

# Spanish chestnut in southwestern France and northern Spain

Edward P. Farrell<sup>a\*</sup>

## Abstract

Spanish or sweet chestnut (*Castanea sativa* Mill.) is a truly multifunctional tree, highly valued for both its fruit and its timber. In Europe, it is found mainly in a small number of countries with a long tradition of chestnut cultivation. It is particularly important in southwest France and northern Spain. It has been cultivated since Roman times and now occurs as high forest, as coppice and in orchards.

Chestnut was historically a valued tree across the whole spectrum of society. Large plantations were established for coppice to provide poles for vineyards, and orchards supplied high-quality fruit for the rich. Peasant communities cultivated the tree for the dual purposes of wood and fruit production. The fruit provided an essential component of their diet through the winter months. The cultivation of chestnut is now declining. However, government-supported schemes are helping to improve neglected coppice and to restore old orchards and establish new ones.

**Keywords:** *Sweet chestnut, marron, coppice, multifunctional stands.*

## Background

Spanish or sweet chestnut (*Castanea sativa* Mill.) is generally considered to be native to southern Europe, having reached there from its post-glacial refugia in Eastern Turkey (Villani et al. 1991, cited by Pereira-Lorenzo and Ramos-Cabrer 2004). It has long been recognised as a particularly useful species. In consequence of this, there has been, for over 3,000 years, a strong human influence in its movement and its introduction to many countries, in temperate regions. It was apparently introduced into Britain by the Romans and reached Ireland sometime before the 17<sup>th</sup> century (Nelson and Walsh 1993).

The species has a variety of common names in English. In addition to Spanish and sweet chestnut, it is also known as European chestnut, Portuguese chestnut and “marron”. Sweet and Spanish are the adjectives best known for the species in Britain and Ireland, but their origins are not entirely clear. It seems that the reason for any prefix is to distinguish the tree from horse chestnut (*Aesculus hippocastanum* Linnaeus). The importance of the species in the Iberian Peninsula is reflected in the word “Spanish” used to describe it, although it could be argued that “French” would be a more appropriate descriptor. This author was unable to find documented explanation as to why “sweet” is used to describe the species. Most likely, it was

---

<sup>a</sup> Sequoia, Mart Lane, Foxrock, Dublin 18.

\*Corresponding author: epfarrell@gmail.com

applied originally to the less abundant, but economically more important trees bearing the sweet, high-quality fruit, known as “marron” (more about this below).

While chestnut occurs from southern Europe to Britain and Ireland, chestnut forests and orchards are concentrated in a small number of countries with a long tradition of chestnut cultivation: France, Italy, Spain, Portugal and Switzerland. By one estimate, France accounts for over 45% of the total area of chestnut in Europe (Conedera et al. 2004). In keeping with the theme of this series of articles, the focus here is on southwest Europe.

### **Ecology**

According to Afif-Khouri et al. (2011), chestnut in Asturias, in northern Spain, performs best under conditions of high rainfall, with a frost-free period of at least three to four months on soils with a relatively high base status. The high base status might appear to contradict both the perceived wisdom that chestnut “prefers” acid soils and the experience in the Dordogne, in southwest France, where chestnut is confined to acid soils rather than the predominant limestone soils of the region. Afif-Khouri et al. (2011) explain this apparent discrepancy through their finding that on the one hand, while chestnut will tolerate acid conditions, such conditions are not optimum for the species and on the other, that the crucial element contributing to the high base status in their study was magnesium, rather than calcium which will generally dominate on calcareous soils. Thus, Pereira-Lorenzo and Ramos Cabrer (2004) recommend the application of a magnesium fertiliser on soils with a pH greater than 6.

Chestnut is particularly intolerant of waterlogged soil, which leads to a higher incidence of ink disease (*Phytophthora cambivora* (Petri) Buisman and *P. cinnamomi* Rands). Ink disease is easily recognised by a blue-black stain around damaged roots, producing root and collar rot. Interspecific hybrids from *C. sativa* (Miller) with *C. crenata* (Siebold and Zuccarini) (Japanese chestnut, the most important Asiatic species) or *C. mollissima* (Blume), another Asiatic species, have greater resistance to ink disease. Chestnut breeding in Europe began with the production of hybrids resistant to ink disease in the first half of the 20<sup>th</sup> century (Pereira-Lorenzo and Ramos Cabrer 2004).

