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Research Paper

## THE IMPACTS OF SOILS EROSION CAUSED BY FOREST HARVESTING AND THE CONSTRUCTION OF FOREST ROADS

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**Abstract:** In the forests of our country, mainly extended in mountainous and extremely mountainous terrains, there are a lot of factors having an active impact in the soil degradation, starting from the natural (*steep relief*) and human ones (*abusive and unchecked human interventions in the forest ecosystem*); technical factors (*the low level of work techniques in forests*) and finally but very significant the financial factors (obvious lack of capital investments). In this study there are taken into consideration, dealt and recommended ways and necessary measures in the fight, avoidance or minimization phenomenon in the forest land.

**Keywords:** forest, techniques in forest, relief

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### Introduction

In the fight, avoidance or minimization of the degradation phenomenon which often leads to catastrophic erosion of forest soil and for the ecological equilibrium of the environment as a whole, it's very important and it sounds rather actual in our present day conditions, the undertaking and implementation of a series operations and complex measures being of a bio-engineering nature ( in the case of the construction of the infrastructure in forests or systematizing works in mountainous watersheds) or technological ( in case of silvicultural operations for the growing, harvesting and protection of forest resources) The analysis of the degradation forms and processes of forest soil ( pointing out the fight of this phenomenon and protection of soil) offers the proper solution, realizing of which is at the same time in service and function of the sustainable long-term management and utilization of the forest fund in our country.

### Material and Methods.

The study, for which there have been carried out a lot of expeditions in some particular forest economies, is based on observation, collection and analysis of data about forms and rates of soil degradation in deferent periods of time. To make possible the bringing closed to reality, there have been selected areas with a few or intensive operations applying for the construction of infrastructure (forest road, tractor tracks or mountainous dams) afforestation of bare areas, intervention of different harvesting intensities and techniques etc. in the districts of Puka, Shkodra, Lezha, Librazhd and Korca etc. Collection and interpretation of data by using the comparison method, has led to valuable generalizations and recommendations for the forest production.

### Results and Discusions

#### Erosion in forested soils because of natural factors, before and after the '90 - ies

Climatic factors, mainly not only the heavy, intensive and irregular rainfalls with an annual average of 1400 – 2000 mm, but also poor mineralogical content of the maternal formations; mountainous relief and extremely mountainous relief of the forest terrains, with an average slope of about 70 %, traversable with water leak of uninterrupted lengths 250 – 300 m, naturally and along years have imposed on the forest sector of the country the initiation of a strategy with investments and complex precautions, to fight the phenomenon of erosion in forest lands.

Over the course of the decades before the '90-ies the forest sector gave to the centralized national economy of those times, considerable revenue and forest productions in the framework of harvesting forest economies. It must be noted that capital investments on the regulation of mountainous torrents, a part of whose with a heavy torrential character enabled the construction of a range of works of art, of different sizes and categories (stonework with mortar - cement, dry stonework, embankments with gabions, fences with reinforcements, even or odd etc). It is worth mentioning, even nowadays, technical projects and qualitative realization, for the regulation and discipline of water flows such as Manasdera / Elbasan; Morave and Kamenice / Korçe; Kallmet and Zadrime / Lezhe; Gomsiqe / Shkoder, etc.

It is simultaneously important to highlight even the accompanying of these works of hydrotechnic nature, with afforestation works, on both sides of the torrents and along their edges, with ligneous types, with a reinforcing rooting system of soils, or other forest surfaces, defoliated and at different degradation conditions, with ligneous types appropriate to the climatic terrestrial conditions of the areas where they were expanded. Such really effective afforestation projects were those of Krrabi, Gomsiqe and Lufi / Puke; Kraste / Elbasan; Qafa e Qarrit / Erseke; Taraboshi / Shkoder, etc.

The same thing cannot be said for the years after the '90-ies. Capital regulation works have been out of the question during this period, but only for several investments "extremely limited in number", mainly for fences and few quantities of dry stone masonry. And the reply to this situation has been the overflows in the territory of Kallmet and Zadrime / Lezhe; Mifol / Kurbin; Mamurras / Kruje; massive terrain slides in Bushtrice / Kukes; Trodhen / Gramsh; Shupal / Tirane, etc.

#### Man's activity and intervention in forests - an inciting influence in the erosion phenomenon

While activating the productive function of forests, man's intervention with his working technique makes up the most complex moments. Providing there have been normal operations, followed by rigorous criteria, scientific governing of forest resources is easily achieved. Furthermore it orients sustainable development of forests and their future.

