AGRO FORESTRY PRACTICES IN WEST BALKAN FOR SUSTAINABLE DEVELOPMENT: WEAKNESSES AND STRENGHTS

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AGROFORESTRY IN PRACTICE

Guide for practical use

Belgrade, 2023

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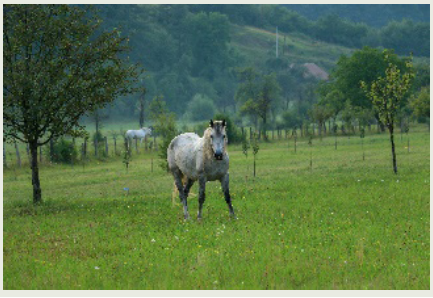
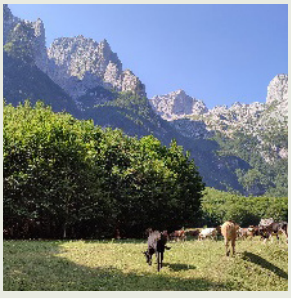
Agroforestry – What is and Why?

Agroforestry is a comprehensive approach that intentionally combines tree and shrub species with agricultural crops and livestock production, as outlined by the USDA. Such systems amplify ecological, economic, and social advantages.

This guide provides practical insights into establishing agroforestry systems tailored to the Western Balkans region. It encompasses valuable information on creating agroforestry systems suitable for lands primarily dedicated to agricultural production.

Agroforestry practices in Southeast Europe (SEE) and Western Balkans

Various agroforestry practices prevail across the SEE and Western Balkans region. In Vojvodina (northern Serbia) and Bulgaria, protective forest belts represent the dominant agroforestry practice. In Slavonia (Croatia), silvopastoral systems take precedence, while agrosilvopastoral systems define the landscape in Dalmatia (Croatia) and hilly-mountain and mountain region of Montenegro.

Agroforestry systems in SEE and Western Balkans		
Protective forest belts/ Shelterbelts – Serbia, Bulgaria		
Agrosilvopastoral – Croatia (Slavonia), Serbia (Vojvodina)		
Silvopastoral - Croatia (Dalmatia) and Montenegro		

Agroforestry practices in the Republic of Serbia

In the northern regions of the Republic of Serbia, protective forest belts exemplify an agroforestry practice, while the central and southern parts of Serbia predominantly adhere to traditional silvo-pastoral land utilization methods. Protective forest belts (including shelterbelts) offer a multitude of benefits, as detailed in **Table 1**.

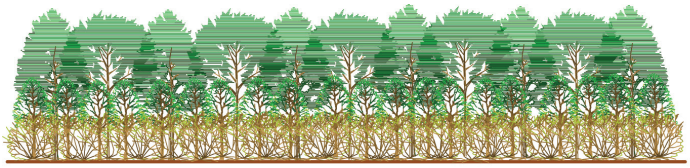
Table 1. Protective forest belts - advantages in relation to needs and goals of their establishment

Type of shelterbelts	Primary function/use	Secondary function/use
Shelterbelts	• wind protection • snowdrift control	• modification of the microclimate • protection from flood waters • increase in crop yields • biodiversity • biological pest control • connecting habitats
Farmstead shelterbelts	• wind protection • snowdrift control	• energy saving • increase in property value • shelter for animals • aesthetic value • protection against unpleasant odors
Water management belts	• runoff control and natural groundwater filtration • wind protection	• sediment control in channels • maintenance of water temperature • connecting habitats
Coastal river forest belts	• runoff control and natural groundwater filtration • wind protection	• runoff control • filtration of pollution • biodiversity • protection from flood waters • stream shading and maintenance of water temperature • shelter for animals • connecting habitats
Biocorridors/ eco-buffers	Environmental improvemen	• connecting habitats • biological pest control • shelter for animals • wind protection
Belts for noise and dust control	Environmental improvement	• wind protection • aesthetic value • increase in property value

Shelterbelts, as an integral agroforestry practice, demand adherence to specific design and management standards

Wind speed reduction behind the shelterbelt is its function that provides numerous benefits for agriculture.

The effectiveness of the protective forest belt in fulfilling its intended functions depends on the appropriate selection of its composition and structure.



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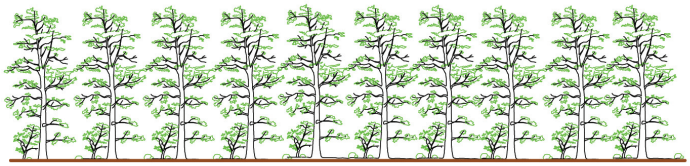