Another pathogen of chestnut, chestnut blight (*Cryphonectria parasitica* (Murrill) Barr) destroys the bark and cambium and is usually fatal. *C. sativa* may be less susceptible to chestnut blight than American chestnut, *C. dentata* (Marshall, Borkhausen).

Bees and nectar-loving insects are attracted to the heavily scented flowers of chestnut. Squirrels will eat the nuts. Young and newly-cut coppice is attractive to scrub and ground-nesting birds.

## Distribution

Conedera et al. (2004) produced the first comprehensive account of the distribution of chestnut in Europe. This was a complex task due to the versatility of the species and the different management systems under which it is cultivated. Chestnut trees occur as both the dominant and minor species in forest stands, with or without a defined productive purpose (timber or fruit), as dual-purpose trees, as high forest or coppice. Stands designated for fruit production may be orchards or high forest. Chestnut orchards are a traditional form of agroforestry, combining fruit production with intercropping with cereals, hay or pasture.

Due to its suitability for both wood and fruit production, chestnut has a history of cultivation in Europe going back to Roman times. In the Middle Ages, large coppice plantations were established by the great monasteries and also in the wine producing regions, as the coppice provided abundant stakes needed to support the vines.

The area of chestnut in southwest Europe is small compared to species of pine or eucalypt, but it has long been a species valued for its fruit and the versatility of its timber. Estimates of the total area of the species in France vary from 732,000 ha, according to the French forest inventory (Anon. undated) to in excess of 1 M ha, 6.7% of the total forest area (Condera et al. 2004); Condera's figure comprises high forest, coppice, coppice with standards and orchards; the last-mentioned is usually not from forest statistics.

In France, chestnut was first planted extensively in the Middle Ages. In the southwest, the largest area of the species is in the Dordogne. The Dordogne has the fifth largest forest area of all the French departments. It is one of five departments in the Aquitaine region. Almost all the forests of the Dordogne are broadleaved, some mixed with maritime pine (*Pinus pinaster* Ait.). It is interesting to note that in a region dominated by the vast maritime pine forests of the Landes, according to CRPF (Le Centre Régional de la Propriété Forestière d'Aquitaine), the standing volume of chestnut in Aquitaine is about 16 M m<sup>3</sup>. Much of the surface geology of the Dordogne is limestone. However, the chestnut grows on acid outwash sands which occur on the hills, overlying the limestone.

In Spain, chestnut is grown at relatively high elevations (400 to 1,000 m), compared to southern France. Estimates of the area of chestnut in pure and mixed stands vary considerably from 138,000 (Condera et al. 2004) to in excess of 272,000 ha (Afif-Khoury et al. 2011, Menéndez-Miguélez et al. 2013). Most chestnut stands in Spain are situated in the northwest, in Asturias. Chestnut is the most abundant forest tree species in the province, covering almost 120,000 ha (Jose Alberto Oliveira Prendes, University of Oviedo, unpublished). Chestnut also occurs further west, in Galicia, mainly in the mountainous, eastern part of the province and in the adjoining western region of Castile-Leon. In Galicia, the emphasis is on chestnut

orchards, for fruit production, located mainly in the southern province of Orense. Efforts are being made to develop this industry (Jacobo Aboal, Xunta de Galicia, pers. comm.). Grazing is traditionally practised in orchards in Galicia (Eloy Villada, Xunta de Galicia, pers. comm.). Chestnut for timber production is not developed to its full potential in Galicia, but is much better developed in Asturias (Victor M. Garcia, Xunta de Galicia, pers. comm.).

Information from Portugal is limited, but the area of chestnut has been reported as 40,579 ha. Seabra et al. (2001) report a figure of 19,881 ha in fruit production. Both orchards and chestnut forest are located, in the main in north-central Portugal.

### **Chestnut in the Dordogne**

Coppice management in the Dordogne is well organised with an active furniture and joinery industry. Much of the coppice originated as orchards, specially planted for that purpose. Many of these were abandoned in the 19<sup>th</sup> century. In recent times, fruit producers in the Dordogne and Aveyron, in the Midi-Pyrénées region, have tended to establish new orchards, whereas in southeastern France, growers have generally regenerated old orchards. These old orchards tend to produce smaller nuts because of the lack of pruning.

