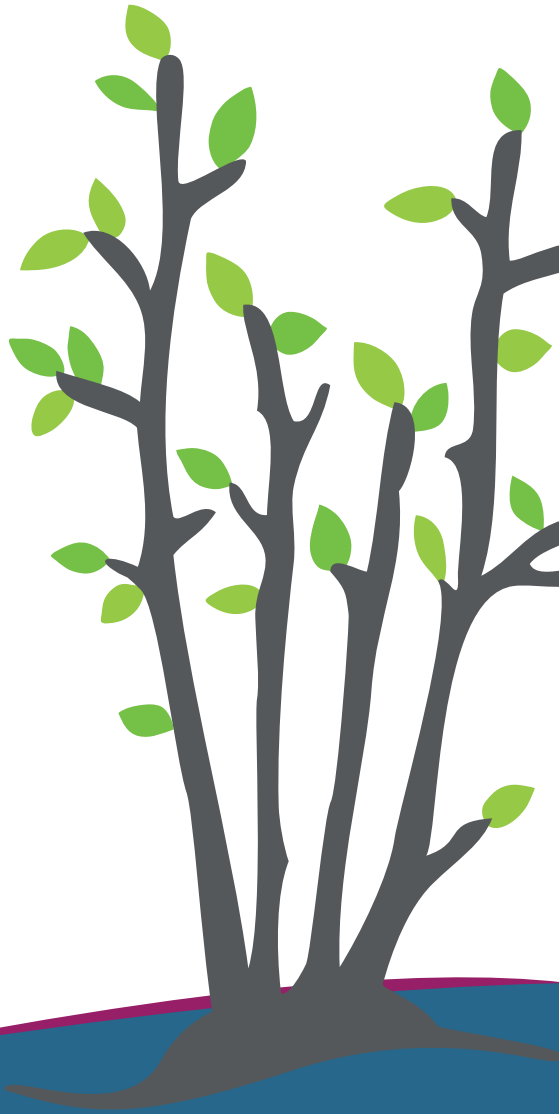
COST Action FP1301 EuroCoppice

Innovative management and multifunctional utilisation of traditional coppice forests – an answer to future ecological, economic and social challenges in the European forestry sector



National Factsheets on Coppice Forests

Editors Dagnija Lazdina & Santa Celma

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Albania

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The coppice forests are originating from sprouts and governed with short production cycle (short rotation).

Pyjet cungishte e kane origjinen nga lastaret dhe qeverisen me cikel te shkurter prodhimi.

Coppice - a forest that has sprout origin/background and which is destined to be regenerated by new sprouts, from which is derived wood material of small and medium sizes.

Cungishte - eshte nje pyll qe ka prejardhje lastarore dhe qe eshte paracaktuar te riperterihet po me lastar, nga i cili perfitohet material drusor me permasa te vogla dhe te mesme.

Coppice = Cungishte, Korie, Zabel

Legal frame of coppice forest:

Forest land which is covered more than 30% of area with tree height up to 3 m. No restriction for density.

Forest - the area of land with a dense group of forest trees greater than 0.1 ha, with a canopy coverage of not less than 30% of area and with the potential to reach a height greater than 3 m, when forest has reached maturity in situ conditions

Forest lands - areas with trees, shrubs, or other non-forest vegetation covering from 5 - 30%, bare surface, eroded and non-productive lands, sandy lands, forest roads which have not entered the register of the landed property of the agriculture lands which are ecologically linked and functionally related to the national forest fund, which together guarantees forest functioning

Statistics

The total forest area in Albania is 1,052,253 ha, while the coppice forest area accounted to 295,440 ha (28% of total forest area) with a standing volume of 8.3 Million cubic meter (Instat, 2016). Young coppice forests up to 20 years old cover about 72% of the whole coppice forest area and are widely spread in Albania. They have mainly production function (about 273,045 ha) and the main source of firewood supply for local communities in rural area.

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Typology of coppice	
Simple coppice	*Populus spp,Salix spp,Quercus spp,Alnus spp,Robinia spp*
Coppice with standards	*Populus spp,Salix spp,Quercus spp, Alnus spp, Robinia spp*
Pollarding	*Not practised*
Short rotation coppice	*Mainly Populus spp. There are efforts to cultivate Paulownia*
Other types	*A few cases are aiming the conversion of oak coppice stands in high forests. This is considered as challenge. The normal coppice rotation age in Albania is up to 60 years old. The conversion of coppice oak forests to high forests is done through clearcutting in the whole forest area leaving about 100-150 trees for seeds production. Few cases of mixed forest management forms (coppice with high forests) exist in Albania.*

Austria

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Coppice: even-aged stands consisting of trees and shrubs, which regenerate wholly or mainly vegetatively (sprout or root shoot).

Short rotation coppice: Plantation of fast-growing trees or shrubs, with the aim to produce in a short rotation period wood as a renewable resource.

Niederwald: Gleichaltriger Bestand aus Bäumen und Sträuchern, die sich ganz oder überwiegend vegetativ (Stockausschlag, Wurzelbrut) verjüngen.

Kurzumtriebsfläche: Anpflanzung schnell wachsender Bäume oder Sträucher mit dem Ziel, innerhalb kurzer Umtriebszeiten Holz als nachwachsenden Rohstoff zu produzieren.

Legal frame of coppice forest:

1. There is no specific legal framework for coppice forests in Austria.
2. Short rotation coppices with a rotation period of up to 30 years are not classified as forests (Austrian Forest Act 1975 in the amendment of 2002 § 1a. (5)).
3. Dibbling of forest plants and cuttings on previously agricultural land is not considered as afforestation, if the owner of this land reports within one year after planting to the district administrative authority that he uses these forest plants in the short term with a rotation period of up to 30 years (Austrian Forest Act 1975 in the amendment of 2002 § 1a. (5)).

Statistics

Coppice forests	93,000 ha	2.3 % of forest area in Austria
Short rotation coppice	2,236 ha	Agricultural area

Short rotation coppices are grown following the quantitative order Populus, Salix, Robinia (*Jürgen Kern)*

Sources: BFW Waldinventur 2009, Agrarstrukturerhebung 2013

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Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method still practised in the Eastern part of Austria. Large parts have been transformed into high forests during the last decades.*
Coppice with standards	*Traditional natural forest regeneration method still practised in the Eastern part of Austria. Large parts have been transformed into high forests during the last decades.*
Pollarding	*Practised in historic wood pastures until the beginning of the 20th century as cattle fodder especially from Fraxinus excelsior*
Short rotation coppice	*Practised as an agricultural alternative with Populus and Salix.*

Belgium

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Coppice : one-storey forest structure, consisting of resprouts on stools and/or root suckers with occasionally some trees from seedlings.

Coppice with standards : two-storey forest containing a upper canopy consisting of tall trees originating from seeds, and a lower canopy consisting of resprouts on stools and/or root suckers

Taillis: une structure à un seul étage constituée de rejets de souches et/ou de drageons, avec éventuellement quelques rares tiges issues de semis.

Taillis sous futaie: peuplement constitué d'un étage supérieur composé d'arbres de futaie issus de semences et d'un étage inférieur issus de rejets de souche et /ou de drageons.

Definition from Walloon Forest Inventory

Legal frame of coppice forest:

Traditional coppice and coppice-with-standards forests are considered a legal management system in broadleaved forests. Short rotation coppices, e.g. of willow and poplar, with rotation periods of <8 years are legally not considered as 'forest'. They are within the legislation of (agricultural) crops. Bosdecreet 1991 (for Flanders); code forestier (for Wallonia)

Rotation period (age of harvesting, felling):

No legal restrictions on rotation period; however the rotation period should be included in the management plan, and should be in accordance with silvicultural rules of good practice for the management plan to be approved.

Rotation period generally varies from 8-12 years (alder, ash, birch) up to 20 years (oak, hazel, hornbeam). Exceptionally shorter (4-6 year in oak for oak bark stripping used for tanning industry) and longer rotations (up to 30 years) were used in the past.

Statistics

In Belgium, approximately 115,000 ha of coppice and coppice-with-standards still occurs (15-20% of the total forest area). This area consists mainly of coppice-with-standards forests with oak in the standards, and hazel, hornbeam, maple, sweet chestnut and birch in the coppice layer.

Low coppice covers about 15,000 ha, and mainly contains black alder in wetland areas, and birch and oak on dryer grounds. Used to be much more common in the past : in 1895 coppice still covered over 100,000 ha. They were often transformed to conifer plantations or high forest of broadleaved trees.

Coppice with standards still covers about 100,000 ha (over 200,000 ha in 1895), mainly in Wallonia, but most of these stands are in gradual conversion towards high forest

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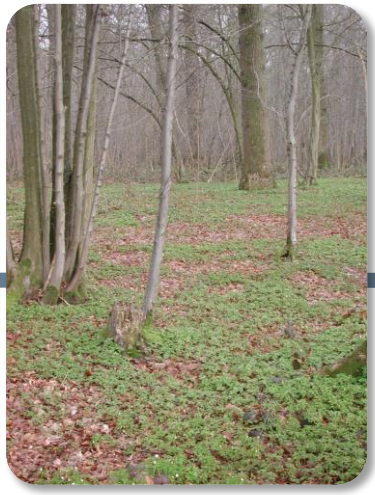


Photographs :
Above left and middel : Coppice-with-standards : oak-hornbeam forest in Cerfontaine (Namur)
Above right : experimental coppice-with-standards restoration – Meerdaal Forest (south of Leuven)
Below : low coppice stands (Bierbeek; Sinaai)
(*all photographs Kris Vandekerkhove except below right : Peter Van de Kerckhove*)

Typology of coppice	
Simple coppice	*'taillis simple', 'hakhout' : about 15,000 ha*
Coppice with standards	*'taillis sous futaie', 'middelhout' :*
Pollarding	*'têtards', 'knotbomen' : only in the open countryside (pollard willows, poplars, ashes)*
Short rotation coppice	*KOH (korte omloop hout) : considered as an agricultural crop, so not under forest legislation*

Bulgaria

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88. (1) The forests are managed as high forest, conversion forest or coppice (Niederwald). (2) High forests are managed in a way to maintain their seedling origin. (3) Conversion forests are managed in a way that transforms them into high forest. (4) Niederwald is managed in a way ensuring its regeneration from re-sprouting. .... (5) Not as forests are managed: ... 2. plantations of tree or shrub species for fast production of biomass;

§ 1. In the text of this act:

54. "Niederwald" are forests of black locust, oriental hornbeam, manna ash (*Fraxinus ornus*) and honey locust, *Gleditsia triacanthos* for coppice regeneration.

Forestry Act 2011, last changed in 7.08.2015

Чл. 88. (1) Горите се стопанисват като високостеблени, издънкови за превръщане в семенни и нискостеблени. (2) Високостеблените гори се стопанисват по начин, запазващ семенния им произход. (3) Издънковите за превръщане в семенни гори се стопанисват по начин, осигуряващ превръщането им в семенни. (4) Нискостеблените гори се стопанисват по начин, осигуряващ издънковото им възобновяване. (5) Не се стопанисват като гора: 2. плантации от дървесни или храстови видове, създадени с цел ускорено производство на биомаса; § 1. По смисъла на този закон: 54. "Нискостеблени" са акациевите, келяв габърови, мъждрянови и гледичиеви гори за издънково възобновяване. Чл. 104. (1) Забранява се: 1. провеждането на гола сеч във всички гори с изключение на тополовите, върбовите и нискостеблените гори;

Legal frame – land use, restrictions:

103. (1) ... Niederwald can be cut from Sept. 1st to Apr. 1st. 104. (1) It is prohibited: 1. to clear-cut a forest except of poplar forests, willow forests and Niederwald;

Rotation period (age of harvesting, felling):

102. The age of regeneration cut can be not less than ... 2. 50 years for a conversion forest; 3. 15 years for a black locust forest and 20 for the other Niederwald.

Hornbeam coppice

Statistics

Total forest area in Bulgaria is 3,833,640 ha. Conversion coppices take up 1,351,815 ha consisting mostly of oak (1,025,571 ha), beech hornbeam and linden. Conversion coppices have growing stock of 158,050,412 m^3. Coppice forests take up 481,747 ha mostly with oriental hornbeam (197,909 ha) and black locust (153,851 ha) and have stock of 18,665,335 m^3. Coppices mainly consist of trees older than 60 years.

