Italy

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Facts and Figures

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Definitions

General definitions

(1) Simple coppice without standards ("simple coppice" hereafter): At each rotation (approx. 8-10 years), all shoots are removed by clear cut. This kind of coppice system is in general permitted for certain species (e.g. black locust, poplar, willow, common hazel) depending on local (regional) forest law. Short rotation coppice theoretically fall under this definition, even though these are no longer considered (Ordinance (D.lgs.) n. 34/2018) under forestry.

(2) Simple coppice with strandards ("coppice with standards" hereafter): When coppice is felled a minimum number of standards per hectare is left depending on local forest law (e.g. 60 standards/ha in case of oak and beech coppice; 30 standards/ha in case of chestnut coppice).

(3) Uneven-aged coppice: coppice with shoots of different ages on the same stump (usually three age classes). Based on coppice selection system; the oldest (i.e. the biggest) shoots are cut every 6-8 years and a light thinning of the smaller shoots is also done.

(4) Compound coppice: forest managed with the aim to obtain a stand formed by a coppice and a high forest. It is characterised by the coexistence on the same area of a coppice, managed with clear cut, and a high forest managed with a selection system and therefore formed by trees of different age classes, that is approximately 2, 3 and 4 times (rarely more) the coppice rotation age.

(5) Mixed management system: This category brings together very heterogeneous and widespread situations, originating from the historic compound coppice system (more precisely called as a high forest above coppice or coppice below high forest, according to the prevailing layer, or by silvicultural interventions varied over time). Mixed management stands are those stands made up of shoots (of vegetative origin) and a variable number of standards (of generative origin), generally of species different from those of the coppice. The latter, which are "older" than the shoots and are distributed in at least 2 diameter classes, must provide for 25% of the crown cover. Below this threshold the stand is classified as simple coppice with standards. If the standards cover exceeds 75%, the stand is then classified as high forest. Operationally, 40% standards' cover is pursued. In addition, if standards belong to just one diameter class or their number per hectare is less than 30, the stands has to be considered as a simple coppice with standards. On the contrary if standards' density is above 300 n/ha, the stand has to be considered as a coppice undergoing conversion to high forest. Finally, also those stands where standards consist of native conifer species are assimilated to mixed management system.

(1) Ceduo semplice senza matricine: Ad ogni rotazione (circa 8-10 anni) tutti i polloni sono rimossi con un taglio raso. Questo tipo di ceduo è consentito solo per alcune specie (a esempio, robinia, pioppo, salice, nocciolo) a seconda dei regolamenti forestali regionali". In questa definizione sono teoricamente compresi i cedui a turno breve (SRC), che il D.lgs. n. 34/2018) non considera una forma di selvicoltura.

(2) Ceduo semplice matricinato: Ad ogni rotazione il ceduo è tagliato a raso lasciando un numero minimo di matricine per ettaro a seconda dei regolamenti forestali regionali (a esempio, 60 matricine per cedui di quercia e faggio, 30 matricine per cedui di castagno).

(3) Ceduo a sterzo: cedui con polloni di età diversa sulla stessa ceppaia (solitamente di tre classi di età). Si basa sul sistema di selezione dei polloni, vale a dire che ogni 6-8 anni i polloni più grandi e di maggiore età vengono tagliati con un contemporaneo leggero diradamento dei polloni più piccoli.

(4) Ceduo composto: Il ceduo composto è una forma di governo rivolta a creare o a gestire soprassuoli formati da un ceduo ed una fustaia, in cui le due componenti si combinano sullo stesso tratto di terreno boscato. La componente a fustaia di solito è formata da matricine di età pari a 2, 3 e 4 volte (raramente di di più) la durata del turno del ceduo.

(5) Governo misto: questa categoria raggruppa situazioni assai eterogenee e diffuse, originate dallo storico governo a ceduo composto, più precisamente denominato come fustaia sopra ceduo o ceduo sotto fustaia, a seconda dello strato prevalente, o da interventi selvicolturali variati nel tempo. Si definiscono boschi a governo misto i soprassuoli costituiti da polloni (rinnovazione di origine agamica) e da un numero variabile di riserve (di origine gamica), generalmente di specie diverse da quelle del ceduo, in cui la copertura dei soggetti affrancati, di età (in pratica diametro) superiore a quella del ceduo e appartenenti ad almeno 2 classi di diametro, è compresa tra il 25% (al di sotto si ricade nel ceduo semplice matricinato) e il 75% (al di sopra si ricade nella fustaia) del totale. Nella pratica si consiglia il 40% di copertura dei soggetti affrancati. Se la classe di diametro delle riserve è una sola o se queste sono presenti in numero inferiore a 30 per ettaro di superficie, il soprassuolo viene considerato a ceduo semplice matricinato; se le riserve sono più di 300 per ettaro, si ricade nella forma del ceduo in conversione. I boschi cedui con presenza di conifere di specie autoctone sono assimilati ai boschi a governo misto.