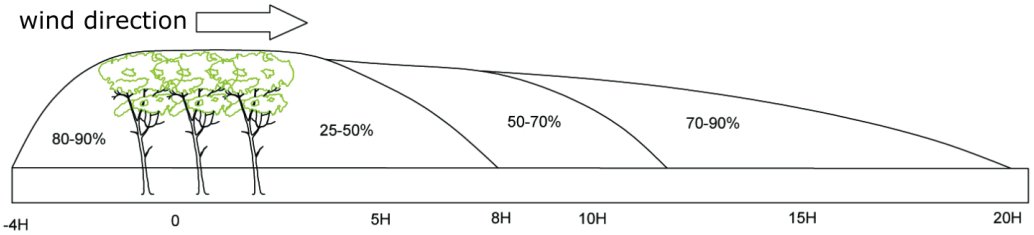
b

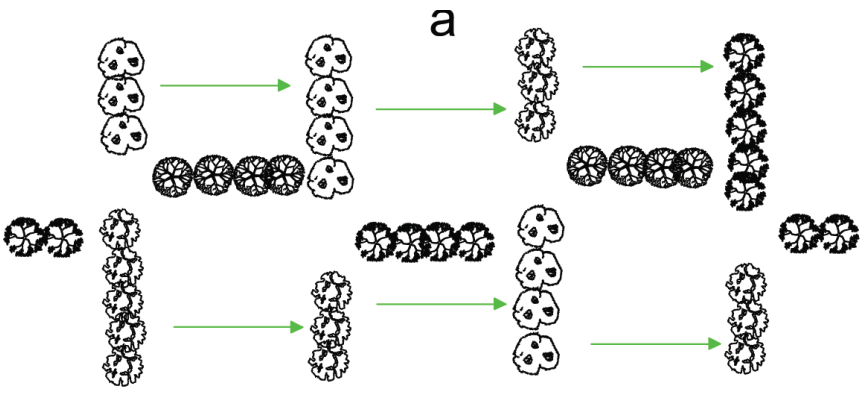
Structure:
a) impermeable,
b) semi-permeable,
c) permeable

c

They exhibit remarkable adaptability to diverse environmental conditions and flexibility in design to align with the unique requirements of the local community. When property legal conditions are met, shelterbelts are established as a network comprising primary and secondary shelterbelts. However, they can also be customized to suit the needs and capacities of stakeholders, even on a smaller, property-level scale, also delivering the desired benefits.

The shelterbelt serves as a barrier to mitigate the development of wind speeds that can potentially harm the soil by carrying away organic matter and nutrients.





The spacing between shelterbelts and the selection of tree species are pivotal considerations in shelterbelt design. Species selected for shelterbelts should be well-matched to the local environmental conditions, preferably exhibiting rapid growth rates, and resilient to soil and climate fluctuations. Earlier research findings have provided valuable insights, offering recommendations for species selection tailored to various environmental contexts, as outlined in **Table 2**.

Table 2. The distance between shelterbelts and species selection

Soil type	The distance shelterbelts Banat/Srem/ Bačka	Species	h m	Soil request
Fluvisol and Mollic Gleysol	500/600/750	Canadian poplar *(Populus x euramericana (Dode) Guinier)*	40	D, M
		Common oak *(Quercus robur)*	50	D, FT, M,S
		Field maple *(Acer campestre)*	20	D, FT, M, Ts
		Black walnut *(Juglans nigra)*	25	D, FT
		White Willow *(Salix alba)*	30	M
Chernozem and Gleyic Phaeozem	400/500/600	Common oak *(Quercus robur)*	50	D, FT, M, S
		Field maple *(Acer campestre)*	20	D, FT, M, Ts
		Tatarian maple *(Acer tataricum)*	12	M, FT, S
		Norway maple *(Acer platanoides)*	30	M, U
		Silver linden *(Tilia argentea)*	25	M, U
		Hazel *(Corylus avellana)*	7	Fr
		Narrow-leafed ash *(Fraxinus angustifolia)*	30	M, FT
Cambisol	500/500/500	Silver linden *(Tilia argentea)*	25	M, U
		Common oak *(Quercus robur)*	50	D, FT, M,S
		Field maple *(Acer campestre),*	20	D, FT, M, Ts
		Hazel *(Corylus avellana)*	7	Fr
		Red Dogwood *(Cornus sanguine)*	2	without special requirements
Solodic	400/500/600	Hungarian oak *(Quercus frainetto)*	30	D
		Turkey oak *(Quercus cerris)*	30	D
		Field maple *(Acer campestre)*	20	D, FT, M, Ts
		European hornbeam *(Carpinus betulus)*	20	D, FT
		Narrow-leafed ash *(Fraxinus angustifolia)*	30	V, FT

D - deep, C – clayey, FT - fertile, M - fresh and moist, Ts - shade tolerant, S - tolerates the presence of salt, Fr - frost-resistant, U - tolerates urban microclimate

Furthermore, commonly used species in shelterbelts encompass Birch (Betula pendula), Canadian poplar (Populus x euramericana), Siberian elm (Ulmus pumila)*, Maple (Acer pseudoplatanus), Narrow-leafed ash (Fraxinus angustifolia), European alder (Alnus glutinosa), Silver linden (Tilia sp.), Mulberry (Morus alba), Honeyberry (Celtis australis), Dog rose (Rosa canina), Wild pear (Pyrus pyraster), among others.

In protected areas, specific requirements and regulations govern species selection, including the exclusive use of indigenous species, among other considerations.

Planting materials must be sourced from reputable nurseries with known origins, ensuring their health and quality.