Almost all the forests of the Dordogne are privately owned. There are 100,000 owners in the in the Dordogne, 10,000 of whom own more than 10 ha. Forest work in the region was always secondary to farming. In the past, stand quality declined with the use of coppice for fuel, as quality was not an important issue. Wood was used for fencing, fuel and as a support for agriculture. Chestnut wood is very good for fuel. Traditionally, it was used, as coppice, for charcoal for iron smelting or directly for steel manufacture; this declined in the 19<sup>th</sup> century.

The mission of CRPF is to direct the management of private forests in France and to provide training and information services to forest owners. It actively supports chestnut growers in the Dordogne, encouraging good silviculture, accrediting management plans and assisting in obtaining PEFC certification. Thinning is now seen as a priority, with thinning to waste encouraged where appropriate. There is concern about the sustainability of the resource, its uneven age-structure, lack of maintenance and wood quality. There is also concern about the impact of climate change on wood quality due to the sensitivity of chestnut to spring and summer drought and to late spring frost.

Coppice (Figure 1) is harvested at 35-40 years, stems ~20 cm diameter, cut in 2 m lengths. On average, about 10% of the total produce goes for furniture or joinery; in the best stands, about 50% of the total is used for these purposes. Flooring is cut to 1-2 m lengths from stems 12 cm in diameter. The residue is used for pulp or fencing. However, chestnut is not favoured for pulp as, because of its high tannin content, it must be bleached. Dead stems are used for fuel.



**Figure 1:** *Managed coppice, Villefrance-du-Périgord, the Dordogne.*

Forest policy aims to improve the quality of the coppice and to develop even-aged stands. For about one third of the chestnut forests in the Dordogne, those on the best soils, in the south of the department, it is possible to grow saw-timber for flooring and barrels (Figure 2). Where the existing coppice is poor, the aim is to replace it with maritime pine / chestnut mixtures. Pine is planted in rows 15 m apart with chestnut coppice in between; this is not ideal, but is the best that can be achieved. Cost is the first concern, but owners are concerned about changes to the traditional landscape. They want to return to conditions that are good for mushrooms and for hunting; cèpes (*Boletus edulis* Bulliard) mushrooms do best in mixed forest. Hunting is also improved because there is better cover and food for game and pine provides good lines of sight.

Chestnut is also an important species in Poitou-Charentes, immediately northwest of the Dordogne. There chestnut is utilised differently from the Dordogne; the industrial sector is poorly developed; consequently, much of the wood goes for pulp with a small amount of joinery.

#### **A multifunctional tree for rich and poor**

Chestnut was, historically, a valued tree across the whole spectrum of society. Chestnut is a truly multifunctional tree, providing wood for construction, roofing, furniture, baskets, tools and poles for supporting vines, as well its use for firewood



**Figure 2:** *Chestnut for joinery, Villefranche-du-Périgord, the Dordogne.*

and for tanning. In addition, it provided an essential component of the diet of rural communities and for the rich, higher quality varieties of the fruit were used to produce an expensive delicacy, “marrons glacés”.

Historically, chestnut was grown by peasant farmers to produce both fruit and timber (Figure 3). It was referred to as “pain de pauvre”, the bread of the poor, or “l’arbre à pain”, the “bread tree” (Bourgeois 1992). It was the staple diet of rural populations, assuring their survival in times of shortage. This was particularly true of isolated communities in the mountains of Galicia, in northwest Spain, in Trás-os-Montes and in Portugal. For centuries before the arrival of the potato, populations in chestnut regions depended on the fruit, as virtually their only food, through the winter months.

Grafting was practised to improve fruit production and quality. The trees were topped above the grafting point, 2 m above ground, producing multiple shoots, suitable for pole production. Dual purpose trees are still favoured in Galicia today (Pereira-Lorenzo and Ramos Cabrer, 2004).