Ciancio O., Nocentini S. (2004). *Il Bosco ceduo. Selvicoltura, Assestamento, Gestione [The coppice forest. Silviculture, Regulation, Management]*. Accademia Italiana di Scienze Forestali. ISBN 88-87553-06-8. Tipografia Coppini, Firenze, pp. 721. [in Italian].

Piussi P., Alberti G. (2015). *Selvicoltura generale. Boschi, societa e tecniche colturali [Silviculture. Forests, societies, and coltural techniques]*. Compagnia delle Foreste, Arezzo, Italy, pp. 432. [in Italian].

Mairota P, Manetti Mc, Amorini E, Pelleri F, Terradura M, Frattegiani M, Savini P, Grohmann F, Mori P, Terzuolo PG, Piussi P (2016). *Opportunities for coppice management at the landscape level: the Italian experience*. iForest, p. e1-e8, ISSN: 1971-7458, doi: 10.3832/ifor1865-009

Definitions according to the 2nd Italian National Forest Inventory (2005)

(1) Coppice (simple coppice or coppice without standards): forest stand completely composed of shoots, or dominated by shoots, as opposed to trees originating by seed (less than 20 standards per ha).

(1) Ceduo (senza matricine): soprassuolo totalmente edificato da polloni o prevalenza di questi ultimi rispetto ai soggetti arborei di origine gamica (meno di 20 matricine/ettaro).

(2) Coppice with standards: forest stand composed of shoots and standards (the latter between 20 and 120 per ha; the age of the standards is equal to 1 or 2 times the coppice rotation age).

(2) Ceduo matricinato: soprassuolo costituito da polloni e matricine (queste in numero compreso tra 20 e 120 ad ettaro, ed età pari a 1 o 2 volte il turno).

(3) Compound coppice: forest stands composed of shoots and standards (the latter > 120 per ha; the age of the standards is not uniform, and can be greater than 3 times the coppice rotation age).

(3) Ceduo composto: soprassuolo costituito da polloni e matricine (queste in numero superiore a 120 ad ettaro e di diverse classi di età, anche superiore a 3 volte il turno.

(4) Coppice in conversion to high forest (in Italian forestry literature and jargon is called "transitory high forest"): forest stand completely composed of shoots, or dominated by shoots, as opposed to trees originating by seed; the signs of thinnings carried out to prepare the stand to regenerate from seeds are clearly evident).

(4) Fustaia transitoria: soprassuolo totalmente edificato da polloni o prevalenza di questi ultimi rispetto ai soggetti arborei di origine gamica; riconoscibili segni evidenti di taglio di conversione.

...where coppice is further divided into:

(1) Young coppice: the age of shoots is less than half of the customary coppice rotation age.

(1) Ceduo giovane: con riferimento al turno consuetudinario praticato localmente o in aree limitrofe ai cedui semplici o matricinati di quel tipo forestale, fase in cui l'età dei polloni non supera la metà del turno.

(2) Adult coppice: the age of shoots is close to the customary coppice rotation age.

(2) Ceduo adulto: fase in cui l'età dei polloni è prossima al turno.

(3) Old coppice: the age of shoots is clearly greater than the customary coppice rotation age.

(3) Ceduo invecchiato: l'età dei polloni è chiaramente superiore a quella del turno consuetudinario.

(4) Coppice in the regeneration phase: forest stand after the final cut; the cut was carried out in the current year or the year before; the shoots reach the height of 1.3 m.

(4) Ceduo in rinnovazione: stadio immediatamente successivo ad un intervento di taglio eseguito nell'anno in corso o in quello precedente; i ricacci, se presenti, raggiungono 1,3 m di altezza.

(5) Uneven-aged coppices: presence of shoots of different stem sizes (age) on the same stump.

(5) Ceduo a sterzo: compresenza di polloni di dimensioni (età) differenziate sulla stessa ceppaia.

Gasparini P., Di Cosmo L., Floris A., Notarangelo G., Rizzo M., 2016 – Guida per i rilievi in campo. *INFC2015 – Terzo inventario forestale nazionale*. Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Unità di Ricerca per il Monitoraggio e la Pianificazione Forestale (CREA-MPF); Corpo Forestale dello Stato, Ministero per le Politiche Agricole, Alimentari e Forestali. 341 pp. https://www.inventarioforestale.org/it/node/72. Last accessed on June 4th, 2018.

