

FORESTRY IN UKRAINE: CURRENT STATE AND DEVELOPMENT TRENDS

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Abstract: *The forest area in Ukraine covers 10.4 million ha, including commercial forests (37.9 %); protective forests (32.9%); recreational forests (15.3%); natural reserves, and forests for scientific, historical and cultural purposes (13.9%). The annual wood increment is 35 million m³, timber harvesting is about 20 million m³ (85% of which resulting from clear cutting). The tendencies towards forest-resistance decrease, caused by excessive forest exploitation, require the transition to the implementation of a close-to-nature forestry management strategy, first of all, at intensively used hardwood forests, with a view to preserving the natural habitat and biodiversity. A shift is needed from the so called “reforming cuttings”, to the selective system of forestry management, cultivation of uneven-aged mixed forest with multilayer, vertically and horizontally closed structure on the basis of natural seed regeneration. Preservation and target-oriented forests restoration are determined by the necessity to recover their ecological functions and sustained forest exploitation. Therefore, it is important to implement forest restoration and preservation, close-to-nature forestry principles, as well as a multi-purpose forest management system.*

Key words: *close to nature forestry, Ukraine, development, forestry resources.*

1. Introduction

The Ukrainian forests have important protective functions (e.g. for water conservation, recreation). The forests have a limited significance for exploitation, and occupy an area of 10.4 million ha [3].

Forestry in Ukraine is characterized by a dynamic development, but the country still has a deficit of forest resources. The forest cover is only 15.9%, which is beneath the optimum level (20-25%). When land resources are used efficiently, ecologically sustainable environment develops and the

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entire complex of forest benefits are available. The current system of forest management is based on the regeneration of forests mostly by artificial means. In the main, timber has been and remains solid narrowly logging. For the most part, timber is harvested by clear cuttings, which have a stronger negative environmental impact in comparison with the selective system of timber harvesting. The transition to the selective system and the close-to-nature forestry system require new approaches and an alternative to the clear-cutting system [1].

2. Forest Resources in Ukraine

In the last decade, the forest area of the State Forest Resources Agency of Ukraine increased by 119 000 ha [3], and the average growing stock grew rapidly from 231 to 241 m³/ha (Table 1).

However, the forest growth conditions in Ukraine facilitate a forest vegetation

growth of much higher productivity (400-1200 m³/ha). The low-growing stock in 1980-s (160-170 m³/ha of mature age) was determined by heavy thinning and other intermediate cuttings in that period.

There are four categories of forests in Ukraine, based on their ecological, social and economic purposes: exploitative (37.9%); protection (32.9%); recreational (15.3%); natural reserves, forest for scientific, historical and cultural purposes (13.9%) – as shown in Table 2.

It should be noted that, despite its small forest cover, Ukraine ranks 8th in the list of Europe's largest countries.

The forest stock in the forest is measured at about 21 billion m³. The total average change in stock is up to 35 million m³, and the annual increment change is 3.9 m³/ha and varies from 5.0 m³/ha in the Carpathians to 2.5 m³/ha in the steppe zone.

Table 1

Dynamics of mean growing stock in the forests managed by the State Forest Resources Agency of Ukraine, m³/ha [3]

Age groups of forest stand	Years of governmental survey				
	1983	1988	1996	2002	2011
Middle-aged	208	216	240	257	267
Approaching maturity	266	267	282	301	312
Exploitative	276	264	262	258	258
Average	167	171	211	231	241

Table 2

Classification of forest area in Ukraine regarding ecological, social and ecological purposes [3]

Forest categories	Area	
	thousand, ha	%
Exploitative	3937	37,9
Protection	3416	32,9
Recreational	1586	15,3
Natural reserve, scientific, historical and cultural purpose	1440	13,9
Total	10379	100

Table 3

Classification of forest area in Ukraine with regard to prevailing tree species

Species	Area	
	Thousand, ha	%
Scots pine – <i>Pinus sylvestris</i> (L.)	3640	35
Pedunculate oak – <i>Quercus robur</i> (L.)	2912	28
Common beech - <i>Fagus sylvatica</i> (L.)	936	9
Norway spruce - <i>Picea abies</i> (L.) H. Karst.	728	7
Silver birch - <i>Betula pendula</i> (Roth.)	624	6
Black alder - <i>Alnus glutinosa</i> (L.) Gaertn.	416	4
Silver fir – <i>Abies alba</i> (L.)	416	4
Common aspen – <i>Populus tremula</i> (L.)		
Common hornbeam – <i>Carpinus betulus</i> (L.)		
Common ash – <i>Fraxinus excelsior</i> (L.)	208	2
Other species	520	5
Total	10400	100

Depending on age structure, middle-age forests prevail (45%), mature and over mature forests amount to 17%. The average age of forests is 60 years, resulting in gradual forest ageing, which influences its sanitary condition. 73% of forests are controlled by the State Forest Resources Agency, 12% - local municipalities, 8% - lands of governmental property which are not harvested, 2% - Ministry of Ecology and Natural Resources, 5% - other ministries.