Man's activity on the forest ecosystem has an objective nature, which implies the performance of works in the service of taking care, maintenance and harvesting of forest productions, always according to the principles of their sustainable management; while in practice even the contrary activity of subjective nature is well known, especially in the case of serious illegal interventions, out of the exploitation and picking of the wood material format, and the secondary forest productions of exploitation and picking of the ligneous material."

### Subjective interventions in forest ecosystems – a source of erosion.

The progress of the forest sector has undergone interventions, whose consequences have been catastrophic with significant influences on the forest ecosystem as a whole.

Before the '90-ies they were the result of the regressive policies and exploitation beyond the real possibilities of the forest fund, whereas after the '90-ies they were the result of a considerably difficult situation and lack of ability by the government to control the forest estate.

Massive deforestations have been extended even in steep terrains for demographic-industrial aims, pasture and shearing for cattle without criteria, mainly on oak trees, pickings of forest productions beyond their natural annual increase, massive illegal cuttings, not based on the orientation and technical norms of treatment, not only on old - aged trunks, but also on the beech trees or pines of the new generation. Different forest works have been often exploited by technologies and working techniques with negative influences on the forest environment, thus constituting that range of interventions which among others - have significantly influenced forest erosion even in the areas around them.



The consequences of the present condition of our forest ecosystem, where spectral analysis evidences regresses such as: uncovering forest lands, degradation of the vegetation, uncontrolled flow of waters, deformations and transformation of mountainous embankments out of order, etc are exactly the emergence and the revival of the eroding natural phenomena, desertification, landslides up to rapid flooding which have been repeated over the recent years in different areas of the districts of Lezha, Kukes, Elbasan, Gramsh, Kurbin etc. Inhibition and avoidance of their consequences dictates the initiation of emergent precautions and the allocation of capital investments, starting with the forest areas which have an activated erosion.

### Forest harvesting – still far away from the ecological requirements with eroding impacts in forest lands.

Intervention in forest clusters, trunks or stumps with cuttings for harvesting, has its own influences on the whole complex of the elements of the natural ecosystem (soil, hydric network, vegetation, fauna etc.), among which those on forest lands should be excluded as a cause of its degradation. Thus in the present day contemporary practice more and more “ecological exploitation of forests” is being extended, which is based on technology and working techniques, by being adapted to the relief conditions and the type of forests, with minimal environmental impacts.

In this context, as it has been shown by experience so far, the application of correct successive cuttings with 2- 3 phases in trunks, as well as of the transverse cuttings in stumps, enables the installation of the new generation of forests in the uncovered surfaces. As a consequence this reparation avoids the phenomenon of their erosion by taking care of the pasture. Thus the contrary, violation of silvicultural-technical criteria such as: the increase in the cuttings intensity, subjective damages of the seedlings or over pasture, in several cases have revealed forest areas, with negative multilateral, ecological, economic, social impacts etc, and above all eroding areas such as: Luf and Krrab /Puke; Geziqe and Fan / Mirdite; Lure / Diber; Starove / Pogradec etc.

In the composition of forest harvesting process, approach and extraction of wood material by being one of the most difficult, impose even the use of equipment and mechanisms whose movement separately or together with the load, necessarily damage, in different sizes and forms, inter alia even forest land.

Nowadays in a lot of countries with a well developed silviculture having rigorous requirements in the protection of natural ecosystems, the ways of sliding –rolling of the wood material directly onto soil surface especially into steep terrains, with developed seedlings or with humidity is being used less and less, as it avoids soil erosion which might reach up to 10-15 cm in depth. Such objectives are being used to operate even in the use of plastic depression slides, for the extraction of thin wood materials, by avoiding their movement in contact with the soil.

The use of tractors with rubber tires instead of those with chains, the use of a range of specific equipment on or behind tractors and the use of cable cars for air transport of timber has marked an overturn in the internal transport of wood material, not only in woods of proper harvesting age, but also those of new age, also estimated as a rational solution in avoiding or minimizing erosion and erosion foci, that this kind of transport causes.

To better understand this technical evolution, it is sufficient to make a survey in the wood areas where massive cuttings have taken place over the past decades, such as Qebik and Kaçinar / Puke, Holte and Qarrishte / Librazhd, FusheZeze and Cukal / Shkoder etc, where tractor tracks can still be evidenced, eroded at different lengths and depths, or bare land surfaces rinsed from nutrients, as a consequence of the use of chained tractors, to pull materials by dragging, and less with half dragging.