Legal Framework

There are several definitions of Forest, depending on local (regional) forest law. For instance:

- The National Forest Inventory has adopted the FAO-FRA definition of forest: Land spanning more than 0.5 ha with trees higher than 5 m and a canopy cover of more than 10%, or trees able to reach these thresholds in situ.
- In Italy (D.lgs. 34/2018) forest is defined as: land spanning more than 0.2 ha with a tree canopy cover of more than 20%.

Restrictions for coppice forests are mainly based on: size of cutting area; rotation period; number of standards. These restrictions can vary in the different administrative regions, depending on local forest regulations. For instance, in the Tuscany region the following restrictions are provided:

- maximum cutting area = 20 ha;
- minimum rotation period: 8 years for chestnut, black locust, poplar, willow, alder, common hazel; 24 years for beech; 18 years for oak and other species;
- maximum rotation period: coppice forests older than 50 years must be converted to high forest;
- number of standards: in the case of coppice with standards, a minimum of 60 standards/ha must be left in the forest (a minimum of 30 standards can be left in case of chestnut forest); in the case of compound coppice, a minimum of 150 standards/ha must be left in the forest, with at least 75 standards older than twice the rotation period.

Although there are differences among the 21 administrative regions/autonomous provinces, simple coppice (coppice without standards) can only be applied to certain species, such as *Salix* spp., *Robinia pseudoacacia* (L.), *Populus* spp., *Alnus* spp., *Corylus avellana* and *Castanea sativa*. In addition, some restrictions refer to the size of the maximum cutting area, which is usually equal to 20 ha, as in the Tuscany region.

Rotation Period

The rotation period varies depending on forest species and administrative region. However, the most common minimum rotation periods are the same as in Tuscany (see above). In most regions, when the coppice is not cut for 40 years it takes the legal status of high forest.

Typology

Simple coppice	Traditional natural forest regeneration method
Coppice with standards	*Fagus sylvatica, Quercus petraea, Q. pubescens, Q. robur, Q. cerris, Q. frainetto, Q. trojana, Q. ithaburensis* subsp. *Macrolepis, Castanea sativa, Ostrya, Carpinus, Q. ilex, Q. suber*, Hygrophilous forest, other (evergreen-) deciduous forest
Pollarding	No longer used
Short rotation coppice	*Populus* spp., *Salix* spp., *Robinia pseudoacacia*, *Eucalyptus* spp., *Alnus glutinosa, Platanus, Ulmus* spp., *Castanea sativa*
Other types	Compound coppice; Coppice in conversion to high forest (esp. *Fagus sylvatica*); Uneven-aged coppice (limited to *F. sylvatica* and *Q. ilex*)

Images

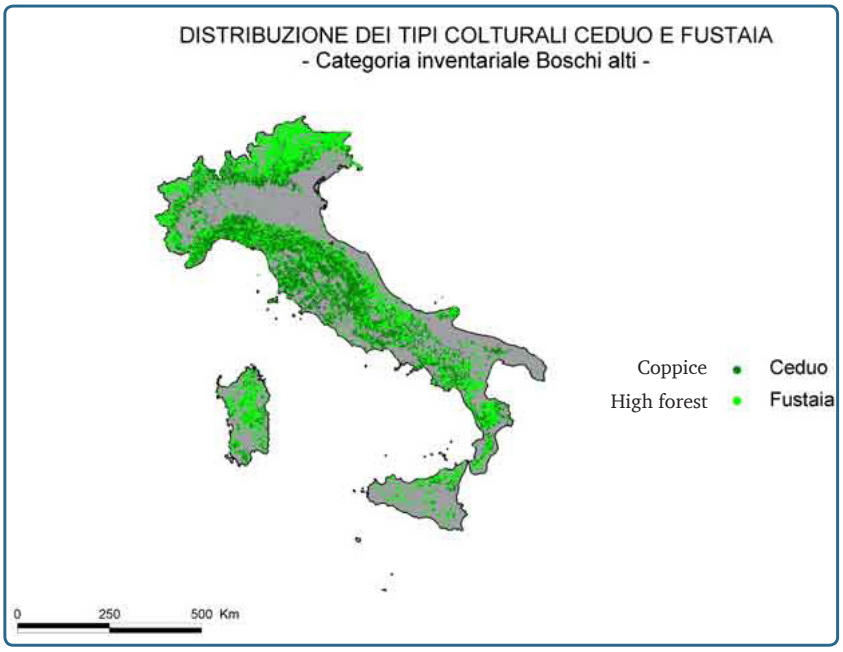
Uneven aged coppice; beech (both of above)

