ECONOMIC MODELLING OF OAK FORESTS, AN IMPORTANT FACTOR FOR THE SUSTAINABLE DEVELOPMENT OF RURAL AREA IN THE DISTRICT DIBËR, DISTRICT DIBËR

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Abstract
According to the non-legally binding instrument on all types of forests of UNFF and legally binding agreement on forest Europe, sustainable forest management, as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations. This definition leads to take into account multifunctional forestry, on the one hand, changes, risks and uncertainties on the other hand. In these document the actual state and multi-functionality of the oak forests of Dibra's district is analysed in order to implement the best practices and the full potential of all forest type in the district. Oak forests are an important component of the primary forest vegetation in Balkan and in Albania. They are well known for the added value on the biodiversity, specific and ecologic so far. Spatial distribution of oak forests is fully dependent from the ecological factors and traditional using practices or silvicultural models, by the rural population for which in this study is spended an important attention. The transfering process oak forests mostly to the ownership of local government call for new concepts on the sustainable forest management of communal forests in terms of objectives identification and implementation of the best treditional using practices. The study actual situation of the forests and the potential productivity are the basic elements to identify the stage of degradation and then the best practices for the rehabilitation and cost efectiveness. There are studied c. a. 43. 000 ha oak forsts or c. a. 4% of all domestic oak forests. There is a high variability of forest types, result of different ecological conditions and traditional using practices. The actual productivity is pretty low, but the elaborated models show that there is in place a big potentiality in terms of biomass production, even if the uneven structure of oak forests per age and diameters classes. The managemant properties distribution of forest type is provided by the GIS analyse.

Key words: biological diversity, proveneince, dendrometric indicators, multivariable analyse, productivity classes

1. Introduction

Mediterranean forests are characterised by a remarkable set of features that make them naturally and aesthetically attractive, on the one hand, but also quite fragile, on the other, therefore calling for careful strategies for their conservation and management.

According to the non-legally binding instrument on all types of forests of UNFF and legally binding agreement on forest Europe, sustainable forest management, as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations. This definition leads to take into account multifunctional forestry, on the one hand, changes, risks and uncertainties on the other hand. Forest provide a wide variety of ecological, social and economic benefits, ranging from easily quantified economic values associated with forest products, to less tangible services and contributions to society. In order to measure progress towards the implementation of sustainable forest management, it is necessary to identify actual situation (level 0) and monitor changes in the outputs provided by forest management in social and economic, as well as environmental, dimensions.The economic benefits of forest management can be calculated directly as the quantity of outputs (products and services) produced by forests, each multiplied by an appropriate value then added together. The social benefits of forests are much more difficult to measure because the amount and value of these contributions to society are both difficult to quantify. In this case, indirect measures are often used to allow trends to be quantified and monitored over time. The vegetation of a given territory is the reflection of a series of ecological factors and the best synthesizer of ecological factors with traditional land using combined [1]. North-eastern Albania, where Dibra's region is located, is distinguished by a high variability of forest ecosystems. Oak forests are extremely variable with regard to their ecological and socio-economic conditions. Forest ecosystem sensitivity and the inherent adaptive of capacity of forest ecosystems to respond to climate change are related to forest ecological characteristics. Forests use, CO^2 and water are substrates for the process of photosynthesis, and biomass and oxygen as products of the process. Forests, on the other hand are also a source of CO^2 through the processes of respiration, decomposition of organic matter, and when there are forest fires and other disturbances. Oak forests to the study region occupy 57951. 59ha or c. a. 25% of total area. The distribution is uneven and the forest type is affected profoundly by climate and soil conditions and traditional using practices. Mostly the forest structure of oaks are coppice forests and a few areas ate high forests with an uneven structure because the human intervention. The oak forests are used for multi products like fire wood, fodder, meditinal plants, grazing etc. The aim of this work was to sample and elaborate the oak forests in Dibra's region. There is tried to discover which oak forest type make up the forests in the region, to define their floristic and ecological diversity and to esyablish their distribution pattern. We attempt to identify the most important ecological and topographical factors that cause the diversity of oak forests. Study offer a base for the protection and sustainable management of oak forests besides ownership title.

2. Materials and methods.

This research was investigated in the Dibra's forest ecosystems, one of the richest districts on oak forests in Albania. Collection of appropriate qualitative and quantitative data is necessary for proper management and planning. Data collection, based on the random methodology of sample design was strictly respected.

In the selected areas, relevé sites were selected subjectively in order to represent the maximum diversity of oak forests in the given region. The undertaking study is realized through two different phases:

1. Analytical phase, during which the site data are collected on the sample plots. Two were the main questions about the identification of sample plots [11, 12] :
    a) The size of sample plot was based on the method of "minimal area" the area which represent the characteristics of the stands, and the position, for which the random statistical analyse was taken into consideration, was based on "*marshrut*" method [32].
    b) The relevés were computerized using the Turboveg data base management program [12] with an electronic species list of Albania.

There are inventory:

- General data about the morphological aspects of the territory (relief, altitude, lope degree, pH, soil type, soil deepness, geology, soil moisture, soil depth),
- Using form,
- Biodiversity,
- Actual state of oak stands: development phase, quality of stands and dendrometric data etc.
- Floristic list with abundance-dominance index Braun-Blanquet "*sensustrictu*" [2].