In the mountains of Galicia, holdings were traditionally very small. Sometimes an owner had just one tree for nut production. It is said that a family, their pig and perhaps a cow, could survive through the winter on the fruit of a single tree. This was

undoubtedly a monotonous diet (it also gave rise to flatulence), but chestnuts can be eaten raw, boiled, baked or roasted and can be incorporated into a variety of recipes. Daily consumption of chestnuts in these communities was 1- 2 kg per day (Kipple and Kriemhild 2000). They were generally eaten fresh until January. Later in the winter, dried chestnuts were used. Peeling by hand was a very tedious operation taking as much as three hours per day for a family of five (Kipple and Kriemhild 2000). Then early in the morning the newly peeled chestnuts were boiled. Drying the chestnuts, often in purpose-built smoking sheds, greatly reduced the labour involved in peeling.

Chestnut is an excellent food source. Dried chestnuts provide 371 calories per 100 g. Potatoes, by comparison provide 86 and wholegrain wheat bread 240 calories per 100 g. In addition, chestnuts are a significant source of trace minerals and are also the only nut to contain a significant amount of vitamin C (Randoin et al. 1976, cited by Kipple and Kriemhild 2000).

In France, there are two words for chestnut, “châtaigne” and “marron”. Châtaigne was the chestnut of the peasant, the basis of his diet for much of the year. Marron was the product of a lower-yielding, higher quality variety of chestnut, such as marigoule, the fruit of a hybrid of *Castanea sativa* and *C. crenata* (Siebold and Zucc.). A marron-type cultivar is characterised by the low percentage of poly-embryonic nuts (Pereira-Lorenzo



**Figure 3:** Dual-purpose trees. A Fonsagrada, Lugo Province, Galicia.

and Ramos Cabrer 2004). The marron is large, globular and broader than long, and usually occurs as a single embryo. They were grown commercially, mainly in Italy and in a few areas in France, to sell to the rich (Kipple and Kriemhild 2000). These high-quality nuts have been used since the late 17<sup>th</sup> century in the production of the French and Italian delicacy, “marrons glacés”, chestnuts candied in sugar syrup and glazed.

### **The Future**

Chestnut production, for both timber and fruit, is declining throughout Europe, although efforts are being made to stem this decline. Nut production in France has gone from 500,000 t yr<sup>-1</sup> in the late 19<sup>th</sup> century to less than 10,000 t today. In southwest France, production is about 3,500 t, most of it in the Dordogne (Hennion 2010). In the mid-nineteenth century, there were 80,000 ha in chestnut orchards in France; now there are about 5,000 ha. Many factors have contributed to the decline. It may have started with the spread of ink disease and the introduction of an alternative staple food, the potato. Chestnut use has also been replaced by cereals. Both chestnut orchards (harvesting is still carried out by hand in most orchards) and coppice management are labour intensive and many coppices have been abandoned or their rotation length markedly increased. These factors and the depletion of the rural population have contributed to the decline. Other factors include the widespread felling of chestnut stands for tannin production.



**Figure 4:** *Bole burned to prevent ink disease. A Fonsagrada, Lugo Province, Galicia.*

Against this trend, new orchards are being established. New orchards are best established on slopes to afford good drainage (Pereira-Lorenzo and Ramos Cabrer 2004). However plantations on steep slopes can only be used for timber production, as they do not easily allow mechanisation. Cutini (2001) explored new management options for chestnut in Italy. The increasing demand for high quality wood cannot be met through traditional short-rotation coppice. He concluded that highly productive stands could be managed sustainably for sawlog production through relatively heavy thinning and longer rotations than are currently used. Stands for timber production should be located in areas of relatively high rainfall (over 1,000 mm per annum in Spain), so as not to limit growth (Pereira-Lorenzo and Ramos Cabrer 2004). The aim in timber production is to produce a branch-free trunk of up to 7 m in length (Pereira-Lorenzo and Ramos Cabrer 2004). *C. sativa* is best for timber production, being the most vigorous. It also produces the largest nuts, but not the best flavoured (Pereira-Lorenzo and Ramos Cabrer 2004).

In southern Galicia, south-facing slopes are favoured for vineyards, north-facing for chestnut orchards (Pereira-Lorenzo and Ramos Cabrer 2004). Currently old orchards are being coppiced to transform them into timber stands. Government support and advice is available for this work.

### **Afterword**

Spanish chestnut is a special tree. It is an integral component of the landscape over much of southwest Europe. It is a tree with a long history, endowed with many traditions. Over the centuries, it made an important contribution to the survival of rural communities. But while it provided both “the bread” and the wood of the poor, it was also a tree of the rich, a valuable source of wood for monasteries and large vineyards and for a delicacy manufactured from its fruit.

