A Comparative Review of Coppice and High Forest Protective Functions in a Romanian and European Prospective

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The protective services provided by forest vegetation are presently gaining an increasing recognition, being worldwide considered at least as important as the wood production function.

increasing recognition ….

and hopefully adequate payments

FORESTS

PROTECTIVE FUNCTIONS

Ecosystem Processes

PROTECTIVE SERVICES

Society Benefits

Hazards Control
and/or
Damage Risk Decrease

Ecosystem functions are integrated in the biophysical processes specific to a certain ecosystem. "They can be characterized apart from any human context, though they are generally affected by human activities" (DAILY, 1997).

"Ecosystem services cannot be characterized apart from the human context and require some interactions with humans. Functions become services only to such an extent to what humans acknowledge them within their social systems of the value generation. However, unlike forest products, most forest service values are not paid for" (Constanza et al. 1997).

PROTECTIVE FUNCTIONS PROTECTIVE SERVICES

- WATER REGULATION
- EROSION AND LANDSLIDES CONTROL
- CLIMATE FUNCTION → AIR QUALITY – CARBON STORAGE

Forest Structure

- ✓LAI
- ✓Litter Amount
- ✓Root System

- ➢WATER REGULATION
- ➢EROSION AND LANDSLIDES CONTROL
- ➢CLIMATE FUNCTION (including carbon storage)

Among the factors affecting the protective efficiency one could mention:

- ❑canopy closure and leaf area (affecting interception etc.),
- ❑ground status and litter amount (influencing infiltration and runoff),
- ❑root system structure (important for the water budget and landslide stability, by anchoring and physiological “drainage”) etc.

Forest Structure

- ✓LAI
- ✓Litter Amount
- ✓Root System

- ❑Species
- ❑Age
- ❑Site Conditions

and others

but not least

- ❑The management system:
  - High forest

or

  - Coppice

Coppicing is one of the oldest forestry systems known from many countries worldwide (Fujimori 2001).

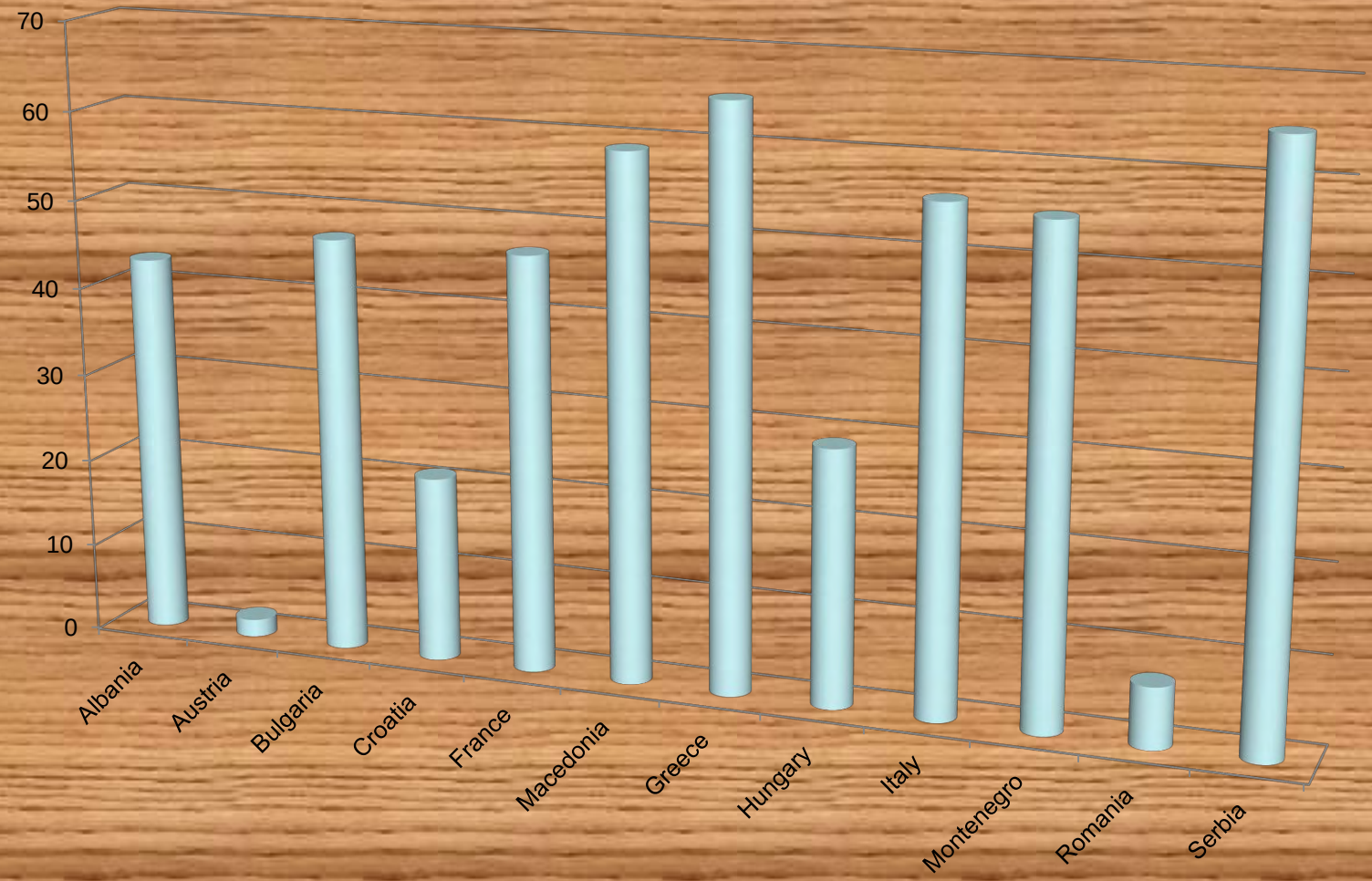
Coppices were usually used as a source of firewood until the second half of the 19th century (Buckley 1992).

