MANAGEMENT OF THE RECONSTRUCTION OF THE FOREST ECOSYSTEM (CASE STUDY BACAU COUNTY)

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Abstract: Massive deforestation of the last 15 years in the forest ecosystem of the county, the lack of interest of local authorities and owners for the up keep and exploitation of forests and scraps lead to the outbreak of a natural catastrophe and to the irreversible degradation of land, rivers and soil. The authors assess the current state of the forest ecosystem through the usual international indicators: size of the forest stock, its geographic distribution, composition of forests, accessibility and yield plan. The proposed measures for the reconstruction of the forest ecosystem aim at: ensuring the integrity and extension of areas with forest vegetation, ensuring stability and increased functional efficiency, preserving biodiversity, increasing the forest stock.

Keywords: management, clearing, degradation, forest ecosystem, reconstruction

1. INTRODUCTION

The fragmentation of forests in small ownerships of less than 1-2 ha, as a result of property restitution (of about 65 thousand ha), entailed clearings with catastrophic consequences. Locally imposed sanctions for overexploitation by local owners and for clearings exceeding the possibilities of forests, the rates and locations of approved crops, were ineffective; this is proof that local institutions are not capable to manage forests.

It has been noticed that in the development phase of forests, maintenance through cultural operations and hygienic cuts seem to be unattractive and economically uninteresting activities as compared to cutting to main products.

Local institutions have an important role in the management of wood and waste resources, taking into account the fact that forests represent a major natural capital due to the multiple services they provide: ecological, economic and social.

Taking into account the physical and geographical characteristics of the county (slopes, climate, geomorphology, lithology and pedology favoring erosions), the decrease in forested areas is the major cause of land and soil degradation.

Keywords: forestation rate, forest accessibility, forest possibility, forest health, management.

2. ASSESSMENT OF THE FOREST ECOSYSTEM

2.1. Size of the forest stock

The surface area of the forest ecosystem in year 1990 was of 275,489 ha, representing 42% of Bacau County's area. After the restitution of about 65,000 ha, i.e. 23% of forest areas belonging to private owners, they exploited the forest through law-cuttings (figure 1), in an amount of about 9,600 ha year 2006, i.e. 3.4% of the restituted forest areas had been cleared.

The consequences of this irrational exploitation of the county's forests (figure 2) induced the catastrophes which took place in the summer of years 2003, 2004 and 2005.

Fig.1 Law-cuttings on the Trotus Valley

Fig. 2 Irrational exploitation of the county's forests

Forest cuttings behind houses (figure 3) and sawdust deposits in the river bed are general phenomena in the whole of the Trotus Valley and its tributaries.

Fig. 3 Forest cuttings behind houses

Fig. 4 Sawdust deposits in the Trotus river bed

2.2. Distribution of the forest stock

Almost half of the forest stock (44%) is situated in mountainous areas with rough ground, with lower temperature amplitude and higher humidity, where most of the forests are of pine spruce, beech and resinous species mixed with beech (Fig. 5). In areas with difficult accesses there are natural brushes of high ecological value. In hilly areas (43%) there are beech forests, oak groves and mixtures of these. The share of forests is very low in the planes, where the consequences of excessive climate conditions are acutely felt, especially of the severe droughts. For this reason afforestation of large areas in the planes is of crucial importance, with a view to contributing to the improvement of climate conditions in those areas. The share of forests should reach 60% in mountainous areas, 50% in the hills and 20% in the planes.

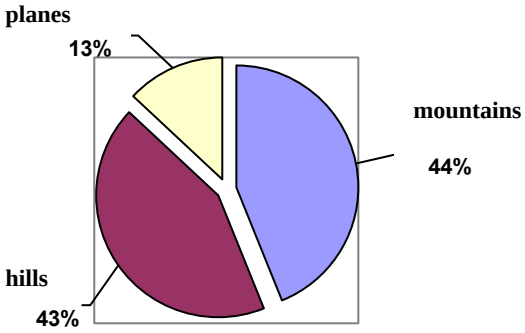

Fig 5 Afforestation rates

2.3. The composition of forests

The forest ecosystem of the county is constituted by:

- number of species - 1839
- number of shrubs - 90
- number of herbaceous species - 1749
- number of forest types - 40
- number of station types - 8

Meanwhile, about 70-80% of the growing stock is grouped in the central-western part of the county, along the Trotus valley and of its tributaries Slanic, Oituz, Casin and Asau.

As concerns the composition of forests by species, this is noticeably close to that of the country, with a large share of beech, and a mixture of softwood and hardwood; valuable species as oak are under the country average (Table 1).

