

Coppice Forests: Can Traditional Coppice Forest Management Help the Western Balkan Region?

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Abstract

Coppice forests are widespread throughout Europe, but in Western Balkan countries these coppice forests play an especially vital role in the everyday lives of their inhabitants. In the Western Balkan region firewood still plays a major role in cooking and interior heating, with about two-thirds of the population using firewood to stay warm rather than using electrical heating. This paper will be an analysis of the current situation of coppice forests in the Western Balkan region and the opportunities that may be available to the region. The paper will look at the policies implemented in the region and the effects they have had on the activities related to coppice forests in the countries of Albania, Kosovo, and Macedonia. The main focus of this paper will be on how Oak coppice forests can help improve the Western Balkan region economies. The limited size and ownership of private forests allow for coppice forests to become an economic asset for rural areas. The integration of traditional practices and new scientific management practices lead to an increase in coppice forests in the region.

Keywords: Coppice; Forest policy; Firewood; Logging; Oak; Ownership

Introduction

Europe is a place where rural landscapes integrate with various forest patches: small woodlots intertwined with fields, isolated trees in pastures and linear forests bordering grass fields. These are some examples of people managing trees as part of their everyday agricultural activities and livelihoods [1,2]. Research has revealed the potential contribution that oak coppice, either from forest or in agroforestry systems, has played to forest goods and services [3-5]. Still widespread all over Europe, coppice forests are of high abundance and importance, especially in Western Balkan countries [6]. Coppicing is an ancient method of enhancing woodland productivity and biodiversity, with the key to successful coppicing lying with nurturing the new coppice shoots. In return, a coppice can provide an endless supply of wood for a wide range of articles. In the Western Balkan region firewood still plays a major role in cooking and space heating, with about two-thirds of the population using firewood to heat their homes and cook with, instead of using electrical or other forms of heating [7]. At the 1992 UN conference in Rio de Janeiro, it was agreed that all products and services from forests would be used more efficiently. Additionally, local people are being recognized as an increasingly important stakeholder group in the forest sector for the adoption of EU standards regarding social, environmental, and economic issues [8].

The aim of this paper is to provide a general overview of the demand and supply of biomass for bioenergy, and how to unlock the huge potential of actually banned coppice forest management practices in the Western Balkan region. Additionally, this paper will look at how to stop further degradation and turn to sustainable coppice forest management, which may lead to alleviation of energy poverty in rural locations.

Review Approach

This paper will look at the actual situation of coppice forest in the Western Balkan; policies implemented and the effects they have had on the activities related to coppice forests in the countries of Albania, Kosovo, and Macedonia. Forest practices refer to historical background in forest management as well the actual forest policies and legislation and guidelines on management plans, preparation, and implementation. The main focus of the paper is the Oak coppice forest and its potential economic benefits. The background information was collected from various sources. The main policy legal documents used are: Policy and Strategy Paper on Forest Sector Developments; Forest laws, the National Forest Inventories (NFI). Further use is made of reports of projects and studies in forestry and energy. Among others the supply and demand of firewood combined with the identification of legal constraints for implementation of traditional coppice forest were taken into consideration.

The paper is split into three major parts: (1) What coppicing is and the role it plays in the Western Balkan region, (2) How ownership affects the supply and demand of firewood, and (3) The future of coppicing. The character is exploratory-descriptive with introduction of main findings coming from both forest policy and legal documents and project field activities (sample plots and surveys) analyzing basic facts and concerns, followed by formulation of main questions for future research on impact of management systems in Western Balkan coppice forest.

Coppicing and its Effect on the Western Balkan Region

Coppicing and its origins

Coppice is an ancient form of sustainable woodland management, which provides both, firewood as well as small-diameter timber. It is thought to have been practiced since the Neolithic age [9], and relies

on trees that are able to re-sprout after being cut periodically. The basic feature of a coppiced wood is that it is cut periodically, and the trees are allowed to regrow from the cut stumps, which are termed stools. Within a small private forest, coppicing usually gives rise to an irregular patchwork of panels or coupes at different stages of growth. Panels typically range in size from a half to three hectares. Occasionally, coppicing is conducted in a more regular fashion, with an equal-sized area being cut each year, or even with the entire wood being coppiced at short-term intervals (less than 30 years) [10-12]. Although [13] stresses the importance of detailed definitions and mapping of both forest types and silvicultural systems, in this paper we used the traditional definition of coppicing [14-16]. Historical European experience shows that with the decline in wildwoods over the ages, coppice management gained more importance, especially in the densely populated areas of North-Western Europe [2]. This interest in increased utilization of forest biomass resources has given rise to questions on the potentials and limitations of forest ecosystems to produce biomass in a sustainable way [17].

