and cultivation of the species dates back to the Romans, who were primarily interested in coppice management for wood (poles) production (Conedera et al. 2004). Chestnut management for fruit production increased in the post-Roman Era and in the Middle Ages, in particular when the chestnut tree became the “bread tree” (*albero del pane*) in many mountain regions of Europe, giving rise to what some people refer to as the “chestnut civilization” (Gabielli 1994). Existing chestnut groves still reflect the historical legacy of the

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past importance of the tree: for instance, the high number of selected fruit varieties (varying in ecological needs or ripening period), including nuts for flour production as staple food or high-quality fruits (*marroni* and *marroni-like*) for seasonal markets. Moreover, many phyto-toponyms related to this species and its cultivation testify its presence throughout southern Europe (Squatriti 2013).



Figure 15.1. *The study area and a view of an iconic traditional chestnut orchard. For a color version of this figure, see www.iste.co.uk/decocq/ecology.zip*

First signs of decline of the Middle Age chestnut civilization occurred in the 18th century as a result of the Little Ice Age climatic cooling, which caused widespread frost damage to chestnut trees at the most exposed sites. In the following centuries, other driving factors such as the improvement of agricultural cultivation techniques and the introduction of new crops (e.g. maize and potatoes), the onset of new diseases and the depopulation of the mountain countryside owing to industrialization caused a progressive and generalized decline in traditional chestnut cultivation (Conedera and Krebs 2008). In Italy, for instance, chestnut stands devoted to fruit production (orchards) have decreased by about 90% since the beginning of the 20th century, passing from 608,000 ha (Vigiani 1908) to 60,000 ha (Bounous 2014). Similarly, coppice stands underwent either an extension of the traditional rotation time or total abandonment.

In this chapter, we focus on chestnut orchards of the Bolognese Apennines (Italy, Figure 15.1), an iconic and ancient anthropogenic south-European landscape at risk of vanishing (Squatriti 2013). In particular, we will apply a historical ecology approach in order to analyze the past 80 years of its cultivation and propose possible

future management options in order to perpetuate this unique landscape feature also in the future.

15.2. The traditional chestnut orchards

Traditional chestnut orchards (or groves) are open stands populated by grafted *C. sativa* trees for fruit production. They are multipurpose systems (Mariotti et al. 2019) with a semi-natural herb layer usually devoted to pasture with domestic animals (silvo-pastoral systems, Figure 15.1). The presence of veteran trees (sporadic in other forest formations) contributes to increase the conservation importance of the habitat, as they preserve local varieties and provide favorable living conditions (e.g. trunks with holes, dead wood, large crowns) for other valuable taxa (animals, plants, lichens, mosses), including red list species (Krebs et al. 2008; Pezzi et al. 2020a).

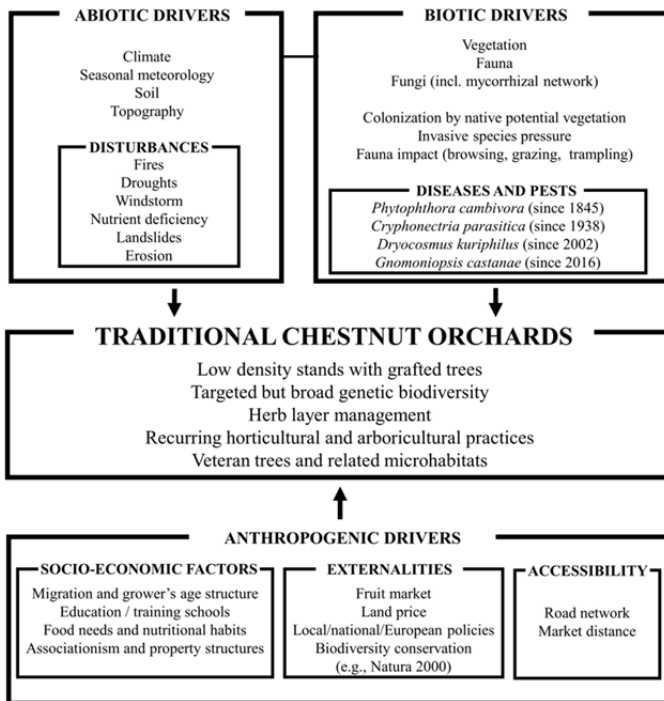


Figure 15.2. Conceptual framework of factors affecting the chestnut orchard cultivation