Oak coppice

Beech coppice

Typology of coppice	
Simple coppice	*Only black locust plantations are still coppiced, rotation age 20 years. Oriental hornbeam is also permitted to coppice but this is seldom done.*
Coppice with standards	*Not practised*
Pollarding	*Abandoned since the post-war years*
Short rotation coppice	*Not practised*
Other types	*1,351,815 ha (in 2015) of conversion coppices, 70% of the oak stands, 15% of the beech stands, also hornbeam, linden etc.* *Rotation age 60 to 100 years, aimed at seedling regeneration, most ageing, average age 45 years*

Croatia

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Coppice forests are the result of deliberate or undeliberate degradation of high forests and they are of vegetative origin (sprouts from the stump or roots). A common feature of most coppices is the absence of any silvicultural activities throughout their development. As they were left to spontaneous development, whole spectrum of coppices was formed, from those with the highest quality, a relatively high wood volume, good structure and crown coverage to those of poor quality and low wood volume. In the past, coppices resulted from the growing needs for fuelwood and the lack of proper managerial interventions. Today, they are mainly result of unsuccessful regeneration of high forests. Tree species forming coppices are oaks (sessile, pubescent, holm), beech, hornbeam, chestnut, alder, black locust, etc.

Panjače su šume niskog uzgojnog oblika nastale namjernim ili nenamjernim procesima degradacije sastojina visokog uzgojnog oblika. Zajedničko obilježje većine panjača je izostanak bilo kakvih uzgojnih radova u mladosti i tijekom njihova razvoja. Kako su prepuštene spontanom razvoju, formirao se čitav spektar, od onih najkvalitetnijih s relativno visokom drvnom masom dobro sklopljenih i suvislo obraslih sastojina pa do onih nekvalitetnih, razbijenog sklopa, s kržljavim i kvalitetno lošim stablima male drvne mase. U prošlosti su nastajale iz potreba za ogrjevom i nestručnim gospodarenjem, u novije vrijeme nastaju kao posljedica neuspjele obnove visokih šuma. Glavne su vrste drveća koje tvore šume niskoga uzgojnoga oblika kitnjak, medunac, cer, crnika, bukva, obični grab, kesten, joha, bagrem i dr.

Rotation period (age of harvesting, felling):

Rotation is determined by legal acts.

Rotation for the coppice forests by species:

1. Oaks (*Quercus pubescens* Willd., *Quercus ilex* L., *Quercus petraea* (Matt.) Liebl.) - 80 years,
2. Beech (*Fagus sylvatica* L.) - 80 years,
3. European hornbeam (*Carpinus betulus* L.) - 40 years
4. Black locust (*Robinia pseudoacacia* L.) - 30 years
5. Soft deciduous (*Populus* sp., *Salix* sp., *Alnus sp.*) - 30 years.

Short rotation forests are defined by management objectives and their rotation could be 1-40 years (e.g. willows).

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Statistics

Area of coppice forest in Croatia amounts to 533.828 ha, while 251.127 ha (47%) is managed by „Hrvatske šume“ Ltd., 4.147 ha (0.8%) of state-owned forests is managed by other legal entities and 278.554 ha (52.2%) are privately owned forests. The total growing stock of coppice forests is approximately 49.5 million m³ with an annual increment of 1.39 million m³. (*Source: National Forest Management Plan 2006 – 2015*)

Area of state owned coppices according to tree species: *Fagus sylvatica* L. (77.852 ha, 35,8%), *Quercus pubescens* Willd. (56.645 ha, 26,0%), *Quercus petraea* (Matt.) Liebl. (20.544 ha, 9,4%), *Carpinus betulus* L. (11.999 ha, 5,5 %), *Quercus ilex* L. (9.306 ha, 4,3%), other tree spec. (101.187 ha, 19,0%).

Area of private coppices according to tree species: *Quercus ilex* L. (65.679 ha, 23,9%), *Quercus pubescens* Willd. (60.424 ha, 22,0%), *Carpinus betulus* L. (46.873 ha, 17,1 %), *Fagus sylvatica* L. (26.356 ha, 9,6%), *Quercus petraea* (Matt.) Liebl. (15.342 ha, 5,6%), other tree species (59.993 ha, 21,8%).

Typology of coppice	
Simple coppice	*The most common in the country.*
Coppice with standards	*Ca 15% of coppices can be regarded as coppices with standards.*
Pollarding	*In the northern part of Croatia, in Istria and especially in the northern part of the island of Cres (oak and chestnut, but also suitable for: Mediterranean oaks, chestnut, mulberry, hazelnut, willows).*
Short rotation coppice	*Populus* sp., *Salix* sp.

Czech Republic

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(1) low coppice forest - forest management system in which trees originate from sprouts (Regulation 83/1996 about regional forest growth plans compilation and also forest management sets of stands specification)

(2) coppice with standards - forest management system in which trees coming from sprouting and individuals originating from seeds are combined (Regulation 83/1996 about regional forest growth plans compilation and about forest management sets of stands specification)

(3) stand of fast-growing trees (short-rotation coppice) - cultivated agricultural land with permanent culture that is uniformly planted with at least one thousand woody plants per ha including handling area that cannot exceed 12 m on both sides of the rows and width of inter-row along the edge rows (government decree 307/2014 about land use records keeping)

Regulation 83/1996 about reginal forest growth plans compilation and about forest management sets of stands specification government decree 307/2014 about land use record- keeping

(1) nízký les (pařezina) - hospodářský tvar lesa vzniklý výmladností

(2) střední (sdružený) les - hospodářský tvar lesa vzniklý jako kombinace výmladkové složky a jedinců semenného původu

(3) porost rychle rostoucích dřevin (výmladková plantáž) -zemědělsky obhospodařovaná půda s trvalou kulturou, která je rovnoměrně a souvisle osázena dřevinami, a to v minimálním počtu 1 000 životaschopných jedinců na 1 hektar dílu půdního bloku, do plochy této zemědělsky obhospodařované půdy se započítává související manipulační prostor, který nesmí přesahovat 12 metrů na začátku a na konci řad a šířku jednoho meziřadí, v nejvyšší započitatelné šířce 8 metrů, podél řad po obou stranách rychle rostoucích dřevin pěstovaných ve výmladkových plantážích a netvoří součást cesty

Sixth harvest in black poplar plantation
(2222 plants per ha, three year rotation)

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Legal frame of coppice forest:

Law 289/1995 about forests defines forest as a forest cover with their surroundings and land intended to function as forest. It also defines the minimal age of trees to be harvested (80 years); earlier harvest is possible only with dispensation or in special forest management sets of stands.
Regulation 83/1996 about regional forest growth plans compilation and about forest management sets of stands specification - defines coppice forests and also 6 forest management sets of stands where coppice forests can be grown and age when they can be harvested.
Law 252/1997 about agriculture - SRC is defined as one of the crops that can be grown on agricultural land.
Law 334/1992 about protection of agricultural land resources - restricts growing SRC on agricultural land of I. and II. protection category; defines the maximum rotation length (10 years) and maximum growing period (30 years) for SRC; the land must be used in the different way 3 years after SRC removal.
Law 114/1992 about nature and landscape protection - growing allochthonous plants (mainly hybrid poplars) is possible only with permission, in addition growing them is banned in protected areas

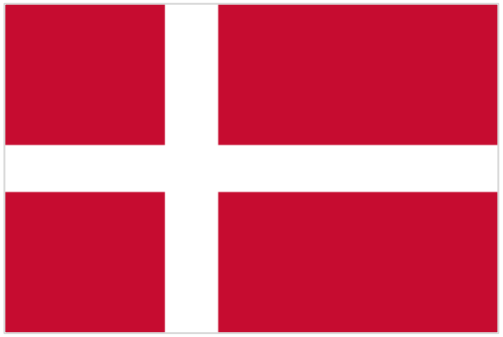
Rotation period (age of harvesting):

1. and 2. According to Czech law 289/1995 about forests, most of the forests cannot be harvested earlier than at age of 80. Only in six forest management sets of stands, it is allowed to manage forests as low forests. The coppice forests with predominance of hardwood trees are definitely preferred with recommended rotation length of 40 years (with range between 30 and 50 years, as the case may be 60 years). In the coppice forests with predominance of soft wood trees, recommended rotation length is between 20 and 30 yrs. Recommended rotation length for willow forest cover and locust forest cover is 40 and 70 years, respectively, in specific forest management sets of stands.
3. Agricultural land can be used for growing woody plants at most 10 years, if it is SRC it can be grown on agricultural land at most 30 years with rotation period no longer than 10 years.

Black poplar plantation in the first vegetation period

Black poplar plantation in the last vegetation period before second harvest (6,061 plants per ha, 3 year rotation)

Typology of coppice	
Simple coppice	*Mainly in 6 forest management sets of stands; alder, oak, hornbeam, maple, ash, elm, lime, poplar, willow (wild cherry tree, birch, rowan tree)*
Coppice with standards	*Mainly with sessile or common oak or common or narrow-leaved ash as standards*
Pollarding	*Not practised*
Short rotation coppice	*Mainly Populus, Salix, minimally Alnus or Fraxinus*



Denmark

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Coppice – silvicultural method where the regeneration is vegetative as the shoots come from the stumps and form the new forest. The rotation cycle is low, usually 1-40 years, which means that the trees never reach their full height. In coppice forestry tree species with good ability to stump shoot formation is used, for example, willow, oak, hazel and alder. In Denmark coppice forestry is not very widespread.

Coppice forest - forest that regenerates through shoot from the stump of the felled tree. In Denmark coppice was formerly a common silvicultural system in alder, oak and ash. The system was particularly widespread in Funen and among small forest owners. The system allows for a continuous, steady production of firewood, poles, fencing and similar assortments from even a small piece of forest.

In Denmark coppice is now rare, but, for example, in large parts of Europe coppice is widespread. Mechanized coppice forestry has been introduced as energy forest has been established.

Energy forest is a plantation of hardwoods with rapid juvenile growth, harvested for use as wood fuel. In Denmark willows are the most used species and the rotation is commonly three years. Energy Forests have mostly been planted on former agricultural land. The production is approximately 7 tonnes dry matter per ha. In 1995 there were approx. 500 ha of energy forest in Denmark.

Gyldendals large lexicon, translated, http://www.denstoredanske.dk/Natur_og_miljø/Skovbrug/Skovdyrkning

Lavskov, skovdriftsform, hvor skovforyngelsen sker ved stævning (vegetativ foryngelse), idet støddene fra de fældede træer sætter stødskud, der vokser op til ny skov. Omdriftstiden er lav, som oftest 1-40 år, hvorfor træerne aldrig når deres fulde højde. Til lavskov benyttes træarter med god evne til stødskudsdannelse, fx pil, eg, hassel og rødel. I Danmark er lavskovsdrift kun lidt udbredt. Se også skovdyrkning og stævningsskov.

Stævningsskov, skov, der forynges gennem stødskud, dvs. skud fra stubben af det fældede træ; d.s.s. lavskov. I Danmark var stævningsskov tidligere en almindelig driftsform, bl.a. i rødel, eg og ask. Driftsformen var særlig udbredt på Fyn og blandt småskovsejere. Driftsformen giver mulighed for et løbende, jævnt udbytte af ved til brænde, pæle, hegnsmateriale og lignende småeffekter fra selv et lille stykke skov.

I Danmark er stævningsskov nu sjælden, men fx i store dele af Europa er stævningsdrift vidt udbredt. Mekaniseret stævningsdrift har fået fornyet aktualitet i form af energiskov.

Energiskov, plantage af løvtræer med hurtig ungdomsvækst, som høstes til brug ved energiproduktion. I Danmark anvendes piletræer, der hugges til flis hvert tredje år, hvorpå de vokser op igen. Energiskove plantes bl.a. på braklagte jorder. Produktionen udgør årligt ca. 7 t tørstof pr. ha; i 1995 var der ca. 500 ha energiskov i Danmark.