### Road infrastructures – in the service of forest arrivals, also an inciting factor of erosion in forest lands.

Nowadays auto roads are estimated as the “key” for forest spreading and one of the main ways for their arrivals by enabling: entrance inside them of the people and the working techniques, intervention in complex silvicultural-technical workings, including those for the picking of forest production, intervention with fighting precautions and forest protection to disease, damagers or fires etc.

These road works are simultaneously considered a necessity for the sustainable forest management and their scientific treatment. They have their own negative influences on the forest ecosystem where they are being built which are dictated by the mountainous nature of their terrains, the dense hydric networks and the non stable geological formations of the forest areas of the country. Nowadays there is a saying for these roads: “Forest roads are e necessary evil, but the smallest”.

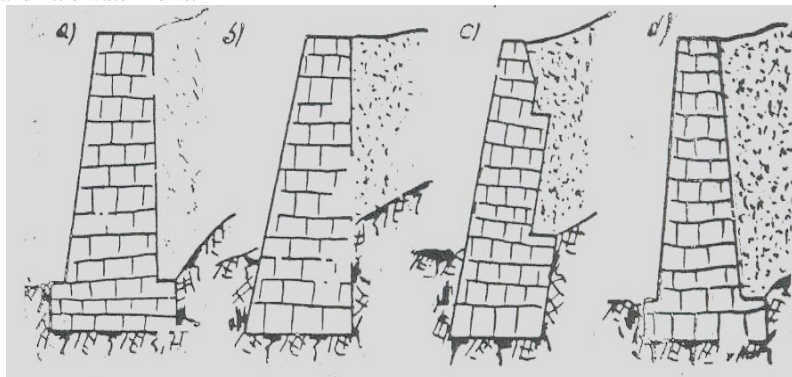
Next to the influences on hydric networks, vegetation and forest fauna, landscape etc, the most evident negative influences with strong eroding degradation effects appear on forest land. Referring to the size of the road infrastructure of forests, built so far in our country, citation of the data such as: destruction of the green surface, average 10 - 11 thousand m<sup>2</sup> / km; decay of the soil structure by the excavations and soils removal, average 5-6 thousand m<sup>3</sup> / km; massive slide of the road structure/parts of escarpments, in several tens of m<sup>3</sup> etc, clearly gives the size of the negative influences that the opening of road networks in forests provokes. But by knowing and estimating the above mentioned phenomena it also appeals for effective precautions to be taken in order to avoid/ minimize their negative effects.



By not excluding steps such as: estimation of the environmental functions of forest clusters, orientation for the optimal value of road density, their projection and construction, adapted to the type of the applied silviculture, the use in road works of the equipment - mechanisms with minimal influences on the forest ecosystem (excavators with rubber tires, availability for stump and stone uprooting etc), attention should be focused on the group of stabilizing and protective road works of the roads, or as they are called nowadays "bioengineering works".

In the present contemporary practice of road infrastructure construction of forests, the following kinds of works are being widespread: of engineering, biological or combinative nature, bio – engineering whose projection and execution is done beside the capital works of projection – construction of roads.

The working group of engineering nature recommends retaining walls made of stone or concrete, not only in the road filling, but also in the excavations, by avoiding the slide of soils of the road embankments and their excavation. Simple masonry (fences) of the same group are made of wood or combined with stone masonry, as well as the channels in length, in transverse and the culverts, works of art, constructed for the discipline of surface waters and little water flows.



The working group of biological nature recommends those for the dressing and greening of escarpments, by using wood types with dense rooting systems and reinforces of the soil structure (acacias, wild pines, hippie trees, willows etc), or kinds of grass by realizing even landscape effects besides soil protection.



The working group of bio – engineering works recommends combinations such as interweaving of wood fences with vegetative material planted in their spaces, whose development helps stabilization of escarpments and avoids degradation of forest land.

## Findings

For the protection of forest land there should be done:

- Forest treatments by shelter wood cutting;
- Systematization of mountainous streams by means of hydro-technical works (cemented or only stone walls, dams with chicken-wire nets; single and double anti-erosive fence etc.);
- Ecological harvesting of forest based on work techniques and technologies suitable to the site conditions and types of our forests with minimal environmental impacts. (by using tractors with tyros, plastic spouts and cable-cranes for the extraction of timber);
- Using of new techniques ( excavators with tyros, special equipments for removing stumps and stones);

- Using of new techniques and undertaken of “bio-engineering operations”, being of protective kind in the construction of road infrastructures ( by excavators with tyros, special equipments for removing stumps and stones, carrying walls with stones and concrete, simple fences of wood or combined with stone walls, lengthwise and cross- cutting channels, concrete pipes, planting of *Robinia pseudoakacia*, *Pinus halepensis*, etc on the slopes.

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