Coppice with standards: chestnut (upper left), downy oak (upper right), holm oak (lower left), turkey oak (lower right)

Mixed management systems

Coppice conversion to high forest; beech (left), oak (right)

Map



Map of coppice in Italy (dark green). Source: INFC (2005)

Reference

INFC (2005) Ministero delle Politiche Agricole Alimentari e Forestali - Corpo Forestale dello Stato Consiglio per la Ricerca e la Sperimentazione in Agricoltura (CRA-MPF) http://www.sian.it/inventarioforestale/img/cartogrammi/ceduo_fustaia.jpg

Description

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Coppice management is the most common silvicultural system in Italy. Within the approximately 8,500,000 ha of Italian forests, the forest land classified as coppice currently includes almost 35% of the national forest cover (approximately 3,666,310 ha) (INFC 2007), yet its distribution varies between administrative units (INFC 2007). This amount has been almost stable since the 1960s (La Marca & Bernetti 2011). Some stands, still regularly coppiced, have been managed this way for several centuries (Piussi 1979, Amorini & Fabbio 2009, Piussi & Redon 2001). However, some stands are relatively recent, such as those (a) derived from oak high forests exploited during the second half of the XIXth century to provide railroad sleepers, (b) resulting from salvage operations in sweet chestnut orchards destroyed by chestnut blight (*Cryphonectria parasitica* [Murr.] Barr.) in the 1940s and 1950s, and (c) derived from woodlands spontaneously or purposely established on abandoned farmland for fuelwood production during recent decades (Del Favero 2000).

The most important species traditionally managed as coppice are deciduous oaks (*Quercus* spp., 33%), European hop hornbeam (*Ostrya carpinifolia* Scop., 17%), beech (*Fagus sylvatica* L., 13%), sweet chestnut (*Castanea sativa* Miller, 16%), which are usually grown as pure stands, and the evergreen holly oak (*Quercus ilex* L., 10%), which frequently grows in mixed stands. As with most (63.5%) of the forest cover in Italy, coppice woodlands are mainly under private ownership. Nowadays, this silvicultural category is based on stools. Among the coded coppice silvicultural systems (i.e., simple coppice, coppice with standards – Matthews 1989, Nyland 2002, and compound coppice – Nyland 2002), coppice with standards is typically applied (76% of coppice woodlands - INFC 2007), while simple and compound coppices account for 24% and 16%, respectively. Other forms of coppice, e.g. shredded trees and pollards, can be currently found only as relicts and/or in agricultural landscapes.

Italian coppices account for approximately 19% of coppice in the EU28, which in turn represents 83% and 52% of coppice in Europe and at a global level, respectively (UN-ECE/FAO 2000).

Negative environmental impacts of coppice are mainly due to how this system was implemented in the past social, technical and economic context. Historically, coppice represents an important source of firewood and, until some 50 years ago, management criteria were based on short rotations (8-12 years), removal of all biomass, including deadwood and litter, and the occasional introduction of agricultural crops following coppice harvesting and grazing (Piussi et al. 2006). Nutrient losses were quite high and erosion was unavoidable, often resulting in forest degradation. These adverse effects are not necessarily the result of coppicing as such, but mainly of poor management practices, including grazing, litter collection and tillage for food crops during the 2-3 years after final harvesting, dictated by need and various physiographic, economic and social constraints (Fabbio 2010). Over time, regulations have been issued to limit activities and disturbances, without which the benefits derived from the coppice system hindered what has been conceived of, and empirically demonstrated through the centuries, as a sustainable wood production system (Mairota et al. 2016a). This more conservative use of coppice woodlands is considered effective in reducing impacts on ecosystem characteristics

and processes such as the water cycle, humus loss and nutrient removal (Piussi & Alberti 2015), particularly when carried out within the limits of the optimal ecological conditions of the dominant tree species (Del Favero 2000) and coupled with planning and implementation of appropriate harvesting systems and sustainable mechanisation levels (Pentek et al. 2008; Marchi et al. 2016; Venanzi et al. 2016). In both coppice and coppice thinned during conversion to high forests, the main harvesting methods for wood extraction (Cut-To-Length, C.T.L. or Tree-Length-System, T.L.S.) use tractors with winches (winching and skidding), tractors and trailers or tractors with bins (Picchio et al. 2009, Laschi et al. 2016). Mules and chutes are used in particular contexts (e.g. protected areas, steep terrain). Firewood bundling machines are considered in flat areas to improve safety during loading operations onto trucks before transportation. The main wood products from coppice are: firewood and poles, as well as in some cases sawlogs (chestnut and black locust) and woodchips (also produced from logging residues).