Coppice as part of the Western Balkan landscape

The Western Balkan region is highly diverse in terms of its ecosystems, ethnic groups, religions, cultures, economies, and geographies. The geomorphologic profile is mainly mountainous, since over two thirds of the Western Balkans landscape is mountainous or is a semi-mountainous area. With regard to the climatic, topographic and geological diversity as well as to the geographic position, the region includes four of Europe's eleven bio-geographical areas: Mediterranean, Central European, Alpine, and Pannonic [18].

The geomorphologic profile and climatic, topographic and geological diversity offer a variety of sites with different productivity and potentials for forest growth. Those sites with diverse potentials and productivity can offer optimal conditions for forest growth which are managed under different regimes.

The utilization of the coppice forest is one of the oldest forms of forest management in the Western Balkan region. Historically, coppice forests covered a considerable area of the Western Balkan region and provided firewood, timber, fodder, leaf litter as fertilizer supply for centuries. Coppice forest management has also been shown to maintain and improve the characteristic habitats and levels of forest diversity [19-21]. The accessibility of different coppice forest management regimes

Two main systems of coppice woodland management are recognized: simple coppice; and coppice with standards. A third, rarer system is selection coppice. In addition, there are two management systems that apply coppicing principles of vegetative regrowth to individual trees, rather than to woods: these are termed pollarding and shredding [22]. In practice, there are no distinct boundaries between types and within each type there are exceptions to each described element. Nevertheless, coppice is a common denominator of all these types, and there are typical "trends" to be found across Europe [23].

Over the last century, as in the most of European countries [24,25], coppice forests in Western Balkan region were subject of the conversion to high forest in different ways [26,27]. Indeed, several studies have revealed that oak high forest on best sites yielded a higher gross value than coppice [28,29]. Bally [28] found the financial effectiveness of coppice on best sites to be lower than that of high forest and that the variability of coppice net financial yield was significantly lower than that of a high forest. The motivation for this well-grounded

type of conversion was to improve the performance of oak coppices, or in other words, the chance to move from low-productive coppice stands to forests producing a higher proportion of round wood. Ainalis et al. [30] showed that the conversion of a deciduous oak coppice forest to a high forest along with livestock grazing in the understory is a very efficient management scheme for sustainable production in such a forest.

Expectations were that transformation into high forests would be achieved in relatively short periods i.e., several decades [27]. However, the conversion in the majority of countries turned out to be unfeasible in practice due mainly to the social and economic conditions of the region [31]. Today the total coppice forest area in the Western Balkan countries of Albania, Kosovo, Macedonia and Serbia has increased to 2.6% [32,33]. Despite the failure to convert coppice to high forest over the past 60 years, the forest sector and the legal framework continue to be oriented towards such conversions [34].

The majority of coppice forests set aside for conversion were left to spontaneous development. Traditional coppices were actually banned in some regions in different ways either through a direct legal ban toward the clear-cutting or non-planned coppicing activities either in state or private forest. Other indirect banning related to the coppicing through forest laws or administrative guidelines such as "it is forbidden to harvest trees (within or outside forest areas), until they are properly marked, counted, measured and before a proper approval has been issued" [35]. In other words, the approval was impossible in case of coppicing, because the marking is not applied, and the system cannot be implemented.

Ownership and the economic impact

The various legal frameworks have had a strong impact on forest resources' accessibility, and consequently upon harvesting, marketing, and pricing of forest goods and services. Legal norms by definition regulate and limit access to the resource base. The region lacks any comprehensive or coherent clear legal framework or guidelines for the utilization of existing coppice forest as a renewable energy resource. It is reflected in the complete banning related to simple coppice forest management aiming at conversion of coppice forest in to high forest [36]. Different studies [27,37] have shown that it is unfeasible in practice, while firewood remains the most basic commodity for the present and future.