Afterwards, the conversion of coppices to high forests has been the principal trend especially in central and northwestern Europe (Matthews 1991; Peterken 1992)

Area and share of coppice forests in some Mediterranean and SEE countries (Stajic et al, 2009)

Country	Total forested area (ha)	Coppice forests	
		Area (ha)	Share (%)
Albania	942 000	405 000	43
Austria	3 992 000	70 000	2
Bulgaria	3 700 000	1 750 000	47
Croatia	2 403 000	512 000	21
France	14 470 000	6 822 000	47
Macedonia	948 000	557 000	59
Greece	2 512 000	1 640 000	65
Hungary	1 702 000	501 000	29
Italy	6 013 000	3 397 000	56
Montenegro	543 000	298 000	55
Romania	5 617 000	369 000	7
Serbia (without Kosovo)	2 252 000	1 456 000	65

Sources: SFA (2005); Bankovic et al. (2008); Toromani, Jupe (2007); Barbu, Barbu (2005); UN–ECE/FAO (2000); Chatziphilippidis, Spyroglou (2004); Glavonjic et al. (2005)


70
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Albania
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Bulgaria
Croatia
France
Macedonia
Greece
Hungary
Italy
Montenegro
Romania
Serbia

In addition to the effects of the structure peculiarities
the protective functions are considerably affected by the disturbances related to the specific management operations

As regards coppices, the harvesting process could be less “invasive” (the transport of small wood pieces requiring light machinery or only horse power) but the more frequent interventions and the subsequent reductions of protective efficiency only allow a comparison with the clear-cuttings system.

There is no doubt about the superior protective services provided by the continuous cover systems.

But as it will result in further analyses, traditional coppice is more efficient than SRC, which are generally better than most agricultural crops.

The negative effects of coppicing on soil properties (less degradation control and reduced fertility) are considered to affect not only the environmental services but even timber production, (Hansen, Baker 1979; Ranger, Bonneau 1986; Ranger, Nys 1996).

"A specific effect on the soil environment is the frequent disturbance of the soil due to timber harvest and skidding" (Ranger, Nys 1996).