2. The synthetic phase, during which there are analyse statistically the data gathered.

The data gathered in the field are archived on Turboveg [12] which is able for data transferring into the JUICE programme, for multivariable analysis and ordination [40] For cluster analysis is used Juice 7. 0 programme [12] and then analysing fidelity degree of the inventoried species, ecological factor [9] and international phytosociological nomenclature [13], per each cluster group are defined plant association [2] and mapped.The ecological conditions were estimated by bio-indicator values. Constant species presented in the text are those with an occurrence frequency exceeding 50% for the given community. Dominant species were defined as those attaining a cover higher than 50% in more than 50% of relevés. We stress out that the forest types [8], the most homogenous area, are identified on that end. The forest stends are classified on a hierarchical system of forest types, defined by its composition and site factors characterized by the country system-NFIs [27]. Forest types are a flexible approach to collect and organise forest information, according to a typology useful for understanding differences which are relevant to evaluation of forest biodiversity condition [8]. Forest types are an important factor for the identification of forest policy, the best practices in forestry and the implementation of the monitoring system for sustainable forest management. On the framework of EEA classification the Albanian forest types are given on the fig, nr.1.

Figure 1 :Albanian Forest type system (NFIs) : A. Proko

Beside the management aspects, the purpose of this classification isforest monitoring, with particular reference to forest biodiversity assessments and further reporting, as well. The key criteria for the identification were the ecological condition and anthropogenic activities. Based on these criteria the map of forest type is provided. The allometric equations related with the measuring data for forest productivity on the level of forest type classification are estimated on this paper. As the conclusion the comparison analyse is used to identify then best managerial alternative per forest type.

3. Results and discussion

The investigated territory was extremely heterogeneous and mosaic of forest habitat types. The climatic variation is manifested by different ecological zones consisting of different vegetation types.

The history of forests in the Dibra's area isa history of forest fragmentation, degradation and eventually deforestation, but also of temporary natural expansion of the forests. Major problems in these areas are forest fires. The accumulation of fuel creates serious hazards, especially during the dry summer months, Typical characteristics of the Dibrës's region include (i) an unusual geographical and topographical variability related to the presence of many, relatively young mountain ranges, of tenquite high in elevation; (ii) a pronounced, climatic biseasonality with dry and hot summers and moist and cool autumns and winters; a large year-to-year variability

of total rainfall as well as frequent strong and dry windsthat favour the spread of forest fires; (iii) a high diversity of plant species, coupled with a rich variability of more or less natural vegetation types and land-use forms, giving rise to complex mosaics of patches; (iv) a long history of manipulation of trees, forests and landscapes.
The territory is ecologically appropriate for the growth and the development of thermophyllous oak species. The thermo-pluviometric diagram based on aridity index of Gaussen, which is presented on the graph below, demonstrate two arid summer months, no long freezing period and two months period with above 100 mm. of the precipitation.
The distribution of oak forest on the north-eastern Albania are presented on the fig. nr.3 of forest type and demonstrate a high distribution of oak forest types or related degraded stages