Table 1

No	Species	Area		% at national level
1	Deciduous trees	141,796	67.0	69.3
	▪ beech	84,250	39.8	30.7
	▪ oak	21,376	10.1	18.2
	▪ diverse	36,170	27.1	20.4
2	Coniferous	74,315	33.0	30.7

If we analyze the evolution of the forests composition over time, we find an increase of the share of beech and a decrease of the share of coniferous wood and oak.

2.4. Forest structure in terms of age classes

Analyzing the structure in terms of age classes (Table 2) there is an obvious imbalance in age-categories, which partially reflects the way exploitation was carried out in past decades and in the present.

The exploitable classes are in excess, 37% of the exploitable wood is over 80 years, of which 21% is made up of wood over 100 years of age. We find that age-class I, with wood of 1-20 years, is rather scarce, as well as

age-class III (41-60 years). The imbalance of age-classes should be taken into consideration when establishing cutting plans, as well as the need to improve accessibility, the latter being a basic pre-condition for an efficient management of forests. Indeed, one of the reasons at the origin of the excessive share in age-classes V-VI is the low density of access roads, thus most of the fallen wood is inaccessible.

Table 2

Age-classes	Age in years	Area		Volume	
		ha	%	m^3	%
I	1-20	29,135	14	291,350	0.58
II	21-40	39,541	19	7,908,200	15.78
III	41-60	29,135	14	7,283,750	14.54
IV	61-80	33,299	16	9,323,280	18.61
V	81-100	33,297	16	9,999,200	19.96
VI	over 100	43,704	21	15,296,400	30.53

Health-state of forests

When we analyze the share of trees with significant defoliation, by classes of altitude and in relation with the main climatic parameters, the findings are as follows:

- the biggest share of trees with defoliation can be found at the lowest altitude, where precipitations are the lowest and average annual temperatures the highest, i.e. frequent severe droughts;
- as altitude increases, the share of trees with defoliation decreases gradually, annual precipitations are greater in volume, average annual temperatures decrease, pollution level is lower, and the share of forests with other destinations is higher.

The smallest share of defoliated trees is at the altitude of 1200-1500 m and at the highest level of spruce-fir trees, where hydrological and thermal deviations to the multi-annual averages are at their lowest, and the share of forest is the highest.

2.5. Forest possibility

The possibility of forests managed by the Forest Department is of 2,733,243 m^3, of which secondary products resulting from cultural operations have a share of 19.92% (Figure 6), lower than the national average of 26%. Hygiene-cuttings represent 6.57%, as against 12% at national level.

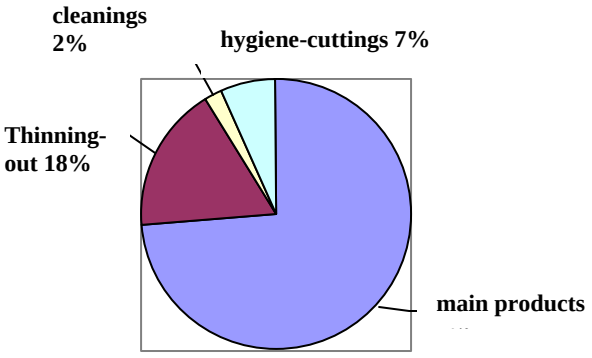

Figure 6. The possibility of forests in terms of products

Consequently, cultural operations should be increased, in order to maintain the vitality of forests and to take care of the natural seeding. The analysis of the dynamics of an increased possibility indicates an upward trend; in 1989 the possibility was of 1,080,000 m^3, while the greater possibility is a result of uncut reserves that keep adding up year after year.

2.6. Accessibility of forests

An inaccessible forest area is an economic loss, sometimes considerable, of wooden and other resources, hampering and even blocking works, creating a potential ecologic risk and limiting tourism and economic development in the respective area.

Density index, expressed in length of roads per hectare, is of 6.5 m/ha at national level; this situates our country among the last countries of similar relief in Europe, far away from countries like Germany (45 m/ha), Switzerland (44 m/ha), Austria (28 m/ha), France (26 m/ha).

Density index in the county's forests is lower than the national one of 6.3 m/ha. The reduced accessibility is in part at the origin of the imbalance of forest distribution, the share of exploitable classes being 37% of the forest areas and of 50.49% of the wooden resources; it is reflected in the low share of secondary products, due to difficulties in carrying out cultural operations, and also in the continuous increase of uncollected reserves and in the losses of large quantities of wooden products for the market after 1991. The mountainous area, where most of the wooden resources are concentrated, is the poorest in road infrastructure; e.g. in the Casin perimeter, he lack of access roads isolates economically 15,000 ha of forests, i.e. 317,000 m^3 of wood.

