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

Coppice Products

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COST is supported by the EU Framework Programme Horizon 2020

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Published by:
Albert Ludwig University Freiburg
Gero Becker, Chair of Forest Utilization
Werthmannstr. 6
79085 Freiburg
Germany

Printed by:
Albert Ludwig University Freiburg Printing Press

Year of publication: 2017

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Reference as: Magagnotti, N., Schweier, J. (Eds.) (2017). *Coppice Products. COST Action FP1301 Reports*. Freiburg, Germany: Albert Ludwig University of Freiburg.

Design & layout: Alicia Unrau
Cover acknowledgements: Simple coppice (grey) based on a drawing by João Carvalho;
Leaf vectors originals designed by www.freepik.com (modified)

Introduction

Coppice is a traditional form of forest management widely practiced in Europe since ancient times. Some studies quoted that, in the Mediterranean area, coppiced forests were already established in the Etruscan-Roman period (Matthews 1989, Gabbrielli 2006).

The management system relies on the ability of broadleaved tree species to regenerate quickly from cut stumps and root systems following felling. The size of felled area and periods between felling both vary depending on the silvicultural needs of different species and local economic factors.

Typical rotation lengths in different countries are detailed in the table below:

Table 1. Most common species and rotation ages in some European Countries (compiled based on the experience of report contributors)

Country	Rotation (Year)	Species
IT	12 - 40	Beech, Chestnut, Oak spp., Hornbeam
ES	15 - 30	Beech, Chestnut, Oak spp.
FI	5 - 6	Willows
SK	10 - 30	Birch, Oak spp.
UA	30 - 60	Ash, Alder, Beech, Birch, Oak spp.
MK	30 - 60	Ash, Beech, Oak spp., Hornbeam
SI	30 - 60	Beech, Chestnut, Robinia
AL	10 - 60	Arbutus, Oak spp.
UK	10 - 50	Ash, Birch, Chestnut, Hornbeam
PT	12 - 30	Chestnut, Eucalypt, Oak spp.
EL	10 - 50	Beech, Chestnut, Oak spp.
FR	10 - 60	Beech, Chestnut, Hornbeam, Oak spp.
PL	60	Alder

Coppice management usually provides a regular supply of small dimension material after just a few years of growth. The continued popularity of this type of forest management may be attributed to a relative ease of management and the fact that it is still possible to practice coppicing satisfactorily without large capital investment. Farmers and loggers can cut stools with simple and affordable tools, and obtain products for use in other field works. The felled stems are often small enough to be easy to handle manually, with simple/low specification mechanized forestry systems or with tools already in use on the farm or for other purpose (i.e tractors, trailers, horses, etc.). Furthermore, coppiced forests are usually harvested during winter and this fits well with the work timetable of farmers.

The final harvest of a mature coppice forest commonly yields between 90 and 200 m^3/ha, depending on species, age and site productivity. Stems cut in coppice stands are generally transformed into small-size assortments. Average stems size varies between 0.05 and 0.25 m^3.

Historical and Current Trends:

Coppice forest management increased with demographic growth during the 17th-19th centuries and with early industrialization (iron industry, glass factories, tile and lime kilns) which created high demand for firewood and charcoal, especially if coal was not locally available (Parde 1991, Woronoff 1990).

In the past century, with the widespread use of other energy sources like gas and oil and the use of posts and poles made of concrete or from coniferous species, coppicing entered a period of decline and many coppiced forests became neglected. Furthermore, the migration of people from villages to towns contributed to the abandonment of rural areas and consequently also of the forests.

Photo: Ivalsa

Now, due to higher fossil fuel prices and efforts to replace fossil fuels by CO^2 neutral renewable energy there is once again a strong demand for relatively cheap fuel wood. Scale is an issue: the current increase is only partly due to demand for traditional small-scale firewood but also large commercial operations supplying both domestic and industrial biomass markets.

There is also an increasing demand for 'environmentally friendly' materials for use in agriculture, horticulture and in bioengineering, such as soil and bank protection, so coppice products have a "second chance" to satisfy these needs.

The general trends can be summarised as long-term growth, a period of short-term decline and now recent revival.