The open structure and the simultaneous presence of woody elements and open space herb species represent an ideal habitat for many plant and animal species (e.g. Obrist et al. 2011; Morelli et al. 2019). As a result, traditional chestnut orchards are biodiversity hotspots and habitats worthy of conservation (9,260 *Castanea sativa* woods) according to the European Habitat Directive (92/43/EEC). The habitat value is however the result of historical and socio-economic factors (e.g. ownership, food needs) and externalities (e.g. conservation policies, tourism, fruit market) and may thus vary highly in terms of the chestnut tree features (age, density, health, turnover, pruning, variety composition), understory vegetation and related management (mainly grazing and mowing), as well as ecological factors such as stand conditions (climate, soil, topography, accessibility), pest and pathogen incidence and other biotic interactions (e.g. game impact, propagule pressure of potential vegetation) (Figure 15.2).

15.3. The chestnut groves of the Bolognese Apennines

The Bolognese Apennines are located to the southwest of the city of Bologna (Lat. 44.492475; Long. 11.34297). They cover about 2,110 km² and are characterized by a marked altitudinal gradient from 49 to 1,944 m a.s.l. Chestnut cultivation in this area has been rooted since the Middle Ages. On the basis of local tradition, some authors even put forward the hypothesis that the chestnut-growing tradition in this area was actively promoted by Countess Matilda of Canossa (1046–1115), as demonstrated by the custom of designating old traditional chestnut groves as *Matildici* (Alessandri et al. 2020). Chestnuts thus represented a vital staple food for entire generations of mountain people and a commercial luxury product for the nobility and the rich city dwellers of the area. As a result, the abundance of chestnut orchards has been constantly linked to the demographic evolution, with expansion during phases of economic growth and decrease in periods of depression, such as the plague in the 14th century (Zagnoni 1997). The existence of both chestnut (i.e. *Pastonese* cultivar) and *marroni* varieties is confirmed in historical documents such as the chorographic dictionary by Calindri (1781–1783) and the coeval Boncompagni cadaster (Pezzi et al. 2020b). At the beginning of the 20th century, chestnut-dominated formations covered ca. 12,863 ha of the area, at an altitudinal range from 300 to 900 (1,000) m a.s.l., corresponding to the deciduous *Quercus*-dominated and the *Fagus sylvatica* forest belts. Most of them (i.e. 10,928 ha) were classified as chestnut orchards, as reported in 1936 by the Italian Kingdom Forest Map. This map is a very important historical reference allowing us to estimate the dramatic decline of the chestnut orchards (at present covering 1,498 ha; Regione Emilia-Romagna 2020) and their conversion into coppices or high forests over the last 85 years (Ferretti et al. 2018).

15.4. A changing world: abandonment, diseases and other problems

Similarly to other south European areas, the strategic role of chestnut culture was subjected to a first serious threat with the appearance of the ink disease (*Phytophthora cambivora* (Petri) Buisson and Petri 1917) in the 19th century. Existing concerns about this disease were confirmed by Quattrocchi (1938), who found 1,024 ha of chestnut orchards affected by the ink disease in the Bologna Apennines, together with 703 ha completely degraded and 7,862 ha in bad condition because of the lack of appropriate management.

Following World War II, most Apennine villages witnessed a large migratory movement towards cities and plains. The need to find a better way of life and to escape from poverty and famine induced many young people to leave the mountains. This wave of emigration, combined with the heavy war casualties, severely affected the local communities in terms of both number of people and their links to the territory and traditions (Gallingani 2019). The resulting social change produced a progressive abandonment of chestnut culture and related activities such as tree pruning, lawn mowing, collecting foliage and burs. Moreover, the contemporary appearance and spread of the chestnut blight (*Cryphonectria parasitica* (Murr.) Barr; Biraghi 1946) affected the trees' health and fruit production, discouraging most of the remaining chestnut growers: the "bread tree" was considered lost and the chestnut era finished. Experts recommended coppicing the orchard stands (the young sprouts were initially considered as more resistant to the disease; Biraghi 1953) or underplanting them with rapidly growing conifers. Paradoxically, the possibility of selling the felled old and declining trees to tannin factories provided an additional source of income and thus a further stimulus for leaving the mountain regions. This abandonment mainly affected the upper Apennines, where most of the chestnut orchards were devoted to flour production. On the contrary, the orchards producing *marroni* continued to be cultivated, at least to some extent.