Table 3. Characteristics of tree and shrub species for shelterbelts (*invasive species)

Species	Distance - rows		advantages	disadvantages
	in	between		
Canadian poplar *(Populus x euramericana (Dode) Guinier)*	6	6	adapted to coastal conditions and high groundwater level	weak wind protection in winter
Common oak *(Quercus robur)*	4	4	indigenous species adapted to coastal conditions and high groundwater level	slower growth wide canopies of trees in edge rows largely shade the crops
Narrow-leafed ash *(Fraxinus angustifolia)*	4	4	indigenous species tolerates shade	slower growth sensitive to pests and disease
Black walnut *(Juglans nigra)*	4	4	indigenous species adapted to coastal conditions and high groundwater level	
Mulberry *(Morus alba)*	4	4	fast growth part of the cultural heritage in silk-producing regions tolerate frost, shade and drought without special soil demands	relatively short life span
Siberian elm *(Ulmus pumila)**	4	4	without special soil demands fast growth and dense canopy	the seed is scattered in the field and germinates quickly resistant to low temperatures
Black locust *(Robinia pseudoacacia)**	4	4	fast growth and dense canopy quality wood honey-bearing species effectively binds the soil (erosion control) high protein content for animal nutrition	power
Hazel *(Corylus avellana)*	3	3	tolerates low temperatures fruits aesthetic value	
Red Dogwood *(Cornus sanguinea)*	3	3	autochthonous species wide ecological amplitude	in wet conditions it suppresses other shrub species

Programs important for the implementation of agroforestry practices

The Vojvodina Plain's landscape underwent significant changes due to intensive agriculture since the mid of the 20th century. Agroforestry present a suitable solution for both augmenting forest cover in this region and restoring what have been termed "agricultural deserts."

Within the European Union (EU), the Common Agricultural Policy (CAP) promotes agroforestry systems through various agricultural and rural development funds. Similarly, in the Republic of Serbia, the development of agroforestry as a foundation for sustainable agricultural land use is emphasized in the Spatial Development Strategy and the Agriculture and Rural Development Strategy, alongside legislation such as the Law on Forests.

Despite this recognition, the specific mechanisms for incentivizing agroforestry practices remain unclear. The Ministry of Agriculture, Forestry, and Water Management of the Republic of Serbia offers several national and international programs for subsidizing agricultural activities. For shelterbelts, individuals or entities may seek subsidies through various channels:

1. **Subsidies for Agricultural Producers**: These are available for those awaiting farm registration, renewing or changing the status of existing farms. More information can be found at www.minpolj.gov.rs.
2. **Annual Program for Sustainable Forestry Development**: This program includes afforestation projects and is announced at the beginning of each year. Details can be found at www.upravazasume.gov.rs.
3. **Loan Subsidies through Commercial Banks**: There is a possibility to apply for loans subsidized by the Ministry of Agriculture.

In Serbia, the IPARD program, currently in its second phase with preparations for the third, is being implemented. This program, adopted by the European Commission through the Instrument for Pre-accession Assistance (IPA), supports several measures:

- ***Measure 7* - Diversification of Agricultural Holdings and Business Development:** Aims to boost economic activities in rural areas, potentially creating new jobs and increasing income for agricultural holdings.
- ***Measure 4* - Agriculture, Environmental Protection, Climate, and Organic Production:** Focuses on adopting EU methodologies and practices in these sectors.
- ***Measure 3* - Investments in Processing and Marketing of Agricultural and Fishery Products:** Supports investments in modernizing processing facilities, enhancing sector performance, and aligning with EU standards.

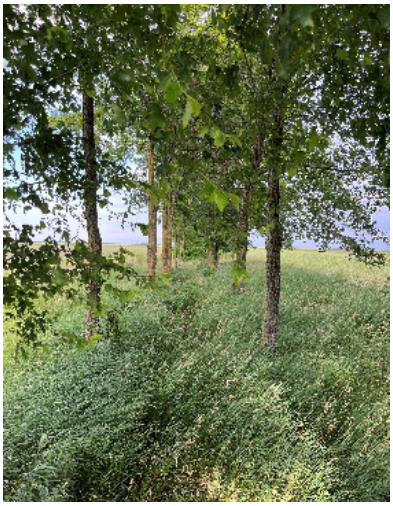
The Directorate for Agrarian Payments of the Ministry of Agriculture will announce a public invitation, with the first expected in September 2023. More details can be found at https://ipard.rs/konkursi

Framework for preparing calculations for shelterbelt establishment projects

Activity	Specification	Measurement unit	Price per measurement unit	Total
Soil preparation	cleaning from the previous vegetation, ploughing, harrowing, etc.	m^2		
Pit excavation	manual/ mechanical	Number (of pieces)		
Selection and procurement of planting material (specification by species and their characteristics)	Choosing the appropriate type and age of planting material; verifying its availability in nurseries	Number (of pieces) (for each species)		
-		Number (of pieces)		
-		Number (of pieces)		
-		Number (of pieces)		
-		Number (of pieces)		
Planting		Number (of pieces)		
Care and maintenance measures	hoeing, crust removal, watering, etc.	m^2		

Potentially accessible funding resources:

Notes



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