Wood Products

Firewood

Firewood was the first fuel and has always been used for heating, cooking and lighting. Historically, small diameter trees were cut for fuelwood and species more useful for building purposes were conserved. Firewood was never completely surplanted by fossil fuels and it enjoyed a revival in recent years with the increasingly severe oil crisis (Warsco 1994). In fact, Europe still uses more traditional firewood than any other industrial energy wood product (Nybakk et al. 2003). In total, Europe consumes over 100 million solid m3 of firewood per year, about twice as much as US and Canada together (FAO 2007).

Figure 1. Firewood from coppice, piles at the roadside (on the left), near the forest, ready to be transport and then split (right) (Photos: Ivalsa)

Firewood production exceeds 17% of the total wood production in Norway, whereas, in Finland and Sweden the level is nearer 10%. In Central Europe firewood production reaches up to 50% of the total wood production (e.g. Hungary 52%) and in some Southern European countries it reaches more than 70% (e.g. Italy 70%, Greece 72%) (EUROSTAT, 2015).

Firewood consumption reached 22 million m^3 solid in France (Elyakime and Cabanettes 2013), about 2.5 million m^3 in Spain, 18 million m^3 in Italy (Caserini et al. 2008) and Slovenian households used about 1.1 million m^3 of firewood every year (Čebul et al. 2011).

Firewood (fig 1) is extracted from the forest in different lengths, from 2 to 6 m in northern Europe, and from 1 to 2 m in southern Europe, due to the different extraction methods (Magagnotti et al. 2012, Zimbalatti and Proto 2009). It is sold to consumers both as roundwood and as split logs in different lengths (typically 25-30-50 cm or 1-2 m billets).

Most common species used as firewood are beech, oak spp, black locust, hornbeam, ash and alder. Traditionally chestnut was not a popular firewood in an open fire because of the tendency to crack and spit during the burning process. Nowadays, with the modern enclosed fireplaces and downdraft boilers these disadvantages are not as relevant and chestnut is more widely used due to its availability and lower price compared to other species.

Firewood has a strong presence on today's markets. In the future one expects a possible slow decline, due to wood stoves and boilers with high energy efficiency and the replacement of solid wood with the new technologically-advanced user-friendly wood-based fuels, namely wood chips and pellets.

Charcoal

Charcoal is produced from hardwoods such as oak, beech, birch, hornbeam by pyrolysis and it is a porous solid fuel having a high calorific value (31MJ/kg). Therefore, the combustion of charcoal gives off high heat, without flames. The main advantage of the product is that the combustion emits no harmful emissions (tar, tannins, methane, etc.). All these qualities of the product have been widely used for domestic purposes: charcoal is popular choice for outdoor cooking.

In former times, it was produced directly in the forest and still nowadays you can find

Figure 3. Chipper working at the landing, chipping coppice wood

(Photos: Ivalsa)

Figure 2. Example of wood chips

small flat spaces in coppice forests, where the simple earth kilns were operated. Charcoal is suitable for a large variety of domestic and industrial uses. As “active coal” it is also used as an absorbent material in filters and as a reducing agent in metallurgy. It can easily be transported and stored.

Nowadays charcoal represents a minor market in the EU, although with exceptions. In the Carpathian mountains of Ukraine, there are notable examples of industrial charcoal-making operations, developed for the export markets over the last 5 years, and currently turning over 0.5 million m^3 of wood into charcoal.

Chips

Wood chips are wood particles with a length ranging between 2 and 5 cm, a width of 2-3 cm and a thickness of few millimetres (fig 2). Chipping is a common way to process woody biomass from coppice woodland, mainly processing the residues and non-firewood species. The efficiency of the operations is determined by appropriate chipper selection and work techniques (fig 3). Generally, chips are obtained from forest residues like branches and tops while trunks are used for firewood or poles. This holds true as long as the prices for firewood or poles are higher than the price for chips.

Species like poplar or willow from short rotation coppice that do not have an alternative market are ideal for chip production.