However, a negative attitude (mainly on the part of academics, controlling authorities and conservationists) towards coppice still persists both in the criteria applied to current coppices and in the recommendations for protected area management (Mairota et al. 2016b), as well as in guidelines for the monitoring of Natura 2000 habitats and species (cf. Angelini et al. 2016). Criteria for current coppice includes a higher density of standards than was traditionally used, which has crept into regulations at different administrative levels without precise scientific support (cf. Zanzi Sulli 1995, Fiorucci 2009, Mairota et al. 2016a). Their implementation has resulted in the transformation of many original Italian coppice with standards into stands with a high density of overstood coppice and declining populations of stools (Becchetti & Giovannini 1998, Del Favero 2000, Piussi 2007).

Other management options frequently applied to coppice woodlands, particularly in marginal or protected areas, are non-intervention and conversion to high forest.

The abandonment of coppice silviculture, however, is likely to hamper the ecological functionality of woodlands, dampen tree species diversity at the patch level in mixed woodlands and in beech woodlands (Garadnai et al. 2010) (Figure 1), disrupt hydrological regimes and increase wildfire risks at the landscape level (Conedera et al. 2010, Piussi & Puglisi 2013). For most species, it is also likely to thwart the eventual reinstatement of the coppice silvicultural system as shading depresses the vigour of stools (e.g. oaks – Bianchi & Giovannini 2006, beech – Terzuolo et al. 2012). Yet, the demise of silvicultural interventions may be a necessary choice for sites of low fertility in economically marginal areas or stands degraded by fire, grazing or other disturbances.

In a similar way, the conversion from coppice to high forest is not always feasible, but rather contingent on species composition and site fertility, and might pose future regeneration problems. It may also cause biotic homogenization at the stand level (Van Calster et al.

Figure 1. Over-aged beech coppice in Pollino national Park, Southern Italy (Photos: P. Mairota)

2007). Conversion to high forest is often a long-term process requiring relatively intensive interventions and may not always be economically sustainable for the owner (Motta et al. 2015). Yet, conversion to high forest, where the ecological, technical (e.g. gentle terrains and accessibility) and socio-economic conditions allow, might trigger functional and structural complexity. It would also add value to timber products in certain forest types (e.g. sweet chestnut coppice), which are currently not fully exploited.

A range of modern approaches to coppice silviculture have been tested in Italy for more than a decade within the framework of several EU- and nationally/regionally-funded pilot projects (e.g. CHESUD, TraSFoRM, SUMMACOP, RECOFORME, ForClimadapt, SELVARBO and PProSpoT, Motta et al. 2015). Most of these approaches are related to the modes of standard selection (Mairota et al. 2016a), with reference to the number of trees selected as standards, the density and the spatial arrangement as well as the age/size distribution of standards within the stand, guided by informed silvicultural choices (Bastien & Wilhelm 2000, Sansone et al. 2012, Manetti et al. 2014, Motta et al. 2015, Manetti et al. 2016). All of these approaches, capable of enhancing stand stability, soil protection and biodiversity, can be combined at the landscape level, thus introducing a wider space-time perspective into this silvicultural system and ultimately contributing to the improvement of the rural economy while reducing the ecological costs of timber importation (Manetti et al. 2006).

Although coppicing promotes simplified compositions and structures, and vegetative propagation causes a 'genetic stagnation' in the tree component of the stands (Piussi 2006), a number of studies now indicate that active coppice management can improve forest biodiversity at both local and landscape levels and that it does not negatively affect decomposition rate and the transport of nutrients (Holscher et al. 2001, Bruckman et al. 2011).

In addition, woodlands managed as coppice over the centuries show a high level of resilience (Piussi & Redon 2001, Mei 2015), owing to the capacity of the stumps of various species (particularly oaks and sweet chestnut) to expand radially, forming new stumps from shoots that develop an independent root system (cf. Piussi & Alberti 2015, Vrska et al. 2016). This should not be overlooked when compared to the uncertainties in the response of reproductive regeneration of tree species comprising current stands under changing climate conditions and the forecasted increase of disturbances (e.g. wild fires, heat or frost waves, grazing by sheep, goats and wildlife, pest outbreaks), suggesting that coppice silviculture should be reconsidered (cf. Zanzi Sulli, 1995) within the framework of balanced forest management strategies.