The proportion of nature's protected areas in Ukraine is 6.15%. In the last 36 years, the area of natural reserves increased four times (from 315 thousand ha in 1978 to 1264 thousand ha in 2014). The protected areas managed by the State Forest Resources Agency (15.7% of the total area) make one third of the protected State-owned area [2, 3].

One of the priorities of forest management in Ukraine is the increase in forest land area.

The measures of afforestation on reserve found lands in rural areas, degraded and low-productive lands, are held annually. Besides, measures to restore and preserve forest vegetation, are taken. Over 50 000

ha of forests were planted and 60 000-80 000 were restored annually in the last decade. In recent years, about 80% of the expenses for forestry management were covered by State Forestry Resources Agency, due to the lack of governmental funding.

The area of forests certified according to the FSC scheme, reached 2.787 million ha.

Timber harvesting from final felling does not exceed the annual allowable cut (circa 9.0 million ha), which establishes ecologically sustainable wood exploitation. The exploitation of annual wood increment is within 50-60% [2], which is less than in other countries (Figure 1).

Clear cutting is the most common form of felling and it is used for about 85% of logging operations. However, the part of gradual (shelter wood) felling is on the increase, in other parts of Ukraine it is rather low (above 10%) and only in the Carpathians region it reaches 50%. Since clear cutting is prevalent in half of the forests, throughout Ukraine, forests are planted, which require tending with greater care (Close to nature 2014).

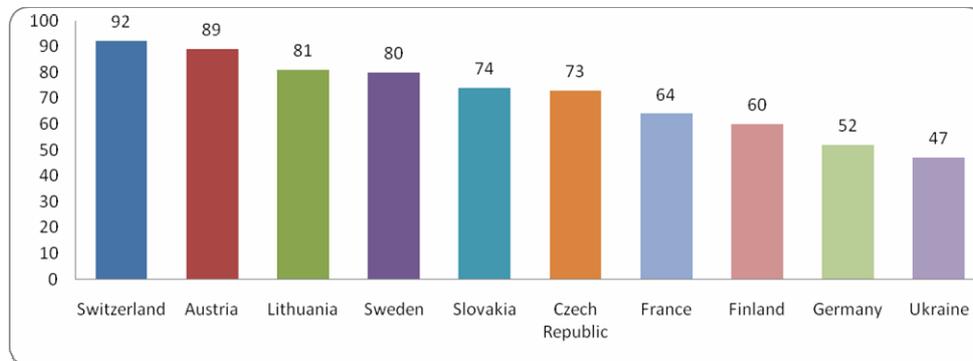


Fig. 1. *Share of annual wood increment exploitation, % [2]*

The forest-road construction is considered a national problem. During 2007-2014, 3948 km of forest roads have been contracted, including 1398 km in the Carpathians. The forest-road density in Ukraine reaches up to 7.3 km/ha.

A considerable base for tree seeds collection has been created in the forestry enterprises of State Forestry Resources Agency in Ukraine. Seed-production stands of the category “plus” make 2.1 thousand ha, genetic reserves – 22.0 thousand ha, permanent forest seed plantations – 1.1 thousand ha. 4.5 thousand seed productive trees of the category “plus” are distinguished in the forest stand. The area of virgin forests, unaffected by anthropogenic impacts, is situated mainly in the Carpathians, and covers over 59 thousand ha [5].

All in all, forests in Ukraine are characterized by such features [1, 3, 5] 3, (Close to nature 2014): lower forest cover; forest distribution in different natural zones (Polissya, Forest Steppe, Steppe, the Ukrainian Carpathians, Crimea Mountains), which determines differences in forest growth conditions, forestry management methods, forest resources exploitation and useful forest functions; a considerable part of the forests (up to 50%) has significant environmental value and therefore is under limited forest exploitation; substantial forest protected

areas (15.7%) which tend to increase; historical practice of subdividing public forests among different forest resource users (forest lands are given to State enterprises belonging to different agencies for permanent management); large area of radioactively contaminated forests (circa 2 million ha).

3. Current Problems of Forestry in Ukraine and Close-to-Nature Forestry

The current problems faced by forestry in Ukraine, which require immediate solutions, are the following [1, 5]: decrease in the area of clear cuttings, which is still considerable; predominance of even-aged planted forest stands, which require special silvicultural measures in comparison to forests of natural origin. Such stands are characterized by simplified structure, biodiversity degradation and lower biotic resistance; a considerable area of forest stand of vegetative origin and semi-natural stand, including spruce stand in the Carpathian region, which should be substituted with native stand; decrease in vitality and resistance of the planted forests caused by global climate change impacts, environmental pollution, and anthropogenic impact increase; gaps in forest laws and lack of regulations regarding enforcement of uneven – aged forest stand formation .