Gyldendals large lexicon, translated, http://www.denstoredanske.dk/Natur_og_miljø/Skovbrug/Skovdyrkning

Legal frame of coppice forest:

In the COMMISSION REGULATION (EC) No 1120/ 2009 of 29 October 2009 on the implementation of the single payment scheme in Title III of Council Regulation (EC) No 73/ 2009 establishing common rules for direct support schemes under the direct support schemes for farmers and establishing certain support schemes for farmers there is a definition of short rotation coppices:

“short rotation coppice” means areas planted with those tree species of CN code 0602 90 41 that consist of woody, perennial crops, the rootstock or stools remaining in the ground after harvesting, with new shoots emerging in the following season and that are contained in a list to be drawn up by Members States from 2010 of the species which are appropriate for use as short rotation coppice and their maximum harvest cycle (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:316:0001:0026:EN:PDF)

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EuroCoppice

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Statistics

In the Danish forest statistics ancient management forms covers about 22,000 ha. The proportion of coppice is estimated to about 6,000 ha of which only few hundred ha is managed the traditional way. Some plantings along roads and railroads are managed as coppice, but we don't have statistics on these areas.

Typology of coppice	
Simple coppice	*Limited use*
Coppice with standards	*Not practised*
Pollarding	*Limited use*
Short rotation coppice	*Salix*
Other types	*Narrow wind break barriers (2-4 m) that are harvested every 30-40 years*

Estonia

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Coppice forests are considered as a traditional form of passive silviculture, that involves:

(1) repetitive felling on the same stump

(2) the meanings of "coppice" and "short-rotation coppice" are considered to be the same. It is very common, but not taken as a respective silviculture.

Lühikese raieringiga metsandus

Legal frame of coppice forest:

Coppice forestry as all of other forestry are regulated mainly by 2 legal acts:

1) Estonian Forestry Law
2) Estonian Forestry Development plan 2012-2000.

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method, but losing ground*
Coppice with standards	*No special standards for coppice as it is considered as a traditional silviculture. Short Rotation Coppice managed on agricultural lands*
Pollarding	*Only on roadsides and on islands*
Short rotation coppice	*Willow, Hybird Aspen, Grey Alder*
Other types	*Very few stands for environmental projects and scientific purposes (Estonian University of Life Sciences)* *Water cleaning in Tartumaa and Lääne-Virumaa counties, Hybrid aspen etc. plantations*

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Finland

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Woodland which has been regenerated from shoots formed at the stumps of the previous crop trees, root suckers, or both, i.e., by vegetative means. Normally grown on a short rotation for small material, but sometimes, to a substantial size.

Vesametsä. Kanto- tai juurivesoista vegetatiivisesti syntynyt metsä. Vesametsiä kasvatetaan tavallisesti lyhyellä kiertoajalla mutta joskus tavoitteena voi olla myös ainespuun tuotanto.

Typology of coppice	
Simple coppice	*Not practised (However birches of stump sprout origin are accepted in regeneration areas to fill in the plantation)*
Coppice with standards	*Not practised*
Pollarding	*Only in gardens and parks*
Short rotation coppice	*Mainly small scale plantations with Salix, Alnus incana, P. tremula x tremuloides, Betula pubescens*

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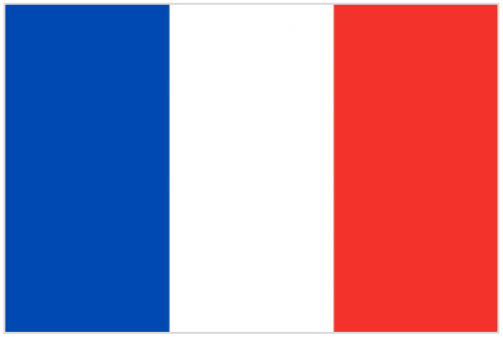

France

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Simple Coppice: forest which trees have been regenerated at the same time, by allowing regrowth from cut stumps or root suckers. Thus, all trees are even-aged and have quite the same size (diameter and height).

Compound coppice with standards system: forest stand composed of high forest (broadleaves or coniferous, even-aged or uneven-aged) and coppice, side by side or stacked. - *Delpech R. et al.,* Typologie des stations forestières – Vocabulaire, IDF, 1993

Taillis simple : peuplement forestier composé d'arbres issus de rejets et drageons auquel est appliqué un traitement régulier. De ce fait, il est constitué d'arbres de dimensions (diamètre, hauteur) voisines et il est équienne.

Mélange de futaie et taillis : peuplement forestier constitué d'une futaie feuillue et/ou résineuse, régulière ou irrégulière, superposée ou juxtaposée à un taillis. - Delpech R. et al., Typologie des stations forestières – Vocabulaire, IDF, 1993

Short Rotation Coppice (SRC): rotation from 7 up to 10 years, objective production of small trees (diameter 15 cm, height 15-18 m).

Very Short Rotation Coppice (VSRC): rotation from 2 up to 4 years, objective production of small shoots (diameter 3 - 5 cm, height 4-8 m). – *Berthelot A.,* Produire de la biomasse avec des taillis de peupliers, AFOCEL, 2007.

Taillis à Courtes Rotations (TCR) : rotations de 7 à 10 ans, objectif produire de petits arbres (15 cm de diamètre, hauteur 15-18 m).

Taillis à très courtes rotations (TTCR) : rotations de 2 à 4 ans, objectif produire beaucoup de petits brins (3 à 5 cm de diamètre; hauteur 4 à 8 m) – Berthelot A., Produire de la biomasse avec des taillis de peupliers, AFOCEL, 2007.

Legal frame of coppice forest :

Forest-related activities naturally have to comply with the National (French) Forest Policies. Logging operations, which are not planned in a approved management document, are generally subject to an application for authorization. It varies according to the situation of the forest and the size of the clear-cut.

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Statistics

Simple coppice forest structures represent 1.7 million ha (11% of the French forests) and compound coppice with standards system 4.7 million ha (30%).
National Forest Inventory, 2013. Les résultats des campagnes d'inventaire 2009 à 2013.
Short-Rotation Coppice (SRC) and Very Short Rotation Coppice (VSRC) cover merely a few thousand ha in France and are therefore quite marginal.

Typology of coppice	
Simple coppice	*Mediterranean coppices (Quercus ilex and Quercus pubescens) : 52% of the simple coppice area and Castenea sativa, 13% of simple coppice; more locally, there are also coppice Fagus sylvatica in the mountains, Quercus robur and Quercus petraea and more marginally Alnus glutinosa or Robinia pseudoacacia.*
Coppice with standards	*Carpinus betulus, Quercus robur or Quercus petraea coppices and standards of common oaks on clayey loam soils in central and northeastern France. Other species such as Betula verrucosa, Fagus sylvatica and Populus tremula can also be found in such situations;* *Common oaks, chestnut or birch coppice and sessile oak standards on poorer siliceous soils in central and western France.*
Pollarding	*Only in some rural regions (Quercus and Fraxinus mostly)*
Short Rotation Coppice	*SRC : Populus, Eucalyptus, Robinia pseudoacacia* *VSRC : Populus, Salix, Robinia pseudoacacia*

FYR Macedonia

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Coppice forest – a forest originating by vegetative means i.e. basal shoots or root suckers or both.

Нискостеблена шума – е шума настаната по вегетативен пат односно изданци од пенушки, ибојци од корења или на двата начини.

Legal frame of coppice forest:
On legal frame no other restrictions.
In practice:
1.Forest land more than 20% cover and
2. Volume density more than 0,3 (30% of normal stands)
Regulation for Forest Management Plans (http://www.mzsv.gov.mk).

Statistics

Total forest area state 2012: 989,000 ha
Managed forest: 902,000 ha
High forest: 276,000 ha
Coppice forest: 561,000 ha
Coppice with standards: 3,000 ha
Shrubs, maquis, etc.: 54,000 ha
Artificial forest (up to 20 years): 8,000 ha
Main species: *Fagus moesiaca, Qu.petraea, Qu.conferta, Qu.cerris, Qu.trojana, Qu.pubescens* and *Qu.coccifera*.
Unmanaged forest: 87,000 ha

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Typology of coppice	
Simple coppice	*Traditional, clearcuts, rotation 40-50 years*
Coppice with standards	*Very rare*
Pollarding	*Practised in the past, very rare today*
Short rotation coppice	*Not practised*
Other types	*Coppice in conversion process (oak and beech) with natural regeneration (seeds) or introduction of conifers (Pinus, Abies, Picea)*

Germany

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(1) Coppice: Even-aged stands consisting of trees and shrubs (mainly: *Quercus spp., Carpinus betulus, Alnus glutinosa*, occasionally *Fagus silvatica*), which regenerate wholly or mainly by vegetative means (sprout or root shoot) and are harvested in small clearcuts (0.5-1 ha) in short rotations of 20-40 years. In some cases combined with standards with longer rotation periods.

(2) Short rotation coppice: Plantation of fast-growing trees or shrubs (mainly *Populus spp., Salix spp.,* and *Robinia pseudoacacia*), with the aim to produce in several short rotation periods (5-20 years each) wood as a renewable resource, mainly for energy.

For National Inventory purposes, the definition is: "Coppice forests originate from vegetative regeneration (stool or root sprouts) and are max. 40 years of age" (BWI3 Guidelines, page 34).

(1) Niederwald (Stockausschlagwald): Gleichaltriger Bestand aus Bäumen und Sträuchern (hauptsächlich Quercus spp., Carpinus betulus, Alnus glutinosa, seltener Fagus silvatica), die sich ganz oder überwiegend vegetativ (Stockausschlag, Wurzelbrut) verjüngen und in kleinen Kahlschlägen (0.5-1 ha) und in kurzen Umtriebszeiten (20-40 Jahren) bewirtschaftet werden. In einigen Fällen kombiniert mit aus Samen entstandenen Bäumen im Oberstand ("Kernwüchsen"), die in längerer Umtriebszeit bewirtschaftet werden ("Mittelwald").

(2) Kurzumtriebsplantagen: Künstlich angelegte Monokulturen schnell wachsender Bäume (hauptsächlich Populus spp., Salix spp., und Robinia pseudoacacia) mit dem Ziel, innerhalb kurzer Umtriebszeiten (5-20 Jahre) mit mehreren Wiederholungen Holz als nachwachsenden Rohstoff zu produzieren, vor allem für energetische Zwecke.

Legal frame of coppice forest:

In Germany, the federal forest law only gives a general framework for legislation; traditional coppice is not mentioned. Forest issues are regulated in detail by regional authorities (for 14 states), which only mentions traditional coppice in some cases and in those cases indirectly: for example, in Bavaria there is mention of high forest ("Hochwald"), and in Rheinland-Pfalz non-productive forests, but neither explicitly mention coppice (low forest, i.e. "Niederwald"). Furthermore, in Bavaria there is an indirect link, as remaining coppice forest stands can be qualified as a historical land use practice and should therefore be protected. Short rotation coppice ("Kurzumtriebsplantagen") is mentioned in federal and regional forest laws; they state that it is only regarded as "forest" if the rotations exceed 20 years, otherwise it is regarded as an agricultural crop.

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Statistics

National statistics according to the third Bundeswaldinventur (National Forest Inventory) in 2012: Simple coppice 45,766 ha (0.42% of total forest area); coppice with standards 32,354 ha (0.30% of the total forest area) (BWI3).

In some regions (Rheinland-Pfalz, parts of Nordrhein-Westfalen) the proportion of coppice may be as high as 5-10%. A recent study carried out in Rheinland-Pfalz shows that 20 % (83,000 ha) of the state and community owned total forest area originated from and still shows signs of coppice forest (Becker et al. 2013). The proportion in private forests may even be slightly higher.

There are approximately 6,000 ha of Short Rotation Coppice in Germany; the plots are mainly experimental (Hauk et al. 2014).

SRC 1 year old Salix and GHG measuring chamber

SRC Poplar and willow second rotation period

Typical German coppice forest
Location: Baumholder, Rheinland-Pfalz

Image: Christian Suchomel, University of Freiburg

References:

Becker G., Bauhus J., Konold W. (2013): Schutz durch Nutzung: ein Raum-Zeit-Konzept für die multifunktionale Entwicklung der Stockausschlagwälder in Rheinland-Pfalz. – Culterra 62.