Chipping has the potential not only to increase the total harvest through a better utilization of the available above ground biomass, but also gives a solution to the problem of residue management (Pottie and Guimier 1985, Asikainen and Pulkkinen 1998). The demand for chips is linked to the uptake of modern boilers and power stations that are more efficient and have lower emission rates that traditional stoves (Strehler 2000).

Industrial Roundwood

Coppiced beech and chestnut from France and Spain is used in industries producing paper, board and panel materials. In 2014, about 4.4 million m^3 of industrial hardwood was used in France (2 pulpwood factories in France, one in Belgium plus about 10 panel and board factories) (Agreste 2014). Eucalyptus from Spain, Portugal and South Africa is used in many pulp and paper mills.

Poles, Posts and Other Fencing Assortments

Traditionally, the three coppice species chestnut, oak and black locust have been preferred to produce posts and poles because of their natural resistance to decay, particularly important for materials that have contact with the ground. With increasing environmental awareness and concerns about the use of chemicals for preserving softwood species, these coppiced alternatives are becoming popular once more (fig 5).

Larger diameter poles are used in land consolidation works such as revetments and the durability can be up to 50 years, while small diameter poles are used for gardens and small holdings. Chestnut poles were used in vineyards since ancient time.

In Italy, the production of vineyard poles is even now on an industrial scale, regionally concentrated near wine-producing areas and is heavily modernised to remain competitive with alternatives such as concrete, steel and impregnated softwood.

UK and France have long experiences in splitting bigger coppice boles to produce fencing materials, but other types also exist (fig 4).

Figure 5. Chestnut poles that have been debarked and sharpened (Photo: Ivalsa)

Figure 4. Example of fencing in the field (Photo: Ivalsa)

Production of oak poles and similar assortments is limited because the price for firewood from oaks is higher compared to other species.

Construction, Furniture and Flooring

Boles of larger dimension from oak and black locust are used as sawnwood for the production of outdoor furniture and solid wood for indoor furniture. A new development is the production of parquet flooring (Fonti and Giudici, 2002) with high resistance and beautiful colour in two main products: the so-called “mosaic” and “laminated, ready to lay”. Chestnut wood is also used for outside decking thanks to its resistance to weather conditions.

In Austria, cherry from 40 year old coppice forests is used to make high value furniture. In Poland, long rotation coppice alder is used to produce high quality plywood.

Craft Products

A number of other wooden objects can be obtained by material from coppice forests. In most cases they are made by artisans and sold locally like baskets, walking sticks, carvings, sculptures, toys and items for food (plates, spoons, etc), many sold as locally produced handicraft souvenirs.

Non Wood Products

Coppice forests can provide many non wood forest products with great potential and market. For extensive research on non wood forest products in general, see COST Action FP1203 "European non-wood forest products" (www.nwfps.eu).

Some examples of non wood products from coppice forests are:

Honey and Bees-wax

Honey (fig 6) is used as sweetener in many recipes, as spread but also in medical traditions to treat wounds and coughs. Honey is also the main ingredient in an alcoholic beverage called mead. Honey is mainly from chestnut, black locust, eucalyptus and linden. Honey and bee-wax are used in the cosmetic industry and pharmacy as well.

Mushrooms and Truffles

Many edible mushrooms grow in association with chestnut or oaks – including truffles, porcinis (*Boletus edulis*) both highly prized in many countries as side dish, or with rice, pasta and meat. Truffle oil is a delicacy and it is made from high quality olive oil infused with concentrated truffles (mainly black winter truffles).

Fruit

Local fruits and nuts are harvested from coppice woodland on a small local scale and can be important to some communities.

Traditional Medical Herbs

Some non wood products are used as medicinal herbs in the Ukraine and the Republic of Macedonia.

Game

The habitats provided by managed coppice forests are ideal for many species including birds, insects and plants adapted to particular levels of open space and shade. Some game species also find the habitats suitable, so coppice is often exploited for rearing and hunting.

Biochemicals

Tannin mainly from chestnut and oaks. The extract is prepared by hot water extraction of the bark and timber, followed by spray-drying of the solution. Vegetable tannin was used for leather production but its use decreased in the 1950's because of synthetic tannins. Nowadays its characteristics are appreciated for premium quality leather.