Such strategies should combine traditional (e.g. coppice selection system in beech forests, Coppini & Hermanin 2007) modern approaches to coppice, conversion to high forest and non-intervention, as most appropriate to specific forest habitats and site conditions at the stand/landscape level and be based on appropriate exploitation criteria. In such a way, they would most likely revitalise local economies and cultural landscapes, while being compliant with the Framework Program for the Forestry Sector – Horizon 2020, the EU 995/2010 Timber Regulation and the Habitats Directive.

Moreover, as standard trees in coppice woodlands can nowadays provide new services related to biodiversity maintenance and aesthetics, the mode of standard selection still represents a distinctive (indeed crucial and challenging) issue for coppice silviculture in Italy. This not only refers to the number of trees selected as standards, but also concerns the density and the spatial arrangement, as well as the age/

size distribution of standards within the stand, which should be guided by informed silvicultural choices. Particularly the ecological and hydrological effects of the spatial arrangement of standards within the stand (i.e. uniform vs group distribution; both envisaged in the technical prescriptions of the majority of regions, i.e. the Prescrizioni di Massima e Polizia Forestale, Annex on Legislation framework) deserves further investigation, even if it has been considered in European forestry literature (e.g. Perona 1891, Huffel 1927, Perrin 1954, Cantiani et al. 2006, Fiorucci 2009, Piussi & Alberti 2015).

Finally, the great heterogeneity of prescriptions across species and forest types in Italy (see Annex on Legislation framework), in some cases further exacerbated by prescriptions for coppicing in Natura 2000 sites, has led to a great variety of woodland structural types, most of which do not correspond to any of the coded coppice silvicultural systems (i.e. simple coppice and coppice with standards – Matthews 1989, Nyland 2002, compound coppice – Nyland 2002) nor to high forest. This calls for an effort coordinated at the national level to define ecologically and socially sound (a) criteria to reduce discrepancies and (b) principles to harmonise prescriptions concerning the same habitat types of the Habitats Directive in Natura 2000 sites in different (often neighbouring) regions.

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Forestry Regulations

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In Italy, from the 1970s onwards (Law n. 382 of 1975 and subsequent modifications), responsibilities for forest regulation are transferred to 19 administrative regions (NUTS2) and 2 autonomous provinces (NUTS3) (regions hereafter) in the case of organisation and management matters and delegated to these concerning landscape and environmental matters. National forest guidelines indicate important goals for the regions to consider in order to develop sustainable, multifunctional forestry, which include environmental protection, conserving and enhancing biodiversity and the forest's protective function, while promoting productivity and improving socio-economic and educational aspects of forestry. To achieve these goals, forest and land use planning is required at the regional, provincial and municipal levels.

The national legal framework relating to forestry consists of **Law n. 3267 of 1923, 'Reordering and reform of legislation on forests and mountainous terrain'** (Riordinamento e riforma della legislazione in materia di boschi e di terreni montani), and its **related Ordinance (Regio Decreto) n.1126 of 1926**, which were enacted for hydrological and soil-protection reasons. By this framework, **forest management plans** ('Piani economici dei beni silvo-pastorali') became mandatory for public estates. **Law n. 431 of 1985, the so-called 'Galasso law'** (later integrated within, and somewhat altered by Ordinance (D.lgs.) n. 490/1999), imposed constraints on various, larger areas for landscape and environmental reasons and *ope legis* included land covered by forests and woods. These two sets of norms greatly differ in the way forests and silviculture are considered (Abrami 2009). In L. 3267/1923, forests are considered in relation to their crucial role in soil-protection and watershed stability (and therefore forest activities need to be regulated). L. 431/1985 bears the legacy of a previous Law n. 1497 of 1939, which aimed to protect natural beauty and landscape from an aesthetic point of view, and considered forests as "good" *per se*. That is, forests (and indeed large chunks of the country's territory, of relevance for their environmental features) are worth protection in the light of the services (*sensu lato*) they can provide to human communities. Despite this stronger and wider "environmentalist" rationale, it has been recognized that this regulation is not actually intended to impede or prohibit silviculture (Abrami 2009).

Further national level rules are provided by **Ordinance (D.lgs.) n 34/2018 'Consolidated ordinance on forestry'** ('Testo unico in materia forestale'). This act was enforced to substitute and integrate **Ordinance (D.lgs.) n. 227 of 2001 'Orientation and modernization of the forestry sector'** ('Orientamento e modernizzazione del settore forestale') and will become effective as soon as implemented within regional regulations. It is compliant with international and EU conventions and recognizes the need for sustainable forestry management, reaffirms the definition of "bosco" (woodland-forest) where the terms woodland and forests are made equal (similar to the French Code Forestier). It also fosters forest strategic and tactical planning on the part of the regions according to the national and **EU (COM (2013 n. 659/2013) forest strategies**.