Average carbon storage(t /ha) in arable use, short rotation coppices and forests (Boman and Turnbull, 1997)

Components	Arable use	Short rotation coppice	Forest
Leaves	4.0	2.5	2.5
Trunks	0	21.0	70.0
Weed	0.5	1.0	2.0
Litter	0.5	5.0	15.0
Roots	2.0	5.5	10.0
Soil	25.0	35.0	45.0
Total	**32.0**	**69.5**	**144.5**

SRC on former arable soils affects the soil nutrient turnover

i) by its biomass and rhizo-deposits and

ii) by its management.

The fine root biomass under clones of the willows *S. viminalis* and *S. dasyclados* in a SRC on former arable soil in Estonia was vertically concentrated (39 to 54 % of the total fine root biomass) in the uppermost 10 cm of soil (Heinsoo et al., 2009).

The fine root characteristics of poplar varied among clones (Al Alfas et al., 2008) and were affected by the management, like irrigation and coppicing (Dickmann et al., 1996).

Species

The species influence on the net production (SRC, on reclaimed sites in Lusatia, Germany) amounted to 64.5 Mg C ha^{-1} for *R. pseudoacacia* and 8.9 Mg C ha^{-1} for poplar, over a period of 36 years (Quinkenstein, A.; Jochheim, H. 2016)

Italian studies in the Mount Etna region (Leonardi et al, 1996):

As regards the age influence on the aboveground biomass, its amount was between 22 and 24 t ha^{-1} in 7-yr-old stands and 83 and 100 t ha^{-1} in 12- and 22-year-old coppices

Aboveground perennial biomass production: 2.4 to 5.4 t ha^{-1} $year^{-1}$ and this was also correlated with stand age and altitude.

Litterfall, measured during 3 successive years, varied between 1.7 and 5.1 t ha^{-1} $year^{-1}$ and was directly related to stand age.

Litter accumulation on the soil surface was 7.4 to 7.9 t ha^{-1}, Decomposition required more than 6 years.

Researches undertaken in Russia (Trashliev,. Ninov, 1975) in a 40-year-old coppice composed of 84% of Quercus conferta and 16% of Q. cerris established that the aerial phytomass amounted 166 ton/ha and the subterranean phytomass 113.3 ton/ha.

Leaf fall was about 7.8 ton/ha.

Litter amounted to about 19 ton/ha; this decomposed over a period of 21/2 to 3 years.

A comparative study between Bialowieza Forest, Poland, and three English woods (two coppiced and a high forest, largely neglected for 100 years and promoted from coppice) indicate that in the English high forest fallen dead wood was only about a third of that in the undisturbed areas of Bialowieza Forest.

As regards age influence, two young stands (From Catania, Italy) had much lower leaf biomass values: (1600 and 1500 kg/ha) than the two older stands (3900 and 4100 kg/ha), located in Salamanca, Spain, and Montpellier, France (Santa Regina et al, 2001).

In Germany, three 20-year-old coppice woods (mainly *Betula pendula, Quercus petraea* and *Corylus avellana)* were compared to two nearby 140-year-old high forests of *Fagus sylvatica (*Hölscher et al,2001):

The mean aboveground phytomass of the two high forests (31.2 kg dry mass m^{-2}) was 4 times larger than that of the coppice woods (7.3 kg m^{-2}) and stored 2 to 3 times larger amounts of Ca, K, Mg and N.

The soil organic layers of the high forests were thicker and contained 6 times more organic matter than those of the coppice woods (6.8 vs. 1.1 kg m^{-2}) and stored 3 to 7 times more nutrients.

PRESENT OPPORTUNITIES AND CHALLENGES for coppice woods in Romania

in relation to their potential ecological functions.

Black locust in Romania

(aprox. 250 000 ha)

Degraded lands Restoration and Protection

- Coppiced ?

>better than eroded pasture or bareland

Riparian Forest Vegetation (willows and poplars)

Shelterbelts

- On erodable hillsopes with agricultural land use
- On sandy lands
- Around lakes and reservoirs
- On the river banks

CONCLUSIONS

Coppice woods could provide land and water protection services, not as a substitute but in addition to the high forests (managed for their protective services as a priority, being included in the first functional group, according to the Romanian zoning system), especially on the small farm estates in steep terrain regions and on riparian areas.

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Thank you very much for your attention !