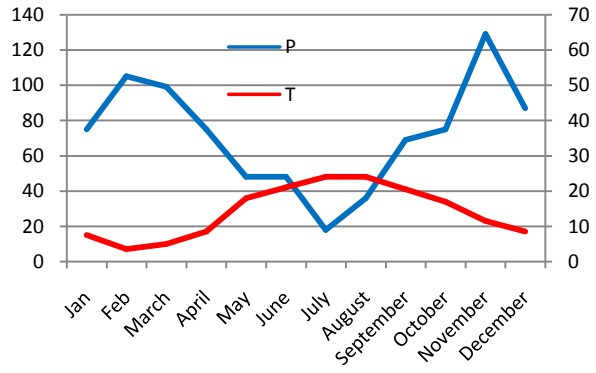

Figure 2: Gaussen aridity index of Dibra region

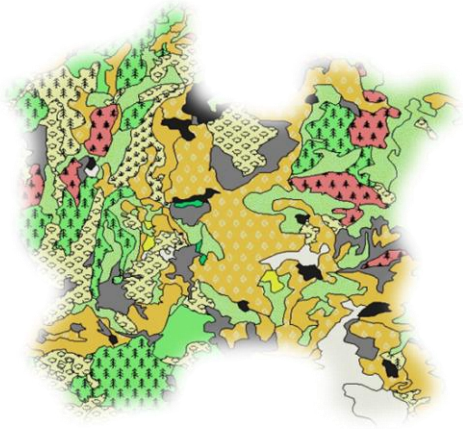

Figure 3: Map of Forest types of Dibra's District

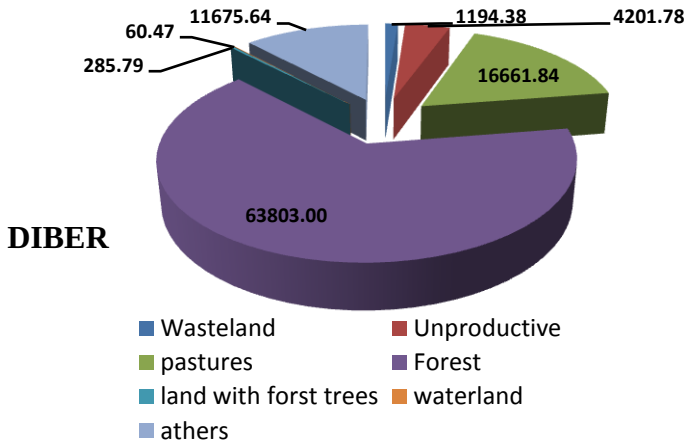

Figure 4. Land use of Dibra's district

Dibra's district is located on the middle Albania with 70635.83 ha, and divided on different land use forms as on the fig. nr. 4: Forest area of Dibra District is c. a. 63803.06 ha with a total volume of c. a. 2.8 mln m^3 wood material and an average of 43.88 m^3/ha and an increment of c. a. 1. 32 $m^3ha^{-1}year^{-1}$. The low productivity is not due to low productivity potential but due to the intensive cutting, overgrazing and the domination of the young forests. On this region the type of thermopile broadleaves oak forests dominate, followed by other thermopiles forest and shrubs species. The overview of the forest type in this region is as on the table nr.1:

Table 1: Area and volume per forest type.

Forest type	Sub-Types	Sip	%	Vol	% (volume)	m3/ha	m3/ha/vit
5. Mesophytic deciduous forest	5. 2 Sessile oak–hornbeam forest	9209.56	14.43	12188.0	0.4	1.3	1.6
	5. 3 Ashwood and oak-ash forest	516.73	0.81	714.0	0.0	1.4	1.6
	5. 4 Maple-oak forest	387.90	0.61	10935.0	0.4	28.2	0.8
	5. 8 Ravine and slope forest	1583.94	2.48	6217.50	0.2	3.9	0.8
	5. 9 Other mesophytic deciduous forests	3563.98	5.59	30060.0	1.1	8.4	0.6
7. Mountainous beech forest	7. 4 Illyrian mountainous beech forest	15122.68	23.70	1646925.7	58.8	108.9	1.1
	7. 9 Mountainous Silver fir forest	1218.08	1.91	132725.0	4.7	109.0	1.7
8. Thermophilous deciduous forest	8. 2 Turkey oak, Hungarian oak and Sessile oak forest	17651.00	27.66	304998.0	10.9	17.3	1.6
	8. 7 Chestnut forest	465.83	0.73	21650.0	0.8	46.5	0.7
	8. 8 Other thermophilous deciduous forests	2053.00	3.22	45163	1.6	22.0	0.1
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	10. 2 Mediterranean and Anatolian Black pine forest	8054.39	12.62	352234.9	12.6	43.7	1.9
	10. 5 Alti-Mediterranean pine forest	1701.85	2.67	226169.00	8.1	132.9	1.8
14. Introduced tree species forests species forest	14. 1 Plantations of site-native species	8.21	0.01	1000.0	0.0	121.8	0
	14. 2 Plantations of not-site-native species and self-sown exotic forest	2265.86	3.55	8797.0	0.3	3.9	0.3
		63803.006	**100.00**	**2799777.09**	**100.0**	**43.88**	**1.32**

An important indicator of the development of appropriate forest policy and sustainable management is variability of forest types. Forest type is result of ecological conditions as well as traditional forest using. Taking into consideration this the forest area represent a high variability of forest type, or a high level of the biodiversity, which must to be taken into consideration. Forest types per area and volume are presented on the fig. nr.5 and 6:

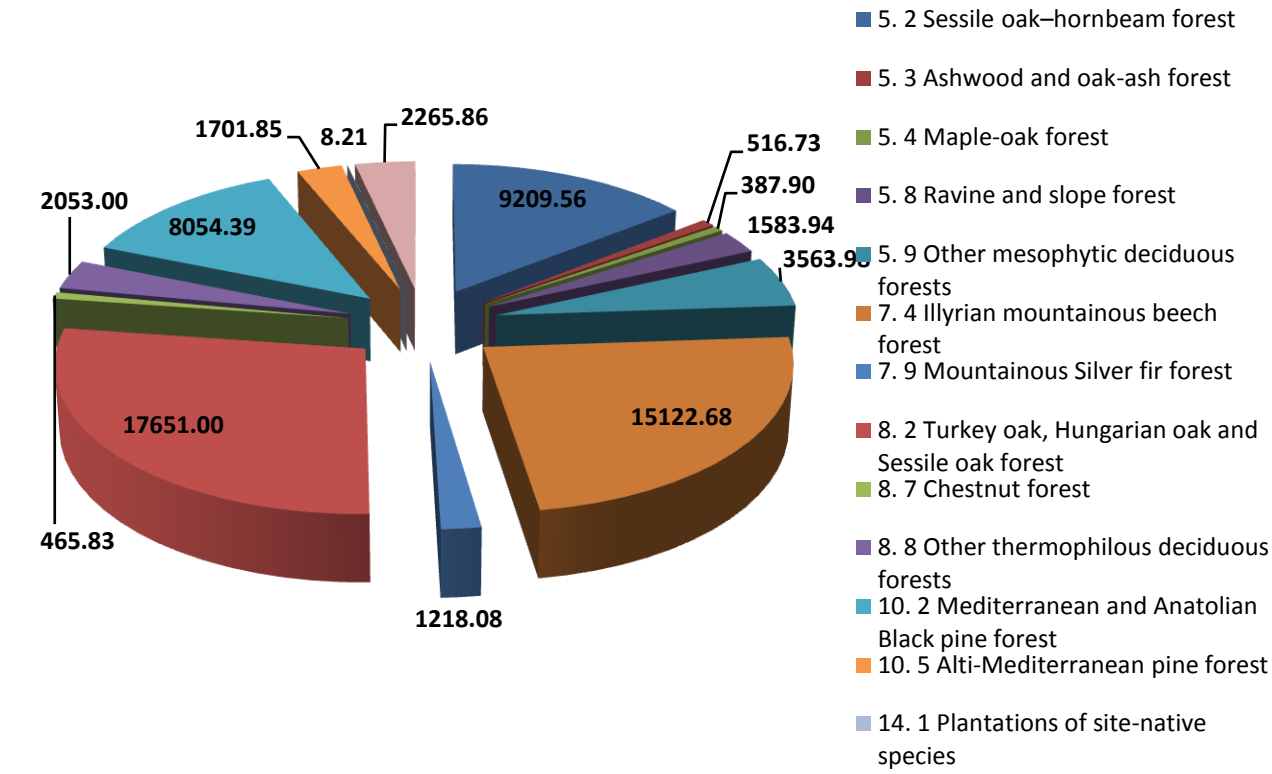

Figure 5: The structure of forest types for area

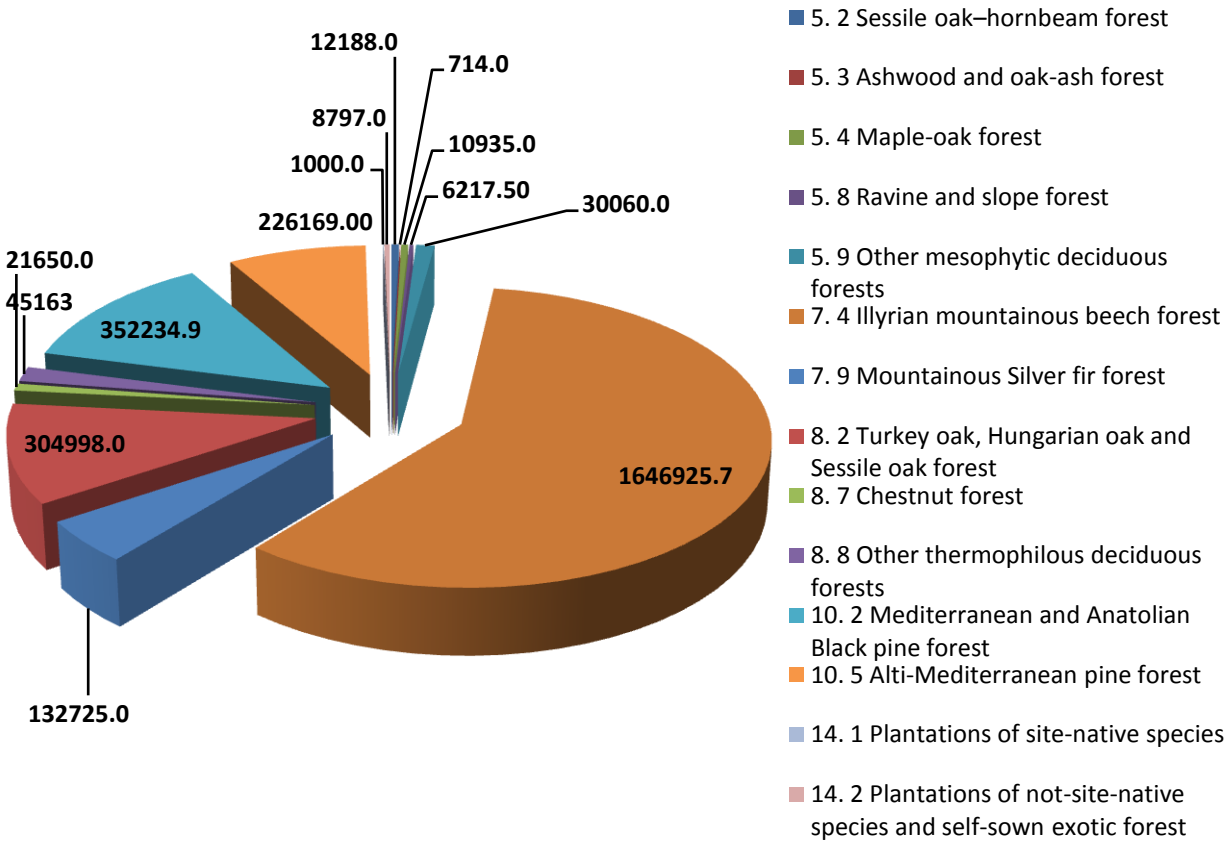

Figure 6: The structure of forest types for volume

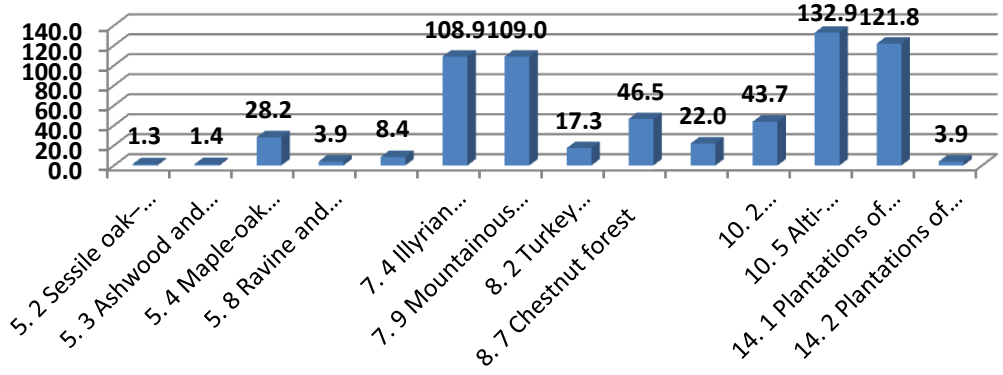

Figure 7: Productivity per forest type

Forest productivity is different in different forest type like as on the fig. nr.7:
Based on the data collection and analyses the main characteristics per forest types are given below.

Mesophytic deciduous Forests (5.)

In this category the Sessile oak-hornbeam forests (5. 2.), Ash wood and oak-ash forests (5. 3.), Maple oak forests (5. 4.), Ravine and slope forest (5. 8.) and other mesopyitic deciduous forests (5. 9.) take place.
Sessile oak-hornbeam forests in general, are found in the upper oak zone forming small forests along cool valleys, on northern exposures and in the submontane beech zone, on eastern and southern exposures, 800-1000 (1100) m above sea level [28, 29]. They occupy the least favorable and highest sites of thermophilous oak forests in the region. They correspond to the physiological optimum of Sessile oak, which is less adapted to worm, dry habitats than Hungarian oak. The diagnostic species of this type are Sessile oak (*Quercus petraea Liebl.)*, Hornbeam *(Carpinus orentalis L)*, Hop hornbeam (*Ostrya carpinifrolia* Scop.), Common juniper *(Juniperus communis L).* Heterophyllous Fescue *(Festuca heterophylla Lam)*, Corymbous Marigold *(Tanacetum corymbosum* (L.) Schultz), Spring Bedstraw *(Gallium vernumScop)*, Peach-Leaved Bellflower *(Campanula persicifolia L.)