In the region, it has been in decline for more than a century. The flight from the countryside, increasing affluence, the high cost of labour, alternative food sources, have all contributed to the decline. Despite this, the future for the species is relatively bright. There is no doubt that chestnut remains a highly valued tree. For many, mushroom production is the main benefit provided by Spanish chestnut stands. For others, chestnut coppice is favoured for hunting. Governments throughout the region promote its retention, whether through the improvement of coppice, for the production of sawlogs, or the development of orchards. Spanish chestnut will remain a special tree for a long time to come.

### **Acknowledgements**

I am heavily indebted for the assistance given me by Sébastien Drouineau, CRPF, Bordeaux and to Roque Rodríguez, University of Santiago de Compostela, Lugo. They in their respective areas, the Dordogne and Galicia, gave a great deal of help

and information on the history and current status of the chestnut industry. Much of the unattributed information in this article is derived from discussions with them and with Joël Lefievre, CRPF, Lambras, le département de la Dordogne. Thanks also to Jacobo Aboal, Eloy Villada and Victor M. Garcia, Xunta de Galicia, Santiago de Compostela and Lugo.

My thanks are due also to Jean-Michel Carnus, INRA, Pierroton, Aquitaine and Agustín Merino, University of Santiago de Compostela, Lugo, who facilitated my stays in Aquitaine and Lugo, respectively and both of whom generously assisted me during my visits there.

## References

- Afif-Khoury, E., Álvarez- Álvarez, P., Fernández-López, M.J., Oliveira-Prendes, J.A. and Cámara-Obregón, A. 2011. Influence of climate, edaphic factors and tree nutrition on site-index of chestnut coppice stands in north-west Spain. *Forestry* 84(4): 385-396.
- Anon. Undated. *Résultats d'Inventaire Forestier. Résultats Standards. La France Administrative. Les Résultats des Campagnes d'Inventaire 2008-2012*. IGN, pp 179.
- Bourgeois, C. 1992. *Le Châtaignier, un Arbre, un Bois*. Institut pour le développement forestier, Paris, pp 352.
- Condera, M., Manetti, M.C., Giudici, F. and Amorini, E. 2004. Distribution and economic potential of the sweet chestnut (*Castanea sativa* Mill.) in Europe. *Ecologia Mediterranea* 30(2): 179-193.
- Cutini, A. 2001. New management options in chestnut coppices; an evaluation on ecological bases. *Forest Ecology and Management* 141: 165-174.
- Hennion, B. 2010. Chestnut production in France: Review, Perspectives. *Acta Horticulturae* (ISHS) 866: 493-497.
- Kipple, K.F. and Kriemhild, C.O. (Eds). 2000. *The Cambridge World History of Food*. Cambridge University Press, pp 1958. Available at <http://www.cambridge.org/us/books/kipple/chestnuts.htm> [Retrieved September 2014].
- Menéndez-Miguélez, M., Canga, E., Barrio-Anta, M. and Majada, J. 2013. A three level system for estimating the biomass of *Castanea sativa* Mill. coppice stands in north-west Spain. *Forest Ecology and Management* 29: 417-426.
- Nelson, E.C. and Walsh, W.F. 1993. *Trees of Ireland, Native and Naturalised*. Lilliput Press, Dublin, pp 247.
- Pereira-Lornezo, S. and Ramos-Cabrer, A.M. 2004. Chestnut an ancient crop with future. In *Production Practices and Quality Assessment of Food Crops, Volume 1 Preharvest Practices*. Eds Dris, R. and Jain, S.M., pp 105-161.
- Randoin, L. and Le Gallic, P., Depuis, Y., Bernardin, A., Duchene, G. and Brun, P. 1976. *Tables de Composition de Aliments*. Institut d'Hygiène Alimentaire, Paris, pp 116.

- Seabra, R.C., Simões, A.M, Baeta, J. and Pais, M.S. 2001. Evaluation of Portuguese chestnut stands by RAPDS. *Forest Snow Landscape Research* 76: 435-438.
- Villani, F., Pigliucci, M., Benedettelli S. and Cherubini, M. 1991. Genetic differentiation among Turkish chestnut (*Castanea sativa* Mill.) populations. *Heredity* 66: 131-136.