Figure 6. Honey produced in *Salix* coppice stands compared to other types; a taste testing at the 5th EuroCoppice Training School in Latvia (Photo: D. Lazdina)

New Products and their Promotion in the Framework of a Green Economy

The demand for coppice products is increasing mainly for energy purposes. This trend is influenced also by the recent development in the management techniques, in the harvesting technology and in the processing. For example, it is quite common having integrated recovery of logs for firewood and poles and branches and tops for chips. It is likely that in many countries the use of wood chips will increase.

The trend of the increasing demand is not homogenous in all regions due to different forest, economic, cultural and social aspects. For example, chestnut demand for furniture production is higher in central Italy, while the production of chestnut laminated beams and panels is increasing in north-eastern Italy (Pettenella 2001).

The development of new markets and green economies can be supported by new management and marketing instruments such as for example new approaches in selling system, efficient promotion and certification.

It is not easy to find the right "recipe" for promoting the use of coppiced products in the framework of a possible green economy. These trends and markets have different level in the countries according to economic, environmental and social conditions and to species compositions.

There are some instruments that can promote and boost the market chances:

- **Networking, association and promotion:** reinforcement of the producers' market power
- **New selling system:** small local markets, which permit the local producers to sell directly to consumers; E-business; Business to business with the sales of semi-finished products and DIY (do it yourself) products
- **Promotion of legal labour:** because of less taxes and minor costs, companies with illegal workers can sell products – especially firewood – at lower price causing a distorted market.
- **New developments in harvesting and processing technologies:** in recent years, new technologies that require different level of power and investment have arrived on the market. There is a wide choice of tractors, trailers, winches, cable-yarders, fire-wood processors, chippers and many more. Public administration should control and promote training courses in safety and technical matters. Short and practical training courses could help logging companies in increasing their competitiveness and productivity.
- **Promotion by public authorities:** thanks to regulations, public investments and promoting programs, the use of coppiced products could be encouraged. For example, a municipality could use benches made from chestnut wood in public parks, or stimulate the use of chestnut poles in vineyards

and installing wooden highway barriers. Cooperation between public authorities and producers could be one success factor in promoting and developing coppiced products. Another is increasing the coordination between local producers.

- **Integrated production:** to develop a profitable market and support the power to the forest owners and operators. In many situations, high firewood prices discourage the production of other assortments like poles. But the economic benefit of good firewood prices can be uncertain since it depends on many circumstances – new products, weather conditions with warm winter, regulation about stopping the use of old stoves due to air quality. For example, the booming market for pellets or microchips, which are easier to manage and more suitable to modern life style. Operators should try to diversify their production with a wide range of valuable assortments.

Conclusions

In coppice forests, man's influence has been more intensive than in other forest types and neglected or disrupted management activities can have more serious silvicultural and ecological consequences than in more 'natural' forest systems. Most of these coppiced stands have been regularly treated as coppice and provided local population with firewood, charcoal, tan, fodder and grazing as well as shelter for animals and a large variety of poles used in agriculture.

Despite some decades of decline, the current economic trends point to a good future for coppice management. Active coppice management has a huge potential to build on local importance and can be a vital part of rural economies, helping to support local communities.

Coppice forests can play an important role in the development of rural areas, avoiding the depopulation of mountainous regions and migration. Rural development policies should encourage and promote the diversification of rural activities and multi-functional models that are suitable for coppice forests. It is important to continue an active management of coppice forests to continue it as a system of forestry.

Without active management there will be no coppice and without income from coppice, there will be no management. Thus, abandoning them might not only lead to environmental degradation and ecological catastrophes, but also to an impoverishment of rural communities.

One of the priorities should be to promote the efficiency of coppiced forests and to pursue this management as a system. It is not seen to be viable to create more coppice from high forest, but to try to dissuade foresters from trying to convert more coppice to high forest. Coppice forest may enjoy the benefits of the modern green economy only, if coppice management is modernized.

Acknowledgments

This article is based upon work from COST Action EuroCoppice FP1301, supported by COST (European Cooperation in Science and Technology).

Action FP1301 EuroCoppice kindly received further support from the Eva Mayr-Stihl Stiftung.

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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