*, Black Bitter-Vetch, Black Pea *(Lathyrus niger (L.) Bernh)*, Barrenwort, Bishop's Hat *(Epimedium alpinum L.)*, characterizes dry and relatively cooler site conditions. The relationship between the diameter or age and the increment and relevant equation per sessile oak forest productivity are given below.

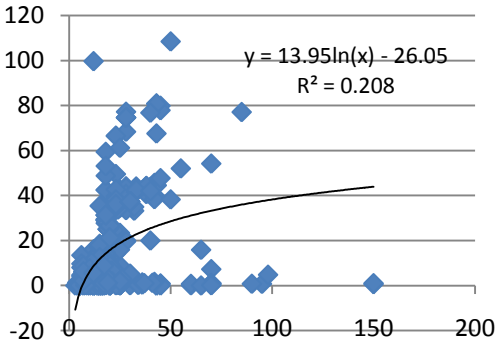

Figure 8: Forest increment per age, for Sessile oak forest type

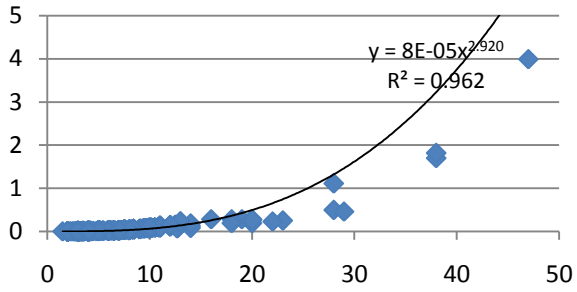

Figure 9: Forest productivity for Sessile oak forest type

Mountainous beech forests (7.

Beech forests have a great importance in the vegetation cover of Dibra's region. These kinds of forests occupyc. a 10% of areas in Dibra's region divided in two forest types: Illyrian mountainous beech forest (7. 5.), and Mountainous silver fir forest (7. 9.). The analysis of Dibra's Beech (*Fagus sylvatica L.)* communities did not show a distinct pattern of geographic differentiation.

Beech is the dominant species in the growing stock in Dibra's (c. a. 60% per volume). The main floristic list of beech forests is compound by Great maple, Sycamore maple (*Acer pseudoplatanus* L.), Common Silver Fir (*Abiesalba* Miller.), Yew (*Taxus baccata* L.), Banewort, Deadly night shade (*Atropabela-donna*L.), Raspberry (*Rubus idaeus L.)*, Wood-sorrel, cuckoo bread, stubwort *(Oxalis acetosella L.),* Coralroot bittercress *(Cardamine bulbifera (L.) Crantz*.), Giant fescue, Tall Brome (*Festuca gigantea* (L.) Vill), Prenante (*Prenanthes purpurea* L.), Sweet woodruff, woodruff (*Galium odoratum* (L.) Scop.), etc. The beech forests in Dibra's region have been very strongly exploited in the past and continue to be harvested.