Had the growing stock not have the right accesses, the following consequences would result:
- the cutting plan would not be correlated with the forests' possibility, calculated as the forestry for each production unit;
- massive cuttings would be concentrated in the most accessible perimeters;
- intensive treatments for natural regeneration would have to be postponed;
- maintenance and hygiene works in the brush, could not be executed on all areas needing intervention;
- wood could not be timely exploited and implicitly valorized.

2.7. Cutting plan

Analyzing the distribution of the stock of wood by species, we find that:
- coniferous wood has a 35.6% share of the total stock, as against 33% of standing wood;
- beech wood has a share of 50.4% but its share in standing wood is by 10.6% higher (39.8%);
- various species have a share of 27.1% but have only 11.7% in the wood crop;
- oak has a share of 2.3% as against 10% in the standing wood.

3. MEASURES PROPOSED FOR THE RECONSTRUCTION OF THE FOREST ECOSYSTEM

3.1. Ensuring the integrity of the growing stock and extension of areas with wooden vegetation by:
- monitoring and maintaining the integrity of the growing stock;
- silvo-technical support and forestation materials for creating forest in areas lacking wooden vegetation;
- extension of forest areas and of other forest vegetation, including degraded areas off the growing stock;
- support for restocking on non-cultivated agricultural land, in accordance with the requirements of sustainable agriculture;
- support for creating protection belts, alignments and other wood plantations outside the growing stock.

3.2. Ensuring the stability and growing efficiency of forest ecosystems by:
- protecting the forests by natural and quasi-natural structures;
- increasing the share of natural regeneration by extending intensive treatments;

- extending brush maintenance and directing works, differentiated on regional basis, with a view to ensuring their stability and quality;
- extending the use of biological forest-pest killers;
- optimizing the composition of forestation in relation with the promotion policy of native species; modifying forest stations;
- using valuable technologies of sapling production for species that cannot be multiplied by other means;
- selecting and promoting resistant tree-biotypes and extending their use in forest regeneration works;
- protecting soil quality.

3.3. Reconstruction of ecologically and economically inappropriate forests by:
- reconstructing forests afflicted by damaging factors and those with an inappropriate structure;
- extending hydro-technical works for torrents regulation and forest protection.

3.4. Preservation of forest-ecosystems biodiversity by:
- preserving forest-biodiversity and managing protected areas of the growing stock in accordance with forest planning;
- inventorying and protecting rare, endemic and threatened species;
- repopulating forest-ecosystems with lost species and reconstructing degraded forest-environments;
- developing projects for the preservation of biodiversity in the growing stock and for the management of protected areas.

3.5. Increasing the share of forest with primary climatic function, for the protection of agricultural land, forests and human settlements against damaging climatic events, including protection belts against droughts.

3.6. Preserving and improving the capacity of forest for recreation, with a view to providing a sanitary-recreational environment for visitors.

3.7. Improving access in the growing stock by:
- modernizing and consolidating existing forest-roads;
- improving access network into the brush and increasing road density from 6.3 m/ha to 12 m/ha.

3.8. Supporting forest-owners in the sustainable management of their growing stock by:
- developing incentives for the creation of forest-owners associations and/or their integration in the existing structures;
- ensuring monitoring and assistance for private forest-owners;
- providing incentives and assistance for private forest-owners to produce sapling material and forestation.

3.9. Increasing the contribution to the development of secondary energy resources by establishing the components of available biomass (wood, branches, leaves, roots) in order to be used as energy resources and creating short-cycle, high productivity biomass crops that could efficiently be transformed in high calorie gases and liquids.

3.10. Monitoring wood scraps as resulting from wood exploitation and processing.

3. CONCLUSIONS

Stubs made in Bacau County are concentrated on the Trotus Valley and its tributaries, practically 20-30% of forest areas having been savagely destroyed. Saving the remaining 70-80% of forest areas requires major investments, civil engineering works and increase of accessibility, works for maintenance and for the preservation of biodiversity.

The proposed reconstruction measures will lead to the restoration of the ecological balance of the county by the increase of natural capital in the county's area, combating soil erosion, reducing water, air and soil pollution.

BIBLIOGRAPHY

[1] Leahu, I.: *Amenajarea pădurilor*, Bucureşti, Editura Didactică şi Pedagogică, 2001
[2] Popescu, GH., Pătrăşcoiu, N., Georgescu, V.: *Pădurea şi omul*, Editura Nord Carta, 2004
[3] Stoica, M., Berca, M., Indrieş, R.: *Capitalul natural–antropic al jud. Bacău în perspectiva elaborării strategiei de dezvoltare durabilă*, Editura ASE, 2004