The solution requires the substantial change of forest management and should be based on close-to-nature forestry, which involves a shift from the currently prevailing clear cutting system of management, to the selective system (plantation of uneven-aged forest stand with multi-layer vertically and horizontally closed structure of forest canopy on the basis of natural seed regeneration [5]).

Close-to-nature forestry takes into account, to full extent, the ecological conditions of the habitat, and it is based on forest typology. Based on the imitation of natural processes, it determines a system of measures that improves forest resistance and its multifunctional role, with insignificant interference in forest life. Only due to close-to-nature forestry are forest plots characterized by constant forest cover at different stages of development and at different levels of vertical and horizontal inter-relations, vast biodiversity and significant structuralism of forest stand, constant exchange of substance, energy and information among the forest components, and, consequently, its sustainability, biotic resistance and self-regulation even under conditions of constant change and influence of unfavorable environmental factors.

Close-to-nature forestry is especially important for improving the ecological situation in the Ukrainian Carpathians, where negative anthropogenic impact intensified by climate change has reached the critical point. In mountain conditions, the focus on forest regeneration, mainly by using the method of natural seeds and planting mixed uneven-aged forest, has become a necessity (Close to nature 2014).

Close-to-nature forestry management is effective not only in social and economic relations. In Ukraine, it helps to provide continuous forest exploitation, even at the small-scale area of forest stand without clear cuttings.

However, a shift to close-to-nature forestry is a rather complex and time-consuming process. The implementation basis for close-to-nature forestry is the formation of uneven-aged forest stands. Unfortunately, due to clear cuttings and planting of forest cultures on harvesting sites, there is an insignificant number thereof. After harvesting, the forests in Ukraine are transformed into even-aged and mainly one-species forest stands. As a result, Ukraine's forest stands have to be transformed into uneven-aged and mainly mixed stands. Rearranged forest has to be characterized by the following features (Close to nature 2014): uneven-aged (permanently available natural seeding, undergrowth, young to over-mature age); mixed natural compounds (in some cases in severe ecological conditions); complex spatial structure, determined by closure and layer age in horizontal and vertical directions respectively; solid canopy cover on the occupied territory; high vitality, biotic resistance, considerable wood increment, which can be obtained both by developed improved forest structure for the given forest site and timely arrangement of relevant forestry activity.

In accordance with the current condition and forest-stand age, different close-to-nature forestry activities can be carried out for its rearrangement: selection of single trees and separate bio-groups, improvement cutting, selective felling, group selection felling, shelter wood cutting, if necessary, selective sanitary felling. Simultaneously, forestry activities for reproductive processes stimulation, emergence and preservation of natural seeding of tree species are being carried out (Close to nature 2014).

The forestry-arrangement stage requires considerable efforts, costs and time. Its implementation in Ukrainian conditions, is associated with a range of challenges and problems. The basic measures are [1]:

- long duration of forest-stand rearrangement, from basic forest formation tree species, including beech, oak, spruce, fir in the Carpathians region. In closed standing, these species are late to reach reproductive period (at the age of 50-60 years). As a rule, under their layer, during their middle period, there is no emergence of preliminary natural regeneration and accumulation of uneven-aged undergrowth, as it is the basis for uneven-aged forest development. Therefore, the period of rearrangement may take up to 70-80 years, depending on the professional level of both planned and conducted forestry activities;
- a large area of even-aged, time-consuming forests requires considerable material and resources for its rearrangement;
- irregular seed production of basic forest forming tree species and time stretched frequency period of heavy yield;
- lower resistance and vitality of parent stands, at first stages of rearrangement, since community and heterotrophic interrelations are violated; the restructuring and adaptation to the new environment of all forest ecosystem components take place;
- lack of highly qualified staff able to carry out forest rearrangement, to provide its organization, to conduct precisely and timely all necessary forestry activities during a long period of time;
- insufficient development of the forest-road system, high expenses inherent to conducting forestry management activities and forest exploitation during rearrangement in comparison to the current forestry management;
- Ukrainian foresters' professional skills focused on the clear cuttings system of management.

4. Conclusions

However, despite the difficulties, experimental transformative cuttings have

been carried out in the Ukrainian Carpathians and Pre-Carpathian region. It is carried out in forest stands of Lviv and Transcarpathian regions on an area larger than 300 ha.

The regulatory system for its implementation is being developed. The document "The conceptual basis of close to nature forestry system implementation" [1] has been prepared, and it describes the object, principles and implementation procedures of selective, close-to-nature forestry management system.

Due to its high ecological, social and economic efficiency, there is no alternative for a shift to selective, close-to-nature forestry management in Ukraine. Ecological, protective, recreational and other functions will be improved and economic efficiency of forestry based on the ecologically sound forestry principles will increase.

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