Thermophilous deciduous forests (8.)

Turkey oak, Hungarian oak and sessile oak forest (8. 2.), Chestnut forest, (8. 7.) and other thermophilous deciduous forests (8. 8.) take place in this category. Turkey oak and Hungarian oak forests are the most distributed forest in this region. These types of forests appeared in the warmest and driest sites and this with Hungarian oak on more humid sites. Phytosociological interpretation of these forests is very difficult due to the important changes in their floristic composition. Hungarian oak forest grows in a phytoclimatic area of mixed deciduous broadleaved communitiesandrare forms pure oak forests. Hungarian oak with Oriental hornbeam dominate forests appear on the warmest sites with moderate inclination. These forests are most continental one here, as is evident from the presence of Oriental hornbeam, which is a specie with continental character [3].
Characteristic or indicator plant species of the Turkey and Hungarian forest typeare Hungarian oak (*Quercus frainetto* L.), Turkey oak (*Quercus cerris L.),* Field rose (*Rosa arvensis* Huds.), *Spring Sedge* (Carex caryophyllea Latourr.), Greenish flowered campion (*Sileneviridi flora* L.), Hedge bedstraw, False Baby's Breath (*Galium mollugo* L.) andSmall-flowered comfrey (*Symphytum bulbosum* C. Schimp.) [25, 26].
In Dibra's region Turkey oak (*Quercus cerris*L.) has a diverse ecology and is distributed from 250 to 1000 m above sea level, forming pure or mixed forests with Sessile oak (*Quercus petraea* (Matt.) Liebl.), Hungarian oak (*Quercus frainetto* Ten.), Wild service tree (*Sorbus torminalis* (L.) Crantz) and Common hornbeam (*Carpinus betulus* L.) [9]. Macedonian oak (*Quercus trojana* Webb.) is found in mixed forests with Bubescent oak (*Quercus. Pubescens* Willd), Turkey oak (*Quercus cerris* L.), Oriental hornbeam (*Carpinus orientalis* Miller.) and Flowering ash (*Fraxinus ornus L.).* The more common species in the understory are Scorpion senna, Shrub wetch (*Coronilla emerus L.*), Blad dersenna (*Colutea arborescens* L.), Turpentine tree (*Pistacia terebinthus* L.), Fierthorn (*Pyracantha coccinea* M. J. Roemer) and Prickly juniper (*Juniperus oxycedrus* L.) The herbaceous layer is dominated by Mouer Alyssum (*Alyssum murale* Waldst. & Kit.), Italian campion (*Silene italic* (L.) Pers.), Bloody Cranesbill (*Geranium sanguineum* L.), Grey sun-rose (*Cistusin canus* L.), (*Micromeriaju liana* (L.) Bentham ex Reichenb) and Yellow rock-rose (*Helianthemum nummularium* (L.) Miller) [44].
Traditionally, Dibra's forests have provide large variety of other products besides wood. Theyinclude food for humans and animals, dyes and medicines and cork and aromaticplants; revenues from such products sometimesexceed the value of wood. Food from forests, forexample with chestnut (*Castanea sativa* Miller.) has assured for centuries the survival ofhuman populations living in hilly and mountainous areas.

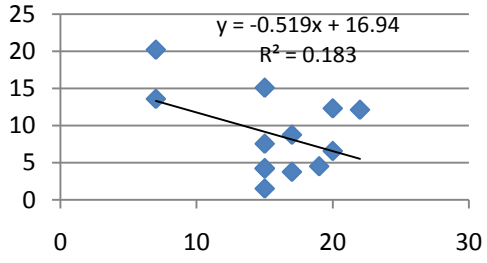

Figure 10: Forest increment per age, for Turkey, Hungarian oak forest type

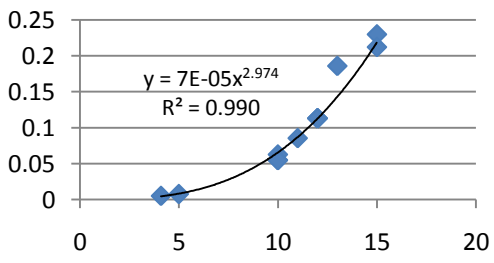

Figure 11: Forest productivity per diameter, for Turkey Hungarian oak forest type

The allometric equation per diameter, age increment and productivity are given on the fig nr. 10 and 11:

Coniferous forests of Mediterranean, Anatolian and Micronesian regions (10.)