BWI3: Thünen-Institut, Dritte Bundeswaldinventur - Ergebnisdatenbank, https://bwi.info, Aufruf am: 1.12.2016, Auftragskürzel: 77Z1JI_L101of_2012, Archivierungsdatum: 2014-8-13 16:42:23.590, Überschrift: Waldfläche [ha] nach Land und Waldspezifikation, Filter: Jahr=2012

BWI3 Guidelines: https://www.bundeswaldinventur.de/fileadmin/SITE_MASTER/content/Dokumente/Downloads/AufnahmeanweisungBWI3.pdf 01.12.2016

Hauk S., Wittkopf S., Knoke T., (2014). Analysis of commercial short rotation coppices in Bavaria, southern Germany. Biomass and Bioenergy, 67, pps. 401 – 412. Cited: ZID: Bayerische Staatsministerium für Ernährung. Landwirtschaft und Forsted (StMELF). Zentrale InVeKoS Datenbank ZID). Available from: http://www.zi-daten.de; October 14, 2013).

Typology of coppice	
Simple coppice	*Small clearcuts, rotation 20-40 years*
Coppice with standards	*20-50 standards/ha, mostly oak, rotation > 60-80 years, combined with coppice with rotation 20-40 years*
Pollarding	*Not significant*
Short rotation coppice	*Populus, in some cases Robinia pseudoacacia and Salix spp.*

Greece

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Forests that resprout after felling

-Papachristou

πρεμνοφυή δάση (premnofie dasi)

-Papachristou

Coppice forest or *paravlastogenes* forest is the forest where regeneration is done by suckers.

-Mallinis

Πρεμνοφυές ή παραβλαστογενές δάσος είναι το δάσος στο οποίο η αναγέννηση γίνεται με παραβλαστήματα.

-Mallinis

Legal frame of coppice forest:

Presidential Decree. 19-11-1928 28-29 . Restrictions and guidelines regarding coppice forest harvesting

Statistics

Coppice forests cover an area of 1,930,000 ha (12% of the total country's area). The main species that are managed as coppice are broadleaved oaks (1,105,339 ha), beech (337,000 ha), chestnut (33,000 ha) and other broadleaved (88,000 ha). The management of these coppice forests is intensive, with a clear cutting cycle ranging from 20 to 30 years.

1.1. Area of forest and other wooded land and its changes

	1964		1992	
	Area (1000 ha)	Percentage (%)	Area (1000 ha)	Percentage (%)
Forest *	2 512	19.0%	3 359	25.5%
Other wooded land *	3 960	30.0%	3 154	23.9%
Forest and other wooded land	6 472	49.0%	6 513	49.4%
Other land uses	6 724	51.0%	6 683	50.6%
Total area	***13 196***	***100.0%***	***13 196***	***100.0%***

* Definitions are quoted in the Appendix I

1.1.1. Area of forest according to management type and its changes

	1964		1992	
Management type	Area (1000 ha)	Percentage (%)	Area (1000 ha)	Percentage (%)
High forest	872	34.7%	1 166	34.7%
Coppice forest	1 206	48.0%	1 612	48.0%
Coppice forest with standards	434	17.3%	581	17.3%
Total	***2 512***	***100.0%***	***3 359***	***100.0%***

Source: a) Distribution of Forests in Greece 1964, General Secretariat of Forests and Natural Environment (GSF&NE), Ministry of Agriculture
b) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

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Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method*
Coppice with standards	*Not practised*
Pollarding	*Indirect method. This method consists in the successive retaining of a number of standard trees individually or in groups, for more rotations. The stands arising by this method have a structure similar to the middle forest, with a multi-story structure.*
Short rotation coppice	*Extension of rotation time and the suitable silvicultural treatment of entire stands as they were high even-aged forests, leading to a single-story structure of stands.*

Hungary

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Coppice forest; coppice wood; coppice; root-shoot or stump shoot coppice

The native poplars, the alder and the black locust forests can be renewed with coppice. The renewing of alder stands can be done by stump-shoot and the black locust and native poplar stands can be done by root suckers.

Reg 153/2009 about the forest, the protection of the forest and the forest management; 28.§.(3)

- Norbert Frank

Coppice: from stump- or root sprout renewed forest

-Imre Czupy

Sarjerdő: a tuskó- vagy gyökérsarjakból felújult erdő.

Legal frame of coppice forest:
Forest Act 2009. XXXVII.

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Ireland

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"Coppice" means a forest crop raised from shoots produced from the cut stumps of the previous crop

Forestry Act 2014

Legal frame of coppice forest:
Forestry Act 2014 (http://www.irishstatutebook.ie/eli/2014/act/31/enacted/en/pdf)

Legal frame – land use, restrictions:
The felling of trees in Ireland is regulated under the Forestry Act 2014. Most trees that are felled require a Felling License. There are some exemptions. Short rotation coppice of willow or poplar species and maintained solely for fuel is exempt.
The felling of coppice requires a felling license unless it is on an agricultural holding, is being removed for use on that holding, and that the total volume felled does not exceed 15 cubic meters in any period of 12 months.

Rotation period (age of harvesting, felling):
There is very little coppicing done in Ireland. Therefore there are no standard rotation periods. Short rotation coppice of willow or poplar species (predominantly willow) is on a 2 or 3 year rotation.

Typology of coppice	
Simple coppice	*Very little in Ireland. Some for conservation/habitat. A little for craft*
Coppice with standards	*Not practised*
Pollarding	*Only in gardens, roadsides and urban streets*
Short rotation coppice	*Willow for biomass*

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Italy

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(1) Simple coppice: coppices without standards. At each rotation age (about 8 years) all shoots are removed by clear cut. Simple coppice is permitted for some species only (e.g., Black locust, Poplar, Salix, Common Hazel) depending on local (regional) forest law. In this type of coppice are also included the "short rotation coppices".

(2) Coppice with standards: At each coppice rotation, the coppice is clear felled leaving a minimum number of standards per hectare depending on local (regional forest law (e.g., 60 standards per hectare in case of quercus coppices and beech coppices; 30 standards per hectare in case of chestnut coppices)

(3) Uneven-aged coppices: coppice with shoots of different ages on the same stump (usually three age classes). It is based on coppice selection system, i.e. 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 characterized by the coexistence on the same area of a coppice and a high forest, the latter formed by trees of different age classes. The high forest component is usually formed by standards left for three or more rotations and therefore are classified into three or more age classes.

The 2nd Italian National Forest Inventory (Floris et al., 2004) classifies the coppice forest into (1) Coppice, (2) Coppice with standards, (3) Compound coppice, and (4) Coppice in conversion to high forest on the basis of the stand structure as reported below:

(1) Coppice (simple coppice or coppice without standards): forest stand completely composed by shoots, or dominated by shoots respect to trees originated by seeds (less than 20 standards per hectare).

(1) Ceduo semplice: ceduo senza matricine. Ad ogni rotazione (circa 8 anni) tutti i polloni sono rimossi con un taglio raso. Il ceduo semplice è consentito solo per alcune specie (a esempio, robinia, pioppo, salice, nocciolo) a seconda dei regolamenti forestali regionali. In questa definizione rientrano anche i "cedui a turno breve".

(2) Ceduo 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 tre o più turni e quindi sono presenti piante di tre o più classi di età.

Il 2° Inventario Forestale Nazione italiano (Floris et al., 2004) classifica il bosco ceduo in (1) Ceduo (senza matricine), (2) Ceduo matricinato, (3) Ceduo composto e (4) Ceduo in conversione a fustaia (Fustaia transitoria) sulla base delle caratteristiche strutturali del soprassuolo come riportato di seguito:

(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 by shoots and standards (the latter between 20 and 120 per hectare; the age of the standards is equal to 1 or 2 times the coppice rotation age).

(3) Compound coppice: forest stands composed by shoots and standards (the latter > 120 per hectare; the age of the standards is not uniform, and can be greater than 3 times the coppice rotation age); coppices with coniferous trees are included.

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

In addition, the 2nd Italian National Forest Inventory (Floris et al., 2004) classified the coppice forest into (1) Young coppice, (2) Adult coppice, (3) Old coppice, (4) Coppice in the regeneration phase, and (5) Uneven-aged coppice on the basis of the stand development stages as reported below:

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

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

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

(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.

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

(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) 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; sono inclusi i cedui coniferati.

(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.

Inoltre, il 2° Inventario Forestale Nazione italiano (Floris et al., 2004) classifica il bosco ceduo in (1) Ceduo giovane, (2) Ceduo adulto, (3) Ceduo invecchiato, (4) Ceduo in rinnovazione e (5) Ceduo a sterzo sulla base dello stadio di sviluppo del soprassuolo come riportato di seguito:

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

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

(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) Ceduo a sterzo: compresenza di polloni di dimensioni (età) differenziate sulla stessa ceppaia (tre o più classi di età).

Floris A., Gasparini P., Scrinzi G., Tabacchi G., Tosi V. (2004). Manuale di campagna per i rilievi di seconda fase con istruzioni per l'uso dell'applicativo INFOR2. Inventario Nazionale delle Foreste e dei Serbatoi Forestali di Carbonio. MiPAF – Direzione Generale per le Risorse Forestali Montane e Idriche, Corpo Forestale dello Stato, CRA-ISAFA, Trento (available on-line at: http://mpf.entecra.it/node/1009. Last accessed on September 28th, 2015).

Statistics

Coppice management is the most common silvicultural system in Italy.
Within approximately 8,500,000 ha forest cover, forest land classified as coppice currently includes almost 35% (approximately 36,631 km^2) (INFC 2007), yet its distribution varies between administrative units (INFC 2007). This amount has been almost stable since the 1960s (La Marca and Bernetti 2011).
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.
Coppice with standards, among the coded coppice silvicultural systems (i.e., simple coppice, coppice with standards – Matthews 1989, Nyland 2002, and compound coppice – Nyland 2002), 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 almost 19.2% of the coppices in the whole EU28, which in turn represent 83.3% and 52.1% of the coppices in the whole of Europe and at the global levels, respectively (UN-ECE/FAO 2000).

INFC (2007). Le stime di superficie 2005 – Prima parte" Authors: Tabacchi G, De Natale F, Di Cosmo L, Floris A, Gagliano C, Gasparini P, Genchi L, Scrinzi G, Tosi V. Inventario Nazionale delle Foreste e dei Serbatoi Forestali di Carbonio [National Inventory of Forests and of Forest Carbon Pools]. MiPAF - Corpo Forestale dello Stato - Ispettorato Generale, CRA - ISAFA, Trento, Italy, pp 409. [in Italian] [online] URL: http://www.sian.it/inventarioforestale/caricaDocumento?idAlle=496

La Marca O, Bernetti G (2011). Il ceduo in Italia aspetti colturali, produttivi, ambientali [Coppice woodlands in Italy, coltural, production and environmental aspects]. Sherwood - Foreste e alberi oggi 173: 5-14. [in Italian]

Matthews JD (1989). Silvicultural Systems. Clarendon Press, Oxford, UK, pp. 284.

Nyland RD (2002). Silviculture: concept and applications (2nd edn). McGraw-Hill, New York, USA, pp. 682.

UN-ECE/FAO (2000). Forest resources of Europe, CIS, North America, Australia, Japan and New Zealand (TBFRA-2000). ECE/TIM/SP/17, Geneva, Switzerland, pp. 466.

Coppice in conversion to high forest. Beech.

Coppice in conversion to high forest. Quercus.

Coppice with standards. Chestnut.

Coppice with standards. Downy oak.

Coppice with standards. Holm oak.

Coppice with standards. Turkey oak.

Uneven aged coppice. Beech.

Uneven aged coppice. Beech.

Legal frame of coppice forest:

Definition of forest

In Italy 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 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ.

• In the Tuscany region forest is defined as: land spanning more than 0.2 hectares with a tree canopy cover of more than 20 percent.

Restrictions for coppice forests:

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

• maximum cutting area = 20 hectares;

• minimum rotation period: 8 years for Chestnut, Black locust, Poplar, Salix, Alder, Common Hazel; 24 years for Beech; 18 years for *Quercus* and other species;

• maximum rotation period: coppice forests older than 50 years must be converted to high forest;

• number of standards: in case of coppices with standards a minimum of 60 standards per hectare must be left in the forest (a minimum of 30 standards can be left in case of chestnut forest); in case of compound coppice a minimum of 150 standards per hectare must be left in the forest, with at least 75 standards older than twice the rotation period.