15.5. The turning point of the 1980s

In the 1980s, after decades of almost total abandonment of chestnut culture culminating in the 1960s and 1970s, the situation began to change. The appearance and natural spread of the chestnut blight hypovirulence, first observed in Italy at the beginning of the 1950s (Biraghi 1953), allowed the chestnut orchard trees to survive and even to recover from the blight attacks. This fungal infection, defined as a healing canker, was able to colonize the bark and girdle the stem or the branch but remained on the superficial layer of the bark, and the flow of the sap was not affected, leaving the tree untouched and living. Over time, the healing canker evolved and completely healed the original infection (Turchetti et al. 2008).

Contrary to what happened with the American chestnut (Griffin 2000), the natural diffusion of the hypovirulence and the healing form of the chestnut blight gave rise to a new and very optimistic scenario for the European chestnut and its cultivation, particularly in Italy.

Moreover, some emigrants returned home after retirement and began restoring the chestnut orchards and introducing new practical and technological management and marketing strategies, including the birth of growers' associations to sustain the sector. The restoring approach consisted of removing the invading vegetation and pruning the old and grafted chestnut trees. New plantations and, more especially, conversions of coppices into orchards by means of grafting the resprouts (Gherardi et al. 1991) also took place, resulting in a significant increase in chestnut cultivation. In this context, the commercial and valuable *marroni* played a central driving role thanks to their appreciation in urban markets as a high-quality natural product and the related optimal price/performance ratio. Furthermore, when selling chestnut fruits, people also market the traditional culture and the related bucolic landscape, which is indeed far removed from the original and grim reality of the chestnut as the tree of bread. As a result, the restoring activities mostly involved the *marroni* orchards in the lowlands of the Apennines. Interestingly, this happened much less in the upper part of the mountains, where the traditional staple food orchards are located.

15.6. Current constraints and future perspectives

The chestnut tree is currently facing old and new threats (Figure 15.3). Fortunately, the hypovirulence of the chestnut blight is still predominant throughout the whole chestnut range, permitting the survival of trees and their cultivation (Pezzi et al. 2011, 2020a). The ink disease is still widespread in the originally affected areas (unpublished data), but a further spread in terms of new foci is very limited and localized (Ambrosini et al. 1997; Pezzi et al. 2011). This suggests that the pathogen does not have the potential to spread into the whole chestnut area as previously hypothesized. A new threat to the chestnut tree appeared in Europe at the beginning of the 21st century (Brusino et al. 2002) and spread to the Bolognese Apennines starting from 2008 (Graziosi and Santi, 2008): the Asian chestnut gall wasp (*Dryocosmus kuriphilus* Yasumatsu). Even if no trees were directly killed by this pest, the heavy damages to the foliage caused a drastic reduction in fruit production, again turning the confidence of the growers into very pessimistic scenarios. The biological control options with the specific parasitoid *Torymus sinensis* Kamijo (Quacchia et al. 2008) have fortunately proved to be very effective since the biological agent was first released in 2010 (Vai et al. 2014). Damage caused by the chestnut gall wasp is at present very limited and does not affect the

trees' vitality or the fruit production (Pezzi et al. 2020a). Therefore, the management of the main chestnut phytosanitary issues can currently be carried out in a completely biological and sustainable way.