Mediterranean and Anatolian Black pine forest, (10. 2) and Alti-Mediterranean pine forest (10. 5) are taking place in this category. This habitat type comprises forests of the montane-Mediterranean level, on dolomitic substrate, dominated by pines of the Pinus nigra group, often with a dense structure [45]. Silvicultural and management practices vary according to forest type in general; management practices

in coniferous forests have had two basic principles: the maintenance of stand conditions and the promotion of natural regeneration. This management aims to prevent the establishment of undergrowth vegetation and to ensure the natural pruning of trees, decomposition of litter, natural regeneration, straight trunks, a final stand with the best individual trees, regular growth of elite trees, and thin branching. Black pine specie constitutes the most typical forests in Dibra's region. These black pine forests both protect against erosion and torrential floods and act as a carbon sink. Management of pine forest should involve adequate representation of associated species and formation of irregular structures, containing trees of various ages, including veryold specimens in order to secure genetic variability and an appropriate amount of dead wood. The floristic cortege is compound by: Beech (*Fagussylvatica* L.), Montpellier maple (*Acer monspensulanum L.)*, Flowering Ash (*Fraxinus ornus L.)*, hop hornbeam (*Ostrya carpinifolia* Scop.), Oriental hornbeam (*Carpinus orientalis* Miller.), Pubescent oak (*Quercus pubescens Willd.)*, White beam (*Sorbus aria* (L.) Crantz.), Milkwort (*Polygala nicaensis* Risso ex Koch.), Red juniper (*Juniperus oxycedrus* L.), Box-tree, common box (Buxus sempervirens *L.)*, Dog rose, brier rose (*Rosa cannina L.)*, Winter-heath, Spring heath (*Erica herbacea L.)*, Heath false Brome (*Brachypodium pinnatum* (L.) P. Beauv.), Liver flower, Hepatica (*Hepatica nobilis* Miller.)

Introduced tree species, forest species, forest (14.)

Plantation of site-native species, (14. 1.) and Plantation of not-site-native species and self-sown exotic forest (14. 2.) are forest type which belong this category.

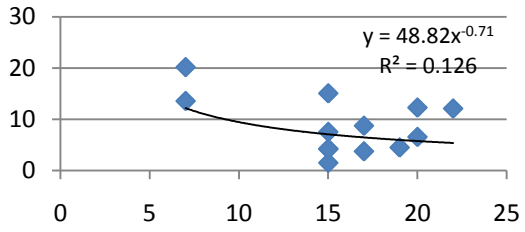

Figure 12: Forest increment for Black pine forest type

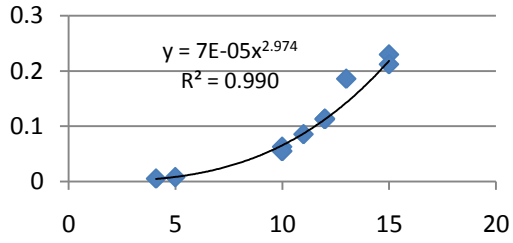

Figure 13: Forest productivity for Black pine forest type

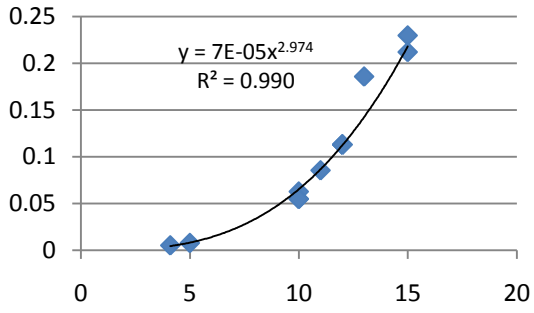

Figure 14: Forest productivity for introduced tree species

Figure 15: Distribution of the oak forests

Pinus nigra planted in this region plays an important role in soil development on substrates that have been difficult for plants to colonize, as in the case of dolomites. Under the environmental conditions in which these forests grow, soil processes are very slow. The presence of good soil conditions has been crucial to ensuring sound forest regeneration and development. Some forestry treatments, such as clear cutting in steep slopes, have resulted in the loss or degradation of forest land, leading to regressive sequential stages and significantly reducing the pines' potential` for growth and their regeneration capacity. The black pine forests often occur on steep slopes and on shallow soil, where only moderatein terventions are suggested in order to avoid soil erosion.

Pinus nigra is adapted to many soil types and topographic conditions and seed viability is very short on the ground. The management of these forests should take into consideration the presence and density of

accompanying species, and should be aimed at improving their coexistence with P. nigra, in order to increase the ecosystem stability. The forests of Dibra's region are an important reservoir for biodiversity and fulfilment of people needs. Dibra's environment presents peculiarfeatures that make it attractive not only from anecological point of view but also for its human historyand cultural aspects. There are identified and described five forest types and 14 subtype forests [8], which demonstrate a high level of ecological diversity (see synthetic table 1) :

(5.) Mesophytic deciduous Forests

(5. 2.) Sessile oak-hornbeam forests,
(5. 3.) Ash wood and oak-ash forests,
(5. 4.) Maple oak forests,
(5. 8.) Ravine and slope forest and
(5. 9.) Othermesopyitic deciduous forests

(7.) Mountainous beech forests

(7. 5.) Illyrian mountainous beech forest, and
(7. 9.) Mountainous silver fir forest.

(8.) Thermophilous deciduous forests

(8. 2.) Turkey oak, Hungarian oak and sessile oak forest,
(8. 7.) Chestnut forest, and
(8. 8.) otherthermophilous deciduous forests

(10.) Coniferous forests of Mediterranean, Anatolian and Micronesian regions

(10. 2) Mediterranean and Anatolian Black pine forest, and
(10. 5) Alti-Mediterranean pine forest

(14.) Introduced tree species, forest species, forest

(14. 1.) Plantation of site-native species, and
(14. 2.) Plantation of not-site-native species and self-sown exotic forest.