Finally, the **Ministry of the Environment's Ordinance DM of 16-06-2005** ('Linee guida di programmazione forestale') stipulates guidelines meant to assess the conservation status of forests with regard to biodiversity, delin-

eating forest planning strategies and criteria to be implemented by the NUTS2 and the NUTS3 regions in charge at different scales (e.g. regional, territorial, local-estate).

Analysis of the laws and regulations issued by the individual regions in compliance with national rules reveals considerable differences. Some regions have no legislation at all with regard to forests and forestry (e.g. Valle d'Aosta, although this autonomous region has a primary authority on these matters), others have enacted framework rules and others partial rules.

Even in the deficiency or absence of regional rules, planning has been developed by most of the regions on the basis of national standards, sometimes supplemented by regional guidelines, issued without the support of a forestry law or drafted for specific public funding schemes.

Forest plans at the regional scale are in fact just broad programming tools that describe forests, strong and weak points, objectives and, in part, resources available for the advancement of the sector. Some regions also have a separate document on the state of forests, updated periodically. This planning level is prescribed by 17 NUTS2 regions. Almost all of these have actually developed such a plan, many have approved it and some have already revised it after its natural expiration. The duration of the regional forest plan varies from 3 to 15 years, and in some cases it coincides with the duration of the regional legislature (5 years).

The second level of territorial planning, developed for **sub-regional homogeneous areas** (e.g. mountain valleys, sub-provincial areas), includes a discussion on forests and their functions, regardless of ownership. It is provided for by 8 regions, which have implemented it on part of the territory, rarely (Piemonte) on an experimental basis and sometimes enforcing it as binding instrument.

Forest planning at the **estate level, individual or associated**, is provided by all the regions that have legislated on these matters, and also has been at least partially developed by the others. This is called a forest management plan, business plan, forestry-pastoral plan, forest estate plan etc., terms that can be more or less considered synonymous.

For some of the regions/provinces, namely Valle d'Aosta, the Provinces of Trento and Bolzano, Veneto, and Friuli Venezia Giulia, forest planning instruments also cover all or most of the c**ommunal or collective estates**, or at least significant portions of the territory. These instruments are devoted to large public (seldom private) estates or, more recently, to those pertaining to associated parties favoured by rural development programs (RDP).

Forest planning in **protected areas** (nature parks and reserves) and in the **Natura 2000** sites is a complex issue, often not addressed at the legislative level, neither as part of the forest framework law, nor as regulations for the conservation of biodiversity. The latter, if enacted, sometimes explicitly provide for a Site Management Plan (PDG) (e.g. Piemonte provides it for all sites), in compliance with the Habitats Directive and the national implementing rules. Some regions/provinces have drawn up the local equivalent for many or all of the sites, in some cases already approved, while others have prepared them either for some sites, or approve site-specific Conservation Measures ('Misure di conservazione' MdC). This regulatory process should have been completed by 2016, at least at the level of site-specific conservation measures.

In any case, the forest management plans involving Natura 2000 sites must comply with such conservation measures and, according to article 6 of the Habitats Directive, must undergo Appropriate Assessment (AA) procedures.

Technical prescriptions

With regard to silviculture (including coppice silviculture), enacted regional regulations either directly provide technical prescriptions or refer to province (NUTS 3) level regulations 'Prescrizioni di Massima e Polizia Forestale' (PMPF). These have been issued for all the provinces under the national framework law (Law n. 3267 of 1923) according to national level guidelines originally (1927) defined by the Ministry of Economy (then Ministry of National Economy), revised in 1957 and again in 1963 by a panel of technicians and jurists (cf. Fiorucci, 2009). Such technical prescriptions for coppice silviculture mainly concern the number of standards to be released in coppice with standards and in compound coppice. It is interesting to note (cf. Zanzi Sulli 1995) that the rationale for the definition of the number and the age distribution of standards differs greatly between the earlier (1927) and later version (1963) of the national guidelines for PMPF, reflecting motivation for the release of standards (animal raising/timber production vs dead stool replacement, respectively). This in turn was mostly due to the need to improve the state of coppice woodlands by preventing traditional side-practices (e.g. grazing, litter collection) as well as the need to define strictly coded systems (i.e. coppice with standards vs compound coppice).

The technical prescriptions in force with respect to coppice silviculture as implemented through either regional or province level (NUTS 3, PMPF) regulations greatly differ across the country and, in particular, for what concerns:

- Possibility of avoiding standard release for some forest types (simple coppice);
- Minimum and maximum number of standards (coppice with standards);
- Minimum and maximum length of rotation;
- Prescriptions for biodiversity in coppice and/or in Natura 2000 sites.