Legal frame –land use, restrictions:

In Italy, although there are some differences among the 21 administrative regions/autonomous provinces, the simple coppice (coppice without standards) can be applied only for species like *Salix Spp., Robinia pseudoacacia (L.), Populus Spp., Alnus Spp., Corylus avellana*. 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 (age of harvesting, felling):

The rotation period varies depending on forest species and administrative region. However, the most common minimum rotation periods are: 8 years for Chestnut, Black locust, Poplar, Salix, Alder, Common Hazel; 24 years for Beech; 18 years for *Quercus* and other species. When the coppice is older than 50 years the coppice must be converted to high forest.

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

Latvia

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Coppice – deciduous tree stand that develops from shoots. Development of coppice depends on shoot production and regeneration ability. Trees that can regenerate with shoots multiple times include grey alder, black alder, birch, aspen, ash, oak and willow. Shoot sprouting activity gradually increases with tree age until it reaches physical maturity. At this point tree has the highest ability to sprout and grow shoots. Therefor it is important to set appropriate felling age to fit trees maturity (40-60 years). Felling time influences natural regeneration as well. Second part of winter is considered the most appropriate time for felling, since tree stumps give shoots very productively in next spring and they have enough time to mature before autumn frosts start.

-J. Bisenieks

Meža enciklopēdija, Apgāds "Zelta grauds", 2005

Atvasājs — lapkoku audze, kas izveidojusies no atvasēm. Atvasāja veidošanās atkarīga no koku atvašu dzīšanas spējas. Vairākkārt un ilgstoši atjaunoties ar atvasēm spēj baltalksnis, melnalksnis, bērzs, apse, osis, ozols un vītols. Pieaugot koka vecumam, pieaug arī atvašu dzīšanas spējas, līdz koks sasniedz fiziskās gatavības vecumu. Tad kokam ir visaugstākā atvašu dzīšanas spēja. Tādēļ, lai pēc mātesaudzes nociršanas panāktu sekmīgu izcirtuma apmežošanos ar atvasēm, jānoteic koku fiz. gatavības laikam (parasti 40—60 g.) pieskaņots cirtmets. Dabiskā atjaunošanās atkarīga arī no koku ciršanas laika. Par izdevīgāko uzskata ziemas otro pusi, jo tad pavasarī celmi bagātīgi dod atvases un tās līdz rudens salnām paspēj nobriest.

-J. Bisenieks

Meža enciklopēdija, Apgāds "Zelta grauds", 2005

Legal frame of coppice forest:

1.Short rotation coppice - as agricultural land if planted *Salix spp., Populus spp., Alnus incana*, rotation no more than 5 years. no restriction for density. 2.Forest land - more than 20% cover up to 5 m height. 2.1. Plantation forests - no restriction for felling age, pine at least 1,000 plants/ha initially; other species - 800, oak, ash - 500.

2.2.Forest- defined felling by age or dimensions, initial density 3,000/ha pine, other species 2,000. (www.likumi.lv).P.S. No natural regeneration, if more than 50% are planted or seeded trees.)

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Statistics:

No official statistics, but species regenerating as coppice in forest (total area of 2,903,412.64 ha) are birch (1,001,737 ha), black alder (121,770 ha); aspen (151,855 ha); grey alder (32,502 ha); ash (18,529 ha); linden (1,982 ha); oak (8,846 ha); beech (119 ha).

On agriculture lands 174 ha of aspens, 14 ha of grey alder and 516 ha of willows declared for common agriculture payments in 2016.

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method*
Coppice with standards	*For Populus, Alnus, Betula, Salix*
Pollarding	*Only on roadsides and in gardens*
Short rotation coppice	*Populus, Alnus incana, Salix*
Other types	*Few stands regenerated with poles or stakes (1.5-2 m)*

Lithuania

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Typology of coppice	
Low coppice (stump stools)	*Small amount,only in private forests*
High coppice (pollarding)	*Only on seedling plantation*
Coppice as standard	*Ash, Birch, Grey Alder*
Short rotation coppice	*Salix, Aspen, Grey Alder*

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Netherlands

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Closed forest with vegetative regeneration by regrowth of the stools of deciduous species (not willow) with good regrowth capacity.

Gesloten bos met vegetatieve verjonging door stronkopslag van loofboomsoorten (m.u.v. wilg) met een goed uitstoelingsvermogen.

Legal frame of coppice forest:

Traditional coppice is seen as forest in the Dutch Natura Conservation Act The minimum area is 0.1 hectare and have to have a canopy cover of at least 60%.

Short rotation coppice is seen as agriculture in the new Nature Conservation Act. It is defined as: Woody biomass plantation of willow, poplar, ash or alder with the aim to produce woody biomass. it is harvested at least every 10 years and contains at least 10,000 stools per hectare per unit. The short rotation coppice needs to be established after January 1st 2013.

Statistics

The forest in the Netherlands consisted mainly of coppice woodlands until approximately the end of the nineteenth century. Since then most coppice woodlands have been converted to high forest through replanting, abandonment and singling. Approximately 1,500 hectares is still coppiced today.

Typology of coppice	
Simple coppice	*As forests and small plantings in open, agricultural area.*
Coppice with standards	*Not practised*
Pollarding	*On roadsides, waterways and as forests along rivers (very small area)*
Short rotation coppice	*Mainly Salix (limited area)*
Other types	*Coppice in conversion process (oak and beech) with natural regeneration (seeds) or introduction of conifers (Pinus, Abies, Picea)*

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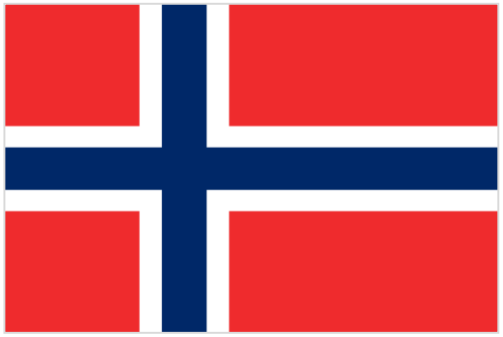

Norway

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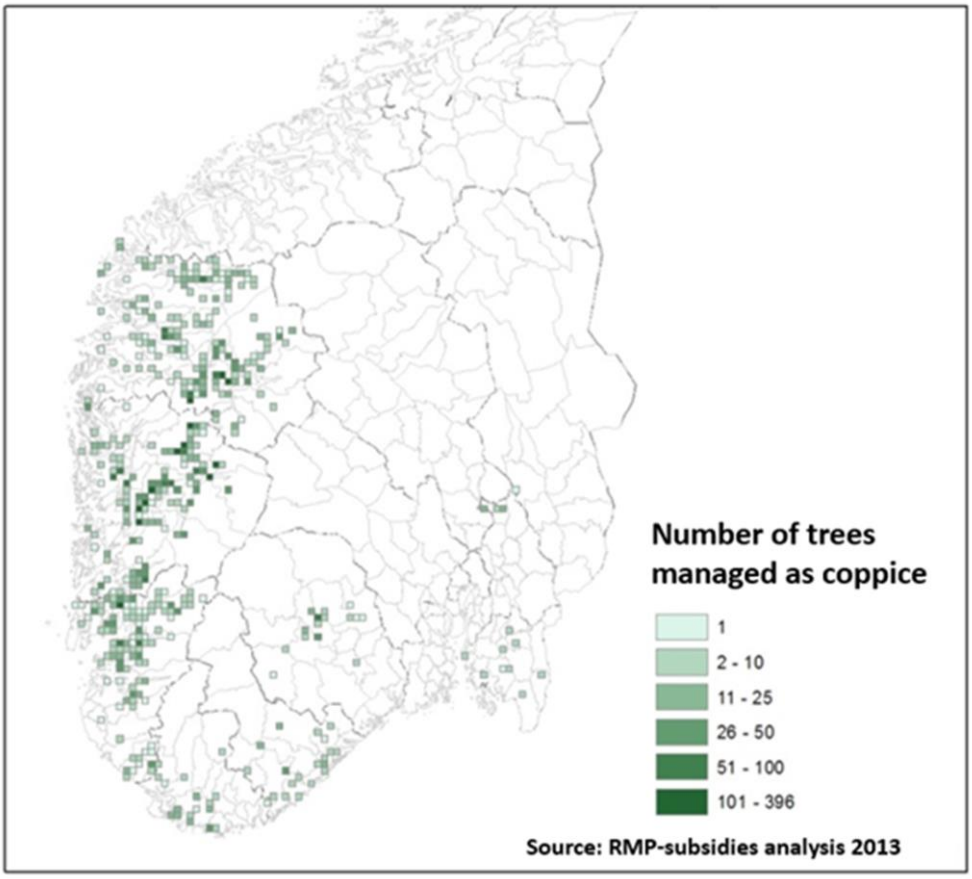

Figure 1: Trees managed as coppice in Norway -2013

Styving, Lauving

Legal frame of coppice forest:

Standard coppice does not exist in Norway as the Norwegian forestry sector is essentially dominated by conifers. On the other hand deciduous trees represent a very important part of the cultural heritage and the biodiversity and they are regulated under the "Naturmangfoldloven" (Diversity Act).

Nowadays coppicing is still performed in several counties i.e. Akershus, Rogaland, Sogn og Fjordane and Nord-Trondelag (see figure 1).

This practice is maintained essentially to keep the historical value of this tradition and protect the biodiversity.

Norwegian farmers can in fact apply for a specific subsidy, which amount at about 50 Euros/tree from the Regional Environmental Program for Agriculture (RMP) for keeping and managing as coppice the deciduous trees on their properties. The legal framework applies therefore to the procedure for registering the trees and obtaining the subsidies.

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Coppice managed tree 1989 and 2009;
Photo by Leif Hauge and Oscar Puschman

Year 1903. Photo taken by Anders Beer Wilse; copy - of the original belonging to Norsk Folkemuseum, Hardanger, Hordaland, Norway

Typology of coppice	
Simple coppice	*Practised still in some areas as a cultural heritage. In the past bark was also harvested for tanning.*
Coppice with standards	*Not practised*
Pollarding	*Practised still in some areas as a cultural heritage for pastures or boundaries.*
Short rotation coppice	*Not practised*

Poland

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1) Coppice: Even-aged or uneven-aged stand consisting of trees (mainly: Alnus glutinosa Geartn., Betula pendula Roth), which regenerate wholly or mainly (at least 50%) vegetatively (sprout or root shoot). After 2 years shoots are reduced to only 2 or 3, after 5 years only one shoot is left to grow as a high forest. Felling age is 60.

2) Short rotation coppice: Plantation of fast-growing trees or shrubs (mainly Populus spp., Salix spp.), with the aim to produce in several short rotation period (5-20 years each) wood as a renewable resource, mainly for energy. 3) Pollarding: cuts by which the tree (Salix spp.) trunks are shortened at 2-3 m height from the ground in order to obtain coppice sprouts on the top of a tree.

1) drzewostany odroślowe: jednowiekowe lub wielowiekowe drzewostany (głównie olsza czarna i/lub brzoza brodawkowata) odnawiane wegetatywnie całkowicie lub częściowo (min. 50%). Po dwóch latach od odnowienia pozostawia się 2-3 pędy odroslowe (pozostałe są usuwane), po 5 latach pozostawia się tylko jeden pęd, który dorasta do wieku rębności (60 lat). 2) odroślowe plantacje drzew szybkorosnących: celem jest produkcja drzew lub krzewów (głównie Populus spp., Salix spp.) w krótkich kolejach rębu (5-20 lat); drewno wykorzystywane jest jako energetyczne; 3) ogławianie: usuwanie wierzchołkowej części pnia wierzby (Salix spp.) do ok. 2-3 m wysokości od ziemi w celu uzyskania krzaczastych odrośli w górnej części pnia.

Statistics

Forests cover almost one third of Poland, 7,094,696 ha is under the State Forest National Forest Holding management. Total area of coppice amounts to 21,477.57 ha and almost 89% belongs to the State Forest. Coppice forests grow very often on areas of low access and are considered to be water and soil-protecting forests.
A main coppice-forming species is black alder (*Alnus glutinosa* Geartn.); the other coppice-forming species are oaks (*Quercus spp*.) and silver birch (*Betula pendula* Roth). Additionally, European beech (*Fagus sylvatica* L.), lime (*Tilia spp*.) and hornbeam (*Carpinus betulus* L.) are also used as mixed species in coppice.