The diversity on forest type is result of ecological variability and traditional using so far. Human kind has benefits from the multitude of resources and processes that are supplied by natural ecosystems.

Even high productive potential of forests (see figure 2 and exponential equations) the actual productivity is extremely low because over harvesting and intensive grazing (Figure 5). The most productive are Beech forests (Category 7) and coniferous forests (category 10). The wood has alwaysbeen, and still is, the basic source of energy. Large areas of broadleaf forestscontinue to be managed as coppices in order tofulfil the local fuel wood needs. Fuel wood requirements have increasedrecently, partly because of developing social needssuch as fuel wood for domestic fireplaces, restaurantsand charcoal production for export. As the result the vegetation degradation caused prolonged droughts and hot spells will further aggravate forest fire risks. In dry areas, desertification may be accelerated in the future and forest stands weakened by drought will be subject to increased biotic risks. Rising temperatures and the projected decrease in rainfall will magnify drought risk. As a consequence, photosynthesis will decrease during hot spells and biomass growth and yield are expected to decline. A major problem in this area is wild forest fires. Wild forest fires will become an even larger threat to Dibra's forestry and human well-being in rural areas. Theaccumulation of fuel creates serious hazards, especiallyduring the dry summer months, when combinedwith the negligence of tourists, citisens or with vandalistic acts. In these circumstances distributional shifts of insect populations seems to be highly probable. Highlythermophilic pathogen species are likely to become more virulent. Non-wood products are important for the rural population in Dibra's zone. There is a clear relationship between non-wood products and rainfall. It can be inferred that a decrease in precipitation with increased droughts will likely reduce non-wood products.

The main characteristics of forest management systems applied in beech forests, can be defined as: shelterwood management system characterized by seed tree felling or shelter wood felling with three cuts (preparatory, regeneration and removal cut) which are performed during the regeneration period; selection management system characterized by selection cutting, in which the trees which reached the target diameter are cut, and of the smaller diameter trees only those that should be removed because of silvicultural reasons; and group selection management system characterized by silvicultural groups which are not defined by the size of the area, but by the homogeneity of stand conditions, the basic silvicultural requirement and the respective basic silvicultural operation.

4. Conclusions

In order to achieve goals of sustainability, the biodiversity of forests must be maintained. Sustainable forest management is close related to the formalization of the forest activities at the level of community and human-

being. In this context, the implementation of this scheme for the environmental services is one of the most appropriate measurements. Forests are important in the global greenhouse gas balance and contribute to mitigating increasing atmospheric CO_2 concentrations by storing large amounts of carbon. Forests play an important role in the protection of soil, water, managed natural resources, and human infrastructure. The knowledge of Dibra's forests, their species composition and ecological conditions would also offer a basis for forestry practice and maintaining of biodiversity. Forest ecosystem services, which include watershed protection, biodiversity conservation, and carbon storage are a big potential for the improvement of forest area and rural economic development. Other services of the forest ecosystems are cultural and recreational services. Significance of ecosystem services is the highest in the Dibra's zone.

The Dibra's vegetation is well adapted to difficult ecological conditions being characterised by mechanisms which counteract the deleterious effects of the environment (summer drought and wildfires) and to increase the ability of survivors to grow and reproduce. Mechanisms of response to environmental stresses include morphological, phenological and physiological adaptations. The ecological constraints and present conditions of forest resources, productive capacity and functions of forests are relatively limited. The problem of maintaining biological diversityand providing for renewable natural resources in achanging climate calls for the integration of basic and applied sciences. Volume vary considerably according to climatic conditions, site fertility, forest tree species and forest management system (MIPA, 1985). Forests on the Dibra's region play a key role in global bio-geochemical cycles as the carbon and watercycles, and regulating regional climates. A better understanding of mechanisms that regulate the energy and matter fluxes amongand within ecosystems will be essential for environmental preservation and, therefore, for our future. The quantification of carbon absorption potential by forests as well as its inter-annual variationis becoming important scientific questions.

The following research priorities can be identified:

_ to study the effects of landscape structure on ecosystem functioning and resilience, in relation tonatural and man-made disturbances; and linking these studies to the transfer of knowledge to landscape and forest management and to decision makers as an important task that needs also the development of user-friendly decision-makingtools [6] ;

_ to study the multiplicity of aspects dealing withman and forests interactions because the perceptionof forests and forest activities by human populations, especially those living in cities, has a prominentrole in determining a sound utilisation or, onthe contrary, an over-exploitation or the abandonmentof forests and forest landscape.

Forest regeneration offers a direct and immediate opportunity to select tree species or provenances that are believed to be better adapted or adaptable to the changing climatic conditions. Most of the adaptation measures focus on the modification of tending and thinning practices, regarding the frequency and intensity of operations. Ecologists are well aware of the risks when landis managed without a sound scientific understanding of the structure and functioning of ecosystems. Ecosystem function can be defined as the set of processes that maintain natural systems through the transfer of energy, matter and information [18]. These processes areregulated by species and biotic interactions that characterise the ecological system. However, still largegaps exist in our understanding of ecosystems functioning, impairing our capability for implementing a safe conservation strategy of the environment.

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