Most regions allow simple coppice for *Alnus, Robinia, Corylus, Populus, Salix, Genista, Eucalyptus* (as well as others) and allochthonous/invasive forest types, with the exception of Valle d'Aosta, Piemonte, Emilia Romagna, Marche, Umbria and Basilicata.

With regard to the **minimum and maximum number of standards**, regions can be arranged in four groups:

1) Regions in which a PMPF derived from the 1957-1963 scheme are still in force (Valle d'Aosta, Molise, Puglia and Sicilia). In these regions, the average minimum number of standards to be released per ha^{-1} is 60 and the maximum is 120 (median values) for most forest types. These average values are close to the reference values provided in the scheme (50-140 ha^{-1}, as reported by Zanzi Sulli (1995)), where the maximum values are the threshold representing one of the attributes discriminating between the coppice with standards system and the compound coppice system, the latter having up to three standard tree age classes.

2) Regions in which PMPF have been revised between 1980 and 2003 (Veneto, Emilia Romagna and Campania) and in which, on average, a minimum of 70 and a maximum of 140 standards ha^{-1} have to be released for most forest types. The minimum is 40% higher than the 1957-1963 reference value for the PMPF scheme, as reported by Zanzi Sulli (1995).

3) Regions in which prescriptions are dictated by regional regulations (Friuli Venezia Giulia, Liguria, Toscana, Umbria, Lazio, Abruzzo and Calabria) in which, on average, a minimum of 60 and a maximum of 140 standards ha^{-1} have to be released for most forest types; the minimum is 20% higher than the reference.

4) Regions in which prescriptions are dictated by regional regulations (Lombardia, Trentino, Marche, Basilicata and Sardegna) where, on average, a minimum of 100 and a maximum of

200 standards ha^{-1} have to be released for most forest types, with the minimum and maximum exceeding the reference values by 100% and 43% respectively.

The sole exceptions are Alto Adige and Piemonte. In the first, no prescriptions are in force for coppices due to the very small share of forest cover under coppice (less than 3.5%). Piemonte's recent regulations have introduced the criterion of minimum forest cover provided by standards, instead of their number, to define standard density. This is deemed more effective for the purpose of a variety of ecosystem services (cf. also Fiorucci 2009).

For the particular forest types of sweet chestnut and beech, all regions, on average, prescribe the release of a minimum of 40 and 100 standards ha^{-1}, respectively. In addition, Friuli Venezia Giulia prescribes a minimum of 120 standards ha^{-1} for *Carpinus* forest types, while Umbria perscribes a minimum of 100 standards ha^{-1} for *Quercus ilex* forest types.

The situation is even more varied concerning the **minimum and maximum length for a coppice rotation**, which differs across regions and forest types. For beech, deciduous oaks and sweet chestnut, for example, their respective average values are: min 24±3, max 40±7 years; min 18±3, max 36±7 years; and min 12±2, max 33±13 years, which are well above the very low values of the past (8-12 years), thus overcoming one of the main drawbacks of the coppice system, i.e. the over-exploitation of soil and stools due to the high frequency of the rotations. Maximum values are more sensible nowadays: most regions discriminate by law between coppice and high forest systems and once the maximum rotation length threshold is exceeded, regulations prohibit the maintenance of coppice management and force the stand to be managed as a high forest - that is to resort, at the right time, to reproductive regeneration.

Finally, in the majority of regions ad hoc regulations concerning **nature conservation** dictate additional, yet varied, prescriptions (e.g. coupe size and spatial arrangement, dead wood and ageing trees retention). For example, the Natura 2000 sites in Puglia (DGR 2250/2010) allow silvicultural operations between October 1st and March 15th to avoid impacts on nesting habitats of protected bird species; the cumulative size of three consecutive years coupes must not exceed 10 ha; 120 standards ha^{-1} must be released in all forest types; and sporadic tree species (less than 10%) must be preserved. In another example, in the Natura 2000 sites of Lazio (Regulation 1/10, modification to article 53 of the Regulation 07/05), the appropriate assessment (AA) of plans and projects significantly affecting Natura 2000 sites, is explicitly prescribed in the absence of approved management plans, regardless of ownership type (i.e. public or private). This is mandatory for old coppices, as well as when the coupe size of regular coppice exceeds 10 ha (20 ha for sweet chestnut) or 0.4 ha in the case of forest habitat types 9180, 9210, 9220, 9340 of the Habitats Directive.

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