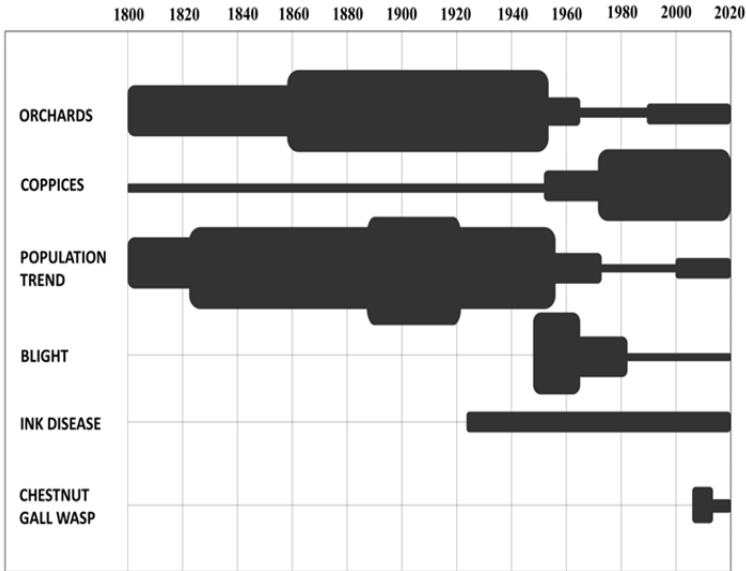


Figure 15.3. Summary of the historical evolution of chestnut orchards and its relationship with the different constraints in the Bolognese Apennines (modified from Pezzi et al. 2011)

A further new risk factor for the chestnut is climate change in general and the ensuing climatic extremes such as summer drought in particular (Conedera et al. 2010). Drought affecting the fruit production occurred in this part of the Apennines in 2017 and 2019. In addition, the chestnut groves were affected by a snowstorm in 2017. Such repeated climatic stress can reduce the resistance of the trees against diseases or cause localized decline phenomena. In this context, the nut rot fungus (*Gnomoniopsis castaneae* Tamietti) newly appeared, severely affecting the fruit production (especially in 2018). Its spread seems to be strictly related to the temperature increase during the vegetative season and particularly at the time of the fruit harvest.

From a socio-economic point of view, the restoration and maintenance of chestnut orchards and their ecological value is closely linked to the presence of interested owners carrying out traditional management. At present, 115 growers mainly located in the lower parts of the mountains and dedicated to *marroni*

valorization are reported as affiliated to the local chestnut growers' association. Interestingly, a generational change is taking place, with an increasing number of young members. In the upper part of the range, there is a small consortium of about 30 members dedicated to chestnut cultivation and flour production. The number of consortia members has changed over the years due to the possibility of easy access to financial support from public bodies. However, there is also the effect of the aging of the growers, with an old generation not always being replaced and the subsequent abandonment of the orchards (Pezzi et al. 2017). In addition, the upper Apennines are still affected by a demographical decrease. On the other hand, the recent rediscovery of the value of flour and the appearance of new products related to chestnut, such as aromatized beers, are opening interesting new scenarios also for the economy of the old flour orchards. Nevertheless, the firms related to agriculture or silviculture in the Apennines show a constant trend of reduction, although slightly slowing down in recent years.

In summary, chestnut cultivation is still vital, but at risk of marginalization and subjected to a balancing act between abandonment and making the recognized multifunctionality potential for the mountains effective. Although the traditional management of chestnut orchards allows a high level of biodiversity to be preserved, there is still a substantial risk of abandonment of these activities, which is related to the low marketing possibilities of products, the highly fragmented property systems, and the aging of the growers and difficulties in granting a management succession. The recognition of the indispensable contribution afforded by chestnut growers should lead to the definition of political choices for territorial governance aimed at supporting, also financially, the work of these subjects. Currently, there is still an important and significant economic income in some areas, but often carried out through personal passion or transmitted between generations as a family cultural heritage. Conserving the multifunctional values of chestnut groves in the Bolognese Apennines thus calls for a complex management strategy that comprises: (i) supporting young growers and helping them to gain possession of chestnut orchards; (ii) supporting associations that enhance the political weight of growers and contribute to spreading traditional and innovative knowledge on chestnut orchards management; (iii) increasing research on both the physiology and ecology of the chestnut and the orchard trees in particular, in order to better cope with future challenges such as climate change and evolving socio-economic conditions, and (iv) exploring new strategies to give added value to the chestnut fruit products in the context of a sustainable management.

A specific effort to safeguard old-growth chestnut orchards could provide a representative example and encourage increased attention to chestnut cultivation, assuring the revitalization of this fundamental heritage of the Italian mountains.

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