Maciejowski K. 1953. *Olsza (Alder)*. Państwowe Wydawnictwo Rolnicze i Leśne. Warszawa, p. 27-28.
Szymura T. 2010. *Tradycyjna gospodarka odroślowa w Europie Środkowej i jej wpływ na różnorodność biologiczną (The traditional coppice management system in Central Europe and its impact on biological diversity)*. Sylwan 154 (8): 545−551.

Black alder coppice in Pułtusk Forest District. Photo by M. Rosińska, 2015.

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration used mainly for alder and oak, after 2 years only 2-3 sprouts are left, after 5 years, only one stem is left*
Coppice with standards	*Alder and oak*
Pollarding	*For willow only, landscape beauty*
Short rotation coppice	*Willow and poplar*
Other types	*Black alder, rotation period 60 years*

Portugal

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Coppice is a system where trees originate from vegetative or asexual reproduction. Most coppice forests have been converted into high-forest since the last decades. This has involved oaks (*Quercus faginea, Q. pyrenaica, Q. robur, Q. ilex*) and chestnut (*Castanea sativa*). The aim is to produce better timber quality and for conservation purposes. In the case of holm-oak (*Q. ilex*) many areas have been managed as a sylvo-pastoral system known as *montado*. The most common coppice forests in the country involves *Eucalyptus* plantations for pulpwood production. The most usual species is *E. globulus* which is grown in rotations of 10 – 12 years. Coppices are characterized by having small-sized trees of lower monetary value and limited applications. It also has a greater risk of forest fire and presents a lower interest for biodiversity and protection. Some regions such as the Mediterranean hold a great biological diversity. Management of oak forests should also ensure the sustainability and enhancement of the biological diversity. Oak forests are very rich ecosystems, ensuring in some regions the survival of rare and threatened plants. Cultural practices have been applied to improve tree growth and the production of wood of larger dimensions and better quality. The high-forest provides larger trees and high quality wood and is important in several aspects related with the environment protection and biodiversity conservation.

Coppice = Talhadia,
Coppice with standards = Talhadia composta

Legal frame of coppice forest:

Short rotation coppice is considered in those cases where the rotation is between 2 – 5 years. In Portugal, short rotation coppices are not common. The Forest Inventory considers forests of over 0,5 ha, minimum cover of 10% and width larger than 20 m. In general, there are no restrictions on clearfellings and on harvesting age. However, some natural parks might put some restrictions for some species. Restrictions consider size of clearcuttings for species that are relevant for conservation and protection purposes (mostly oak species). Some species are protected by law in respect of harvesting. Cork-oak (*Quercus suber*) and holm-oak (*Q. ilex*) cannot be pruned or harvested without permission from the official authority (Institute for Nature Conservation and Forestry). In relation to forest establishment densities, there are some minimal densities if the afforestation is supported by a financed project. It depends on species: Pine and other conifers 1000 trees/ha; *Pinus pinea* (fruit) 200 trees/ha; broadleaves 600 – 800 trees/ha; cork-oak and holm-oak (sylvo-pastoral system) 250 trees/ha. Forest areas affected by fire cannot be used for another purpose (e.g. construction) and must be forested.

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Statistics:

The coppice area is estimated around 863 thousand ha. The *eucalyptus globulus* area tended for pulp production occupies with a rotation period of 12 years an area of a 812,000 ha or ~ 26 % of total forest area (3,154,800 ha). Other types of coppicing with much higher rotation periods (20 - 50 years and eventually converted to high forest in a significant scale) correspond to oaks totalizing about 13% of the total forest area, *Castanea sativa* (~ 40,000 ha) and about 6% of the total forest area dedicated to species such as ash and poplar (20 years rotating cycle) aimed for timber production.

ICNF, 2013. IFN6 - Áreas dos usos do solo e das espécies florestais de Portugal continental. Resultados preliminares. Instituto da Conservação da Natureza e das Florestas, Lisboa 34 pp.
Carvalho, J., Viana, H., Rodrigues, A., 2015. Portugal. In: Nicolescu, V., Pyttel, P., Bartlett, D. (Eds.), Evolution and Perspectives of Coppice Forests in Europe and South Africa, Universitatea Transilvania din Brasov, pp. 27-29.

Typology of coppice	
Simple coppice	*Eucalyptus is the most common type of coppice forest in the country. The most usual species is E. globulus and is grown for pulpwood production. Most of the chestnut area refers to orchards for fruit production. Only small areas exist with coppice which was more used in the past for the production of small sized wood. Some oak species are used with coppice (Quercus faginea, Q. pyrenaica, Q. robur, Q. rotundifolia, for the production of firewood. Holm-oak (Q. rotundifolia) is the most used oak species used as coppice. Most of these forests have been improved to likely high-forest for quality timber production and conservation purposes. Pollarding may be found in some areas and it is mostly applied with ash (Fraxinus angustifolia) and poplar (Populus nigra)*
Coppice with standards	*Castanea sativa, Quercus faginea, Q. pyrenaica, Q. ilex subsp. rotundifolia*
Pollarding	*Pollarding may be found in some areas, mostly on ash (Fraxinus angustifolia) and poplar (Populus nigra)*
Short rotation coppice	*Not practised*

Romania

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(1) Coppice regime (regeneration method) is the general way of managing a forest, based on vegetative propagation (Forest Law, 2015).

(2) Simple coppice (low coppice) - silvicultural system in which the old stand is exploited at young ages (under 30-40 years) by clear-felling, and the regeneration is accomplished by stump stools or root suckers.

(3) Pollarding - cuts by which the tree trunks are shortened at 2-3 m height from the ground, to avoid the death by asphyxiation of the cut trees during flooding.

(4) Coppice with standards - intermediate regeneration method, between the two fundamental ones (coppice and high forest), in which the regeneration is accomplished by both seed and stools.

(1) Regimul crângului constituie modul general de gospodărire a unei păduri, bazat pe regenerarea vegetativă (Codul Silvic, 2015).

(2) Crâng simplu - tratament prin care arboretul se recoltează la vârste tinere (sub 30-40 ani) printr-o tăiere rasă, iar regenerarea se face prin lăstari sau drajoni.

(3) Crâng cu tăiere în scaun - tăieri prin care tulpinile arborilor se scurtează de la înălțimea de 2-3 m de la sol, pentru a feri suprafețele tăiate de asfixie în timpul inundațiilor.

(4) Crâng compus - regim intermediar între cele două regime fundamentale (crâng și codru), în care regenerarea se face atât din sămânță, cât și din lăstari.

Legal frame of coppice forest:

In all Romanian forests, the only regeneration method (regime) legally allowed is high forest.

The only forests where coppice regime is allowed consist of native poplars (black and white), willows, black locust, as well as alluvial forests (pure or mixed willow and/or poplar stands) (Forest Law, 2015).

Rotation period (age of harvesting, felling):

Black locust stands: from 20 years (5th yield class) to 35 years (1st yield class); White willow: from 15 years (5th yield class) to 30 years (1st yield class)

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Willow clone treated as short rotation coppice

Low coppice of linden

Pollarding

Statistics

Coppice (low) forests cover only about 5% of national forestland.

Typology of coppice	
Simple coppice	*Legally performed only in black locust, native poplars (black and white) and native willow stands; size of logging areas: maximum 3 ha*
Coppice with standards	*Forbidden since 1948*
Pollarding	*Performed in white willow (Salix alba) stands along the Danube and major inner rivers*
Short rotation coppice	*Practised on a small scale, only for willows and hybrid poplars*

Serbia

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Coppice forest is a traditional silvicultural form, that involves repetitive felling on the same stump, near to ground level, and allowing the shoots to regrow from that main stump or roots. Coppice forests in Serbia based on their productivity can be grouped into three categories: Good productive on good site, low productivity on good site and low productive on bad site. Most common are productive coppice stands with valuable wood quality on good site. Main silviculture strategy in such coppice stands is indirect conversion towards high forest. Maximum rotation period is 80 year. Coppice are important asset for private forest owners specially in regular supply of fuelwood from their small scale forest lots. The most abundant species are oak and beech.

- M. Krstić

- Gajenje šuma – konverzija, melioracija i veštačko obnavljanje, 2006

Izdanačke šume – panjače su su uzgojni oblik šume obnovljene vegetativnim putem, kada su se nova stabla razvila iz panjeva ili žila posečenih stabala . Izdanačke šume u Srbiji se mogu grupisati prema produktivnositi u sledeće kategorije: Dobre na dobrom staništu, loše na dobrom staništu i loše na lošem staništu. Najzstupljenije su dobre izdanačke šume na dobrom staništu. Glavna mera u toj kategoriji izdanačkih šuma je indirektna konverzija sa ciljem dobijanja visokih šuma. Maskimalna ophodnja u izdanačkim šumama je 80 godinaIzdanačke šume igraju važnu ulogu u redovnom snabdevanju privatnih šumovlasnika ogrevnim drvetom za sopstvene potrebe. Najzastupljenije vrste su hrast i bukva.

- M. Krstić

- Gajenje šuma – konverzija, melioracija i veštačko obnavljanje, 2006

Legal frame of coppice forest:

1. Serbian forest development strategy defines the optimal use the available measures of economic policy to ensure the permanent and long-term financial means for the stimulation of private forest owners, and to ensure the protection and improvement of the state of private forest resources.
2. The State is obligated to financially support this action.
3. The Law on Forest defines the financial mechanism for conversion of coppice into high forest by a special forest fund.
4. The main instrument for implementing forest policy into coppice forest is the forest management plan, where rotation and other management strategies are defined, based on existing silvicultural and forest management planning literature.
5. All management strategies are approved by the responsible ministry, and such management plans become legally binding documents after approval.

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Statistics

Representation of coppice in the forest area is 64.7% (1,456,400 ha)
Dominated by oak forests with 42% and beech with 21%
Most of coppice forests are in private ownership with 61.4%
The most common are preserved coppice stands with 76.3%
Share of insufficient stocked coppice stands is 21.3% over the area.
Representation of devastated coppice stands is 2.4%
Unfavourable age structure: 1. young (10%), 2. middle-aged (78%) and mature (12%)

Source: National forest inventory of the Republic of Serbia, 2009

Typology of coppice	
Other types	Preserved coppice: *Dense to complete canopy (1.0-0.6), good health and good-quality trees, favourable ratio of principal and minor tree species.*
	Insufficiently stocked coppice: *Incomplete canopy (0.4-0.6), good health and good-quality trees, more unfavourable ratio of principal and minor tree species*
	Devastated coppice: *Characterised either by broken canopy (below 0.4), or by poor tree health and quality, or completely unfavourable tree species ratio (changed in favour of minor species).*

Slovakia

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Coppice is a stand of deciduous trees with re-sprouting ability from roots and tree stools, predominantly in the oak forest vegetation zones.

VÝMLADKOVÝ LES. Výmladkový les tvoria listnaté porasty obnovované koreňovou a pňovou výmladnou schopnosťou, väčšinou v oblastiach dubového vegetačného stupňa.

Legal frame of coppice forest:

No direct legal framework but mentioned in the classification of forests in the Regulation of the Ministry of Agriculture, nr. 453/2006 (coppice and high forest originated from coppice)

Statistics

The extent of coppice forests in Slovakia is 34,463 ha (1.8 %) and 76,216 ha (3.9 %) high forests from coppice of first generation (the last category is according to the Country Act nr. 453/2006, § 19). The area of traditional coppice is in process of decreasing due to conversion towards high forest (in 1920: 208,438 ha). The Slovak legislation does not count with coppicing in the future. A total area of SRC on forest land of Slovakia is 520 ha, potential area for SRC on forest land is 15,000 ha. According estimations of the National Forest Centre theoretical potential for SRC on agricultural land in Slovakia is 45,000 ha (however currently there are only about 150 ha of SRC).