Coppice forest management has been reported as being one of the most problematic issues of the Western Balkan region for decades. Generally, the implementation of forestry management practices has been under oppressive regimes. It is believed that the limiting of ownership of forests dates back to the Ottoman Empire. In the Islamic canonical law ownership of forests was seen as a public good and thus did not allow for private ownership. Coupled with the communist regimes that came after the Ottomans who also restricted all property rights, it becomes clear why the private ownership of forests is still limited. A study by [8] showed that the policies of the past have led to a situation where most forest ownership is in the hands of public administrations. Furthermore, the lack of silvicultural skills and an insufficient number of owner associations has contributed to the absence of coppice forests. The split between public and private forests varies from country to country. This can be observed with Macedonia having 240,000 owners, Kosovo having 130,000 owners, Serbia having 800,000 owners, and Bosnia and Herzegovina having 500,000 owners, with each owner owning 1-7 cadastral parcels with an average size of 0.34 ha.

Continually, poor households in the Western Balkan region, owning small private forest, spend a considerable portion of their income on heating firewood services, coming from a complicated legal frame to manage their forest according to their priorities.

Elsewhere, access to forest is determined by a set of rights as is the right to plan and set management objectives (important in view of decade long planning and production cycles). This is not the case for most of the Western Balkan region's forest owners. As pointed out by [8]: "Private forest owners' interests are mainly in the hands of public forest administrations. In many of Balkan countries, the prevalence of legal restrictions and prohibitive obligations have created a unique relationship between the public institutions that regulate this sector and the forest owners, leading to a situation where there is greater focus on control of the owners than on mutual collaboration" [8]. This situation has led to the centralization of management functions and as a whole the responsibilities have moved to the administrative level. This centralization and limiting of private ownership has led to illegal logging and degradation on both state and private coppice forests [35], as local people have little or no incentive to preserve or invest in the forests of their region. This leads to a lack of understanding of how to manage, a lack of appreciation for the products used traditionally by the forest owners, and a slide into illegal forest management and energy poverty.

Energy poverty: firewood supply and demand

Energy poverty is a significant problem in the Western Balkan region [38]. Very few studies have been undertaken for the region, but their results have not been encouraging. It is estimated that in the Western Balkan region, that 16% of the population suffer energy poverty, meaning they do not have access to sufficient energy services to ensure a healthy lifestyle for themselves and their families. In several parts of the region, up to 40% of households are not able to ensure sufficient interior heating for their homes [39]. Closer examination of the Western Balkan region shows that people living above the national poverty line are not immune to being exposed to energy poverty. Households normally heat less than 10 m² of living space per person

during the winter season; often even this limited space is not heated to a sufficiently high temperature to maintain a minimum standard of living. Moreover, indoor air pollution is widespread due to extensive use of firewood and poor stoves. These impacts are particularly noticeable in rural areas where employment opportunities are already limited, and incomes are low.

The use of firewood is widespread throughout the Western Balkan region [40]. In fact, some surveys show that consumption is much higher than reflected in official statistics. Firewood consumption in Kosovo has been estimated at more than 2 million m³ – more than five times higher than official statistics [41]. A similar situation has been found in Albania [42], Bosnia and Herzegovina [43], FYR Macedonia [44] and Montenegro [45]. Firewood consumption is widespread across the region, generating intense domestic and cross-border trade [39]. Data on actual consumption derives mainly from household surveys and estimates, but the data is scarce and lacks reliability. However, it is widely accepted [35,43,46] that much of the harvesting and sales are informal or illegal. A general map of the features of demand for firewood can be summarized in the direction of (i) demand is higher in rural areas, (ii) firewood is collected and consumed mainly by rural households, although some urban areas use firewood in significant amounts throughout the year for heating, (iii) levels of demand on firewood in absolute terms is high, leading to high pressure on forest resources, (iv) official consumption estimates are lower than actual consumption, and (v) shortage of alternative energy sources (irregular or insufficient electricity supply, for instance) triggers excessive use of forests [35]. The average firewood consumption per household and the total for each country according to a 2011 Biomass Consumption Study by the Centre for Renewable Energy Sources and Saving survey are given in the Table 1. The current consumption rates are considered to vastly exceed sustainable harvesting levels especially under the current forest management approach. With demand for biomass fuel being so high, that it is feared that eventually higher quality timber may be used as fuel and thus add to the worsening of socio-economic issues.

Country	Annual Consumption Ktoe	Share of firewood		Pellets briquettes %	Average firewood consumption per household meter st.	
		%	Equivalent with volume m ³		Rural	Urban
Albania	240	98.1	1177200	1.9	8.2	8.2
Bosnia & Herzegovina	981	99.4	4875570	0.6	13	10.3
Kosovo	323	98.7	1594005		9.9	8.7
Macedonia	398	97.6	1942240	1.4	10.7	9.1
Montenegro	120	96	576000	2.4	11.3	8.2
Serbia	1290	92	5934000	3.1	10	7.5

Table 1: Summary of ESC Biomass Consumption Study [Source: CRES (Centre for Renewable Energy Resources and Saving), 2016].

In the Western Balkan region, the forest sector contribution to each country's economy is high by each conceivable standard. Firewood as compared to timber lies within these two characteristics: (1) in the small dimensions of wood product and (2) mainly coming from the coppice locations closest to the rural settlements. This management system of coppice, applies particularly to countries with special

demand on small dimension wood materials, where regular supplies of firewood are essential to the welfare of the local population.

High demand on increasing forest biomass resources and its impact on the poverty alleviation, gave rise to questions on the potentials and limitations of forest ecosystems to produce biomass in a sustainable

way [47]. Rural economies benefit from the replacement of imported fuels with local produces biomass, since the revenue from the production of biofuels tends to be retained by the local community [48,49].

All the countries under study have set ambitious targets to increase the contribution of renewable energy derived from wood resources. The lack of supply of raw timber has a great impact on the demand and price paid for firewood. For this reason, the future challenge is to quantify both sides of the firewood market and its impact on energy poverty. A detailed analysis of the energy needs of each country could be met by wood fuel from all potential sources.

The Future

The possible solution

In most of the forest inventories, coppice forests are described as very problematic, degraded forms of more developed forms of forests, with low productive capacity [50]. It is not clearly defined if the degraded stage is compared with fast growing species, or to uniform oak trees with high timber quality, or with the main destination of the coppice forest to produce small diameter wood materials, periodically following the seasonal needs of the forest owner. However, when they occupy high-quality sites they show high productivity potential [27].

In a time of growing fuelwood exploitation for domestic purposes [51] where the significance and concern about current fuelwood supply in the developing world, as well as in developed countries [52] is increasing, we should look to the possible ways to address the issue through various policy intervention proposals; especially concerning the fuelwoods' consumption and production [53].

Besides traditional products such as firewood, coppice forests are now supposed to deliver biomass for energy production, a product that has not been economically viable until recently. The retail price of firewood fundamentally influences the per-consumer firewood consumption [52] the upward trend of firewood prices, which has been apparent in recent years, justifies efforts to reintroduce coppice forests in many regions [29] and a reappraisal of the coppice-with-standards silvicultural system is warranted [54]. Chalikias et al. [52] report that the precise households' supply of firewood at an attractive retail price could be satisfied by the development of coppice oak forests, and suggest the utilization of logging residues, and the use of forest plantations on marginal or degraded agricultural land. On the other hand, forest rehabilitation works represents a real opportunity for employment, to increase the productivity of biomass on large areas of currently degraded forests which under efficient management can produce a much higher yield of timber, firewood and wood biomass [55]. For a long time now, coppice forests have been seen as a problem, but they could be part of the solution for the Western Balkan region [55]. The system could fulfill the multiple objectives of woodland owners, providing a wide range of additional financial and other options, such as shooting game, farm shelter, small round-wood production for firewood or fencing, production of more valuable timber, landscape enhancement, and wildlife conservation [56,57].

The cost of forest management must also be mentioned here. Many studies [58-61] report that high forests produce high quality timber, but most of these papers concentrate only on the gross value yield as a potential result of virtually harvested and sold assortments without taking into account any kind of costs. International practice shows that coppice is, in terms of the cost of firewood produced, probably

considerably cheaper than high forest [29]. In addition, it has been reported that coppice on poor sites brought about higher net financial yield than high forest [28].