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method, recently limited use only, in black locust, oak, hornbeam, beech, alder, willow, poplar forests*
Coppice with standards	*Oak, rarely others*
Pollarding	*Historically yes, recently rare on roadsides or in yards and parks - willow, mulberries*
Short rotation coppice	*Willow, poplar*
Other types	*Coppice in conversion to high forests (oak-hornbeam, beech etc.), ageing (trend)*

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Slovenia

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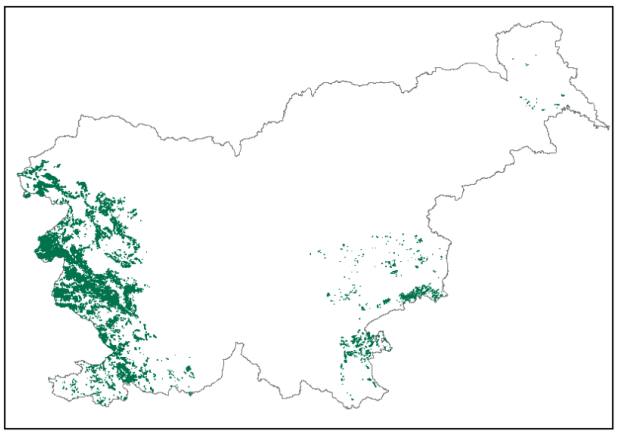
Coppice forest is forest with short rotation period and is characterized by rejuvenation with stump shoots.

Panjevski gozd je gozd s kratko obhodnjo, ki se obnavlja s poganjki iz panja.



Statistics

Coppice forests in Slovenia are present only on 36,340 ha, which is less than 3,1 % of total forest area (Slovenian forestry service, 2015). These forests are present in the west, south west, and south-east part of the country.

Legal frame of coppice forest:

1. Short rotation coppice is allowed only on agricultural land (Forest law, 2016)
2. Coppice forest is a stand of coppice origin, that has not overgrown the size of a pole stand. In coppice forest the marking of trees is not mandatory (Forest law, 2016)

Rotation period (age of harvesting, felling): Distinctivly short rotation with felling age between 12-30 years

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method (Beech, Chestnut, Robinia, Quercus)*
Pollarding	*Historically present in the south of the country*
Short rotation coppice	*Present on test plots – Salix spp*

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South Africa

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Coppice - when tree are cut at - or near - ground level so that it regrows with multiple stems which are then thinned at regular reductions to one stem per stump at clearfelling age in *Eucalyptus* in pulpwood or mining timber production at ages between 8 and 15 years.

-Pierre Ackerman

Various exotic eucalypts (and their hybrid combinations) that are grown for commercial timber production, resprout from the cut-stump (cut-surface ca. 5-15 cm in height) following harvesting, predominantly from epicormic buds, and/or lignotubers. For commercial production, these coppice shoots are selectively thinned through time and managed as a coppice stand for pulp wood, mining timber or poles. In general the coppice shoots are reduced to the original stocking in two operations, the first to 2 or 3 shoots when the dominant height is about 4 m, and the second to the original stocking when the dominant shoot height is about 8 m. Rotation-lengths vary according to site productivity and/or product and range from ca. 7 -15 yrs. Increasingly, rurally-based small growers are managing eucalypt coppice stems for multiple products (droppers, laths, poles and pulp wood), with a higher management intensity in terms of repeat visits to remove product, and over a much shorter rotation (ca. 3 - 7 yrs).

-Keith Little

Legal frame of coppice forest:

As Eucalyptus stands regenerated via coppicing are generally managed for commercial timber production, the same legal framework that applies to all exotically grown tree species would apply. As such there is no direct legislation that applies specifically to how coppice stands are managed.

Rotation period (age of harvesting):

The rotation period will very much depend on the eucalypt grown, desired end-product and site productivity.

For laths/droppers the rotation period may be 3yrs, extending to 7-15 yrs for pulpwood and poles. The general rule is to plant - coppice - replant - coppice due to improved genetics, species and/or hybrid combinations (the idea being to only coppice once before replanting)

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A coppiced stand of six-year-old *Eucalyptus grandis* x *E. camaldulensis* clones in the sub-tropical region of Zululand

Statistics

Of the total land area, ca. 1.1% (1.275 million ha) is planted to exotic plantation forests. The main tree species planted for commercial purposes include pines (51%), eucalypts (42%) and wattle (7%). Rough guess estimate of the area managed for coppice would be 25 - 33% of the area planted to eucalyptus at any one time that would be managed for coppice, but this figure will fluctuate from year to year.
Most of the plantation forests are located along the eastern seaboard of South Africa. Intensive silvicultural regimes are practised to maximise volume production, with mean annual increments ranging from 15 to 60 m^3 ha^{-1} $annum^{-1}$, dependent on site quality. Although eucalypts are planted at various inter- and intra-row distances, the target density at felling age 1,300 – 1,600 sph.

Typology of coppice	
Simple coppice	*In short rotation eucalyptus pulpwood stands*
Pollarding	*Partially; where replanting is for some reason not deemed suitable or necessary. In our natural forests it is applied to certain species; e.g. Stinkwood, in terms of protecting the species particularly when damaged during illegal bark stripping for "medicinal" use*
Short rotation coppice	*Eucalyptus pulpwood and mining timber stands*

Spain

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Coppice forests - forest composed of trees originating from stump or root resprouts.

-Míriam Piqué

Coppice forest - "monte bajo" = Masa arbórea compuesta por pies cuyo origen es un brote de cepa o raíz

-Míriam Piqué

(1) Management system applied to hardwood forests where regeneration is due to sprout up from roots or stumps after clearcutting.

(2) Forest formed by small softwood trees and shrubs

-Rubén Laina

(1) Método de beneficio aplicado a una masa forestal de frondosas que busca la regeneración mediante brotes de cepa o de raíz.

(2) Estructura de una masa forestal, compuesta por frondosas de bajo porte y/o arbustos.

-Rubén Laina

Legal frame of coppice forest:

There is not a specific legal frame affecting coppice forest management in Spain. Management practices must follow "general good practices" in terms of proper rotation period (depending on species and objective), silvicultural criteria, and also organization and implementation of logging works. Harvest plans are supervised and approved by the Government forest services to ensure good management practices are included.
-Míriam Piqué

Rotation period (age of harvesting, felling):

1. 20-30 year rotation coppice of *Quercus ilex, faginea* or *pyrenaica* oak with 1500-3500 trees per ha density, and 10 to 20 m height.
2.- 12-16 years eucalyptus plantations, 600 trees/ha, three rotations before planting again.
3.- Chestnut forest, several thinnings before clearcutting at 80 years.
-Rubén Laina

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Quercus faginea abandoned conversion to high forest. Photo by Pau Vericat

Quercus ilex ilex selection coppice. Photo by Pau Vericat

Quercus humilis conversion to high forests. Photo by Míriam Piqué

Quercus ilex ilex selection coppice. Photo by AGS-CTFC

Quercus ilex ballota low coppice. Photo by Pau Vericat

Typology of coppice	
Simple coppice	*Most usual type for obtaining fuelwood in evergreen oak (Q.ilex), decidous oaks (Q. faginea, Q.pubescens, Q. pyrenaica, Q. canariensis, Q. petraea, Q. robur) and other species as Betula pendula/pubescens, Salix caprea and Eucalyptus spp. Also applied in Castanea sativa, Platanus, Alnus and Salix*
Coppice with standards	*Quercus pyrenaica*
Pollarding	*Was often used in the past in several species as beech, deciduous oaks, chestnut, ash, poplar, elm or willow, in order to combine grazing uses together with fuelwood or timber production but this type of coppice is mostly abandoned nowadays*
Short rotation coppice	*Populus*

References: Serrada R, Montero G, Reque JA, 2008. Compendio de selvicultura aplicada en España. Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Ministerio de Educación y Ciencia, Madrid. 1178 pp.

Vericat P, Piqué M, Serrada R (eds.). 2012. Gestión adaptativa al cambio global en masas de Quercus mediterráneos. Centre Tecnològic Forestal de Catalunya, Solsona. 172

Vericat P, Piqué M, Beltrán M, Cervera T. 2011. Models de gestió per als boscos d'alzina (Quercus ilex subsp. ilex) i carrasca (Quercus ilex subsp. ballota): producció de fusta i prevenció d'incendis forestals. Sèrie: Orientacions de gestió forestal sostenible per a Catalunya (ORGEST). Centre de la Propietat Forestal. Departament d'Agricultura, Ramaderia, Pesca, Alimentació i Medi Natural. Generalitat de Catalunya, Barcelona. 166 p.

Sweden

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Coppice forests - forest composed of trees originated from stump or root resprouts.

Lågskogsbruk / skottskogsbruk

Legal frame of coppice forest:

There is no specific legal frame for coppice forests in Sweden. Excepts for *Salix* which is considered as a agricultural crop, coppice have mainly been practised historically is very limited nowadays. Pollarding and coppice with some trees like alder is sometimes practised.
Rotation period is 3-5 years for *Salix*.

Typology of coppice	
Simple coppice	*Have been used historically, but not anymore*
Coppice with standards	*Have been used historically, but not anymore*
Pollarding	*Widespread historically, nowadays only for restoration purposes and along roads etc. in the southernmost part of the country*
Short rotation coppice	*Salix plantations*

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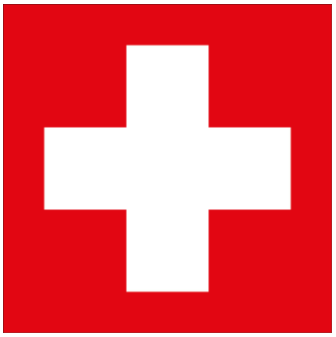

Switzerland

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Forest grown from coppice sprouts or root shoots with a short rotation period. Oldest form of regulated forest use, mostly to obtain firewood. This management system favours tree species that can develop coppice sprouts like chestnut, beech, hornbeam, and oak. Coppice forests are regularly (every 10–30 years) clear-cut

Legal frame of coppice forest:
no particular restrictions

Statistics

No data (also because close to not existing) for pollarded (high) coppices and short rotation coppices.

	Simple coppice	Coppice with standards
Area ha	26,200	9,400
% of total Swiss forest	2.1%	0.7%
Average stem density N/ha	622	528
Average growing stock m3/ha	189	267
Average growth rate m3/ha/yr.	5.5	6.7

Ceduo - Bosco cresciuto da polloni di ceppaia o radicali a turno breve. È la più antica forma di gestione regolamentata del bosco, finalizzata prevalentemente alla produzione di legna da ardere. Questo tipo di gestione favorisce lo sviluppo di specie arboree capaci di generare polloni, quali il castagno, il faggio, il carpino e la quercia. Il ceduo viene tagliato a raso a brevi intervalli di tempo (ogni 10–30 anni).

Taillis - Forêt à courte rotation, issue de rejets de souche ou de drageons. C'est la plus ancienne forme d'exploitation forestière réglementée, qui sert avant tout à produire du bois de chauffage. Cette forme d'exploitation privilégie les essences pouvant donner des rejets de souche, comme le châtaignier, le hêtre, charme ou le chêne. Les taillis sont exploités à intervalles courts et réguliers (tous les 10 à 30 ans).

Niederwald - Aus Stockausschlag oder Wurzelbrut hervorgegangener Wald mit kurzer Umtriebszeit. Älteste Form der geregelten Waldnutzung, vorwiegend zur Brennholzgewinnung. Die Bewirtschaftungsart begünstigt Baumarten mit der Fähigkeit zum Stockausschlag wie Edelkastanie, Buche, Hagebuche und Eiche. Niederwald wird in kurzen Zeitabständen (alle 10–30 Jahre) kahl geschlagen.

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Chestnut coppice with standards

Ceduo samplice – chestnut simple coppice

High chestnut coppice – pollarded former orchard

Typology of coppices	
Simple coppice	*Coppicing of chestnut stands or Alder-stands close to the rivers (0.1 to 0.3 ha)*
Coppice with standards	*Only exceptionally practised in chestnut forests. In the Northern Part of the country there were coppices composed by oaks from seeds (for masting) and hornbean from coppice (for firewood). This type is almost disappeared*
Pollarding	*Former orchards treated as pollards starting in the late 1960s and now abandoned*
Short rotation coppice	*Not relevant in Switzerland at the moment*

Turkey

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Coppice - a forest that has sprout origin/background and which is destined to be regenerated by sprout, for harvests of small and medium-sized wood.

- Halil Barış Özel

(1) Coppice Forests - Even-aged stands consisting of trees and shrubs (mainly: *Quercus spp., Carpinus betulus, Castanea sativa, Alnus glutinosa*), which regenerate wholly or mainly vegetatively (as sprout or root shoots) and are harvested in small clearcuts (0.5-1 ha) in short rotations of 20-40 years.

(2) Short rotation coppice: Plantation of fast-growing trees or shrubs (mainly *Populus spp., Salix spp.,* and *Eucalyptus spp*.), with the aim of producing wood as a renewable resource in several short rotation periods (5-15 years each).

- Murat Ertekin

(1) Baltalık Orman: Farklı yaştaki ağaç ve çalılardan (Meşe, Gürgen, Kestane, Kızılağaç) oluşan, meşcere bazında (0.5-1 ha) 20-40 yıllık periyotlarla tıraşlama kesimleri vejetatif (kök ve kütük sürgünü) yolla gençleştirilen ormanlardır.

(2) Kısa süreli baltalıklar: Hızlı büyüyen ağaç ve çalılardan (kavak, söğüt ve okaliptus) oluşan, odun üretimi amacıyla kısa rotasyon süreyle (5-15 yıl) işletilen plantasyonlardır.

- Murat Ertekin

Legal frame of coppice forest:

1. 40-50 year rotation coppice of *Quercus petraea, robur, Fagus orientalis,* oak with 2,500-4,200 trees per ha density, and 15 to 25 m height.

Coppice forestry, as all other forestry, is regulated mainly by 2 legal acts:

1) Turkish Forestry Law,

2) Forest Management Plan of Regional Directorate 2010-2020.

Turkish oak forests, main coppice species (5,150,000 ha), are generally state owned. The management of these coppice oak forests is intensive, with a clear cutting cycle ranging from 20 years.

Rotation period (age of harvesting, felling):

Minimum rotation period: 8 years for poplar, *Salix* ; 15 years for eucalyptus; 20 years for oak.

Maximum rotation period: coppice forests older than 50 years must be converted to high forest.

Short rotation coppice is seen as agriculture. It is defined as: Woody biomass plantation of willow, and poplar with the aim to produce woody biomass. it is harvested at least every 5-10 years.

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Statistics

There are 2.7 million hectares of forest in Turkey. Coppice area is 12% of the total forest area.

	Productive Area	Unproductive Area	Total Coppice
Area distribution (ha)	785,087	1,938,130	2,723,217
Stem volume distribution (m^3)	33,692,118	11,953,934	45,646,052
Mean annual increment (m^3/year)	1,511,561	585,191	2,096,752

Source: **GFD, 2015**. The Forests of Turkey in 2015, General Forest Directorate, Ankara, 36p.

The degraded coppice of European Hornbeam (*Carpinus betulus* L.) in Western Black Sea Region.

The productive coppice of oriental beech (*Fagus orientalis* Lispky.) in Western Black Sea Region.

Typology of coppice	
Simple coppice	*Small clearcuts, rotation 20-40 years*
Coppice with standards	*Yes - standards often of oak*
Pollarding	*Only in gardens, roadsides and urban streets*
Short rotation coppice	*Populus spp., Salix spp., Eucalyptus spp.*
Other types	*Conversion of coppices to high forest, especially oak and beech*

Ukraine

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(1) Coppice - Even-aged stand consisting of trees and shrubs (mainly: *Quercus spp., Fraxinus spp., Betula spp., Carpinus betulus, Alnus glutinosa*, occasionally *Fagus silvatica*), which regenerate wholly or mainly vegetatively (sprout or root shoot) and are harvested in small clearcuts (0.5-1 ha) in short rotations of 30-60 years. In some cases combined with standards with longer rotation periods.

(2) Short rotation coppice: Plantation of fast-growing trees or shrubs (mainly *Populus spp., Salix spp*.), with the aim to produce in several short rotation periods (5-20 years each) wood as raw material for weaving furniture and a renewable resource, mainly for energy.

Переліски - невеликою здебільшого вузькі, витягнуті ділянки лісу, які межують або чергуються з окремими полянами, полями або луками, сюди також відноситься рідкостійні ліси, що з'єднують лісові масими. Гай - невеликий за площею ліс, сформований деревами однієї породи близького віку. Підлісок - чагарники, рідше деревні породи, що не досягають висоти верхніх ярусів, не входять в основний деревний ярус і не здатні утворити деревостан у даних умовах.

Natural mixed broadleaved coppice forests in the Ukrainian Subcarpatians

Legal frame of coppice forest:
Low forests

Legal frame – land use, restrictions:
Practical regulations and recommendations for forestry

Rotation period (age of harvesting):
The rotation period varies depending on forest species. However, the most common minimum rotation periods are: 5 years for *Salix*; 30-60 *Quercus, Alnus*, Birch, Ash, *Populus*, Beech; and *Carpinus*.

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Statistics

Coppice forests are about 10% of total forest area (9.7 Mill. ha). Most of the coppice are oak forests (5.1 %). There are differentiated natural coppice with rotations of up to 60 years and coppice with rotations of 2 – 5 years (wood energy plantations). The density (up to 20 thousand trees ha^{-1}) of coppice plantations have been established mainly with *Populus* and *Salix* species. Main products extracted from natural coppice forests are firewood, charcoal, pole wood and branches for brooms.

The coppiced trees were mainly selected for firewood (e.g. *Carpinus betulus* L., *Robinia pseudoacacia* L., *Fagus sylvatica* L., *Betula verrucosa* Ehrh., *Salix alba* L., *Salix caprea* L., *Alnus glutinosa (L.) Gaerth., Alnus incana* (L.) Moench, *Sorbus aucuparia* L., *Malus sylvestris* Mill., *Populus tremula* L., *and Corylus avellana* L.), while the uneven-aged standards were selected to produce timbers *(e.g. Quercus robur* L., *Quercus rubra* L., *Fraxinus excelsior* L., *Fagus sylvatica* L., *Alnus glutinosa* (L.) Gaerth.).

Sopushynskyy I.M., Vintoniv I.S., Kharyton I.I., Ostashuk R.V. (2015): Some Features of Firewood Qualimetry // Scientific Bulletin of UNFU, Issue 25.1: 162-166.
Forests in Ukraine. http://dklg.kmu.gov.ua/forest/control/uk/publish/category?cat_id=32867

Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method*
Coppice with standards	*Populus, Alnus, Betula, Salix, Fraxinus, Quercus , Carpinus*
Pollarding	*Only on roadsides and in gardens*
Short rotation coppice	*Populus spp., Salix spp.*

United Kingdom

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Woodland comprising broadleaved trees, areas of which are clear felled, often regularly, and which then re-sprout (sometimes including suckering species). These sprouting root stocks will grow another crop of trees in the absence of grazing and browsing.

- David Rossney

Coppice in the UK really just means any tree that is cut at - or near - ground level, so that it regrows with multiple stems. These trees would then be described as 'coppiced'. Coppice woodland is woodland where this management technique has occurred and this may be carried out repeatedly, and so called rotational (or in rotation) coppice. We would refer to such woodland as managed by coppicing or in coppice management.

- Debbie Barlett

Legal frame of coppice forest:

No special legal frame work for coppice, but it is mostly covered by general UK Forestry legislation and tree felling controls.
Coppice often grows in ancient semi-natural woodland which is itself subject to legal protection from damage. This does not mean that felling coppice cannot take place, but that the woodland must be allowed to re-grow again. This in effect means not cleared for building or agriculture and protected from grazing farm animals and wild browsing animals like deer.
-David Rossney

There is no legal framework. In fact we have some problems defining woodland. Short Rotation Coppice is usually *Salix spp*. although chestnut can be managed on a wide range of rotations depending on end use, for example 3 years for walking sticks.
-Debbie Barlett

Statistics:

In 1999, total forest cover in the UK was over 2.6m ha
Coppice and coppice with standards amounted to 0.9% of this total (24,000 ha)
Historically this was higher and estimated at 5.3% in 1947 and 1.5% in 1980
Source: Forestry Commission Research Report 2010
Much of the broadleaved woodland was, in the past, managed as coppice even if this practice has not been continued

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Typology of coppice	
Simple coppice	*Traditional natural forest regeneration method still practised, particularly in Southeast England, maybe sweet chestnut, hazel or mixed species and may include standards*
Coppice with standards	*UK - Very common with usually oak as the standard. This was, in times past important for timber, particularly ship building, but recruitment of standards is no longer the norm but is encouraged for biodiversity.* *England - standards often of oak*
Pollarding	*UK - Practised in historic wood pastures and also within low coppice areas as one way of marking boundaries between felling areas and changes in ownership, parish boundaries etc.* *England - historically - now regarded as archaeological features of cultural/biological significance*
Short rotation coppice	*UK - Practised as an agricultural alternative to normal farmed crops. Not really part of our woodland management heritage, unless counting hazel coppice cut on 7-9 year rotation.* *England - limited and considered as agriculture rather than forestry*
Other types	*Self-seeded stands and newly planted coppice. A little new planting is still undertaken with the intention of creating new coppice woodland, particularly for sweet chestnut.* *Seed regeneration, especially of species such as silver birch, is often mistaken for or mixed in with coppice and is effectively managed in much the same way. After cutting, some stools will coppice, but with birch, most new trees come from self -seeding.*

Main tree species managed as coppice in the respective countries

Data from National Factsheets on Coppice Forests

	Alders	Ash	Aspens/Poplar	Beech	Birch	Elm	Eucalyptus sp.	Hophornbeam	Hornbeam	Lime	Linden	Maple	Oaks	Paulownia	Platanus	Robinia	Rowan tree	Sweet chesnut	Wild cherry	Willows
Albania	x		x										x	x		x				x
Austria			x																	x
Belgium	x	x	x		x				x			x	x					x		x
Bosnia and Herzegovina	*No data available*																			
Bulgaria				x					x		x		x			x				
Croatia	x		x	x				x					x			x		x		x
Czech Republic	x	x	x		x	x			x	x		x	x				x		x	x
Denmark																				x
Estonia	x		x																	x
Finland	x		x		x															x
France	x	x	x	x	x		x						x			x		x		x
Germany			x										x			x				x
Greece													x							
Hungary	x		x													x				
Ireland																				x
Israel	*No data available*																			
Italy	x		x	x		x	x	x	x				x		x	x		x		x
Latvia	x		x		x						x									x
Lithuania	x	x	x		x															x
Macedonia				x									x							
Netherlands				x									x							x
Norway	*No data available*																			
Poland	x		x		x								x							x
Portugal		x	x				x						x					x		
Romania			x								x					x				x
Serbia				x									x							
Slovakia	x		x	x					x				x			x				x
Slovenia				x									x			x		x		x
South Africa							x													
Spain	x		x		x		x						x		x			x		x
Sweden	x		x		x						x									x
Switzerland	x								x				x					x		
Turkey			x	x			x						x							x
Ukraine	x	x	x		x				x				x							x
United Kingdom		x							x				x					x		

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Hungary
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Italy
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Romania
Serbia
Slovakia
Slovenia
South Africa
Spain
Sweden
Switzerland
Turkey
Ukraine
United Kingdom

EuroCoppice - COST Action FP1301 2013 - 2017

Over 150 experts, researchers and practitioners from **35 European and partner countries** came together to collect and analyse information on coppice forests and their management. A broad range of topics were addressed in five **Working Groups**: (1) Definitions, History and Typology, (2) Ecology and Silvicultural Management, (3) Utilisation and Products, (4) Services, Protection and Nature Conservation, and (5) Ownership and Governance.

Action Members have produced reports and publications for science, policy and practice, raised awareness for important coppice-related issues, highlighted findings at numerous conferences and supported the careers of young researchers. Further information can be found at: www.eurocoppice.uni-freiburg.de

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Further Contacts: EuroCoppice initiated a long-term platform for coppice-related topics within IUFRO (www.iufro.org), the global organisation for forest research: Working Party 01.03.01 "Traditional coppice: ecology, silviculture and socio-economic aspects". Coordinator: Valeriu-Norocel Nicolescu, nvnicolescu@unitbv.ro