A biodiversity measure should be considered when implementing such land-use changes, as the results of the simulated conversion may be more accurate and closer to reality [29]. Vacik et al. [21] noted that the overall conversion of coppices to high forests and as well as the strict protection of sites could lead to a loss of diversity in the long run. At some places, conservation management has to consider formally incorporating coppice management in order to maintain the characteristic habitats and levels of forest diversity caused by man.

Despite the significant economical, ecological, and social importance of these forests for Western Balkan region, many professional and scientific problems relating to this complex issue have not been solved completely, the knowledge required for their sustainable management is often fragmented and needs to be re-discovered and scientifically scrutinized [27]. It requires a clear reflection from foresters in policymaking and planning approaches to consider the following questions: Do the forestry experts accept the objective of coppice forest management for firewood production? Do the forest planning experts estimate the difference between the felling trees in high forest and coppice forest, or the irregularities in oak coppice forest related to the biodiversity?

Additionally, the national inventories have indicated [6,16,33,42,62-64] that simple coppice management was largely abandoned after the latter half of the last century in most of the countries. The question raised is: is the described status of coppice the result of a management system or of no management? The answer is important and needs to come after surveys and measurement. Foresters were obsessed with fast growth and have forgotten what the woodlands are for [9].

The way ahead

Forest management practices are based on silvicultural systems, including a complex integration of both the art and science of forestry, and reflect an understanding of ecological relationships, long-term desires of the landowner, operational realities, and a creative spirit of innovation and discovery. Successful silviculture depends on clearly defined management objectives.

While the majority of silvicultural systems have been proven to be successful with high forests, technical interpretation of coppice forests within silvicultural systems, which are a significant component of the Western Balkan region's woodland estate, remain a major challenge. The most important common characteristics in coppice establishment in the area were the absence of any silvicultural measures in early ages and very weak and inadequate silviculture treatments in later stages [27]. Although formally adhering to the concept of 'multifunctional forest use', some of these practices should be re-discovered and tested against ecological, economical, and social indicators of sustainable forest management [21].

Past experiences and traditions on management practices on how coppice forests have been implemented by forest owners, as well as the main problems and knowledge gaps should lead the way towards sustainable management of coppice forest resources. This should contribute to the ecological stability and economic development in the region. Some of the advantages in management, production, and revenues from coppice management should be taken into account are as follows:

The system is very simple in application, needs less expertise in field and regeneration is usually more certain and cheaper in its outcomes than in the case of forest regeneration or replanting by seed.

In the earlier stages coppice growth is more rapid; hence where a large outturn of firewood of small to moderate size is required, coppice is generally superior to high forest [16]. Coppice is worked on a shorter rotation than most high forest crops, and can very soon have positive impact in reducing illegal logging and fill the gap between the planned volume to be removed and demand for firewood.

Coppicing in careful demarcating coupes can transform the problem of “illegal cutting” to legal cutting in planned forest parcels with clear definitions, to transform the degraded forest in an improved forest.

The small size and fragmentation of the private forests in the region [8,65,66] makes coppice forest and biomass production from them, a good opportunity for the additional income in rural areas.

Changing the coppiced forest sectors largely “informal” status, can produce other important benefits: First, many people are generally involved in producing, buying, transporting, and re-selling wood-based biomass; thus, the potential for poverty alleviation and the contribution to the domestic economy cannot be underestimated.

Revenue collection could be significantly enhanced to leverage much needed resources for investments in sustainable natural resource management and other aspects of economic development.

The bioenergy sector offers many possibilities for major investments in GHG emission reductions on a large scale. With appropriate policies—which require reforms in almost all Western Balkan countries—investments in forest management, firewood, innovative heating systems and stove technology could be linked with carbon finance options. Last, pro-actively promoting and distributing improved cooking stoves should be mandatory.

Better use of traditional management concepts and introduction of new scientifically sound management practices with regard to ecological, economic and social concerns, associated with good political framework and clear strategy, will lead to the increase of share of coppice in the region. Linked with professional and financial support to private owners, sustainable management of coppice forest resources can therefore contribute significantly to the ecological stability and economic development of the region.

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