



## THE EVALUATIONS OF ENVIRONMENT RESOURCES IN PRESPA NATIONAL PARK – ALBANIA, BASED ON REMOTE SENSING METHOD

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### SYNOPSIS

According to the human activity assessment aspect and prosperity, the environment of Prespa National Park is specific. In the geomorphologic framework, the relief is generally mountainous. The main characteristic forms of the relief are the steep slopes which fall in holes and in the lake. But this element shouldn't be taken in consider as the only conditioner for the human prosperity of the community. The study on "The evaluations of environment resources in Prespa National Park – Albania, based on remote sensing method" is a serious undertaking to evaluate soil resources having some fundamental characteristics of Prespa micro zone in the Albanian part. The achieved results have been based on data obtained from the filed and from the laboratory tests. The comparison of the values of the analysed indicators has been done based on the FAO\_USDA standards [1]. Soil resources have been studied in their physical, chemical and biological properties. Based on the evaluated values of the qualitative and quantitative indicators we want to emphasise that the soil resources are under the direct influence of the eco-climatic factors [2]. The findings on the micro zone of Prespa may serve as the basis for more profound studies.

### INTRODUCTION

#### 1.1The ecological areas and natural resources

The ecological areas represent a special significance from the perspective of study, evaluation, utilization, conservation and improvement of natural resources. In every ecological area the biotic and the a biotic components are interconnected with one another. This kind of interaction has its influence in the progress of evolution and in the equilibriums of an ecosystem. Along with the factors which influence the

improvements of the ecosystem or not there also exist the anthropogenic factor, which takes initiatives over the ecosystem.

One of the basic resources whereby the life of fauna and especially that of men is supported is the petrologic factor. From the ecological perspective, this resource is the basis for the species life existence, the relations between them, the establishment of dynamic equilibriums as well as of damages and deviations of the ecosystem. Considering the ecological zones in their entirety from this point of view, it is important to carry out the study on soil resources. [9]

The ecological areas contain environments which are used for agricultural purposes which in turn comprise the agro-ecosystems. Today's tendency in the agro-ecosystems is to build agriculture with a similar functioning as that of the ecosystem.

### **1.2 The concept for the territorial environment and the agricultural land**

The definition of land environment we can be found in the wording of FAO, 1976: "Land is an area of the earth's surface, the characteristics of which embrace all reasonable stable, or predictable cyclic, attributes of the biosphere vertically over and under this area, including those of the atmosphere, the soil and the underlying geology, the hydrology, the plant and animal populations, and the result of past and present and future uses of the land by man" [1, 7, 12]

From the consideration of the soil resources we distinguish also soil environments used by man for agricultural purposes. These are the agricultural lands, which are defined by the experts as: "The agricultural soil is a natural body of the surface of the earth, constituted by mineral and organic components, able to support plant and animal life, as a result of the joint action of the soil-forming factors", USDA.[6,17,]

The agricultural soil is the object of study of sciences related and integrated with one another such as:

Fundamental: Chemistry, Physics, Mathematics.

Biological: Botany, Zoology, Microbiology.

Environmental: Climatology, Geology, and Geography.

Applicative: Agronomy, Forestry, Engineering, etc.

The natural resources are extended in time and space. Considering this, even the soil resources are studied, used and improved by observing in time and space the elements of bio-climate, the associations of plant and animal life as well as the life of men itself. [2], [3].

### **1.3 The considerations for the ecological area, Albania and Prespa Park**

Albania is located on the western part of the Balkan Peninsula, between 39 38' and 42 39' latitude and between 19 16' and 21 4' longitude. It is bordered by Greece in the East and South east, by Macedonia in the East-Northeast and by Former Yugoslavia in the northeast, North and Northwest: Adriatic and Joni and Seas from the west and southwest borders of the country. The country covers a surface of about 28.748 km<sup>2</sup>. The coastal area is 7000 km<sup>2</sup> or 25% of the national territory; the

Mediterranean watershed includes 28748 km<sup>2</sup>. In the following are done the Albanian land use statistics.

**Table no. 1 The Albanian land use statistics. Sources: Ministry of Agriculture, Albania, 2004**

Land Category	Hectares Ha	Percent total %
Forest	1,030,000	36
Agriculture: arable, and permanent crops	718,000	25
Agriculture: pastures and meadows	431,000	16
Other land and lakes	696,000	23
Total land area	2,875,000	100

The natural environment (micro ecosystem) of Prespa Park is located in the Albanian, Greek and Macedonian territories. It is composed of Lake Environment, that of Big Prespa and the Small Prespa, as well of mountainous environment such as Dry Mountain, Kallogjer, Ivan etc.

The ecological area of Prespa is situated in the geographical borders as shown in the following table:

**Table no. 2. The ecological area of Prespa. Sources: Ministry of Agriculture, Albania, 2004**

The geographical borders	Big Prespa	Small Prespa	Eco territorial Prespa
Latitude north	40 ° 56' 28"	40 ° 41'	
Latitude south	40 ° 41'	40 ° 40'	
Longitude west.	20 ° 50'	20 ° 50'	
Longitude East	21 ° 00'	21 ° 03' 37"	
Altitude from sea	874 m	874	
Total surface	1095.22 Km2	254 Km2	1349.2 Km2
Land surface	822.14 Km2	210.27 Km2	1032.33 Km2
Water surface	273.08 Km2	43.73 Km2	317.82 Km2

Persia's area climate is conditioned by the geographical position and the climatic parameters which obviously affect natural resources. During the seasonal periods we have an extreme presentation and wide amplitude of values. The highest temperature during the summer season reaches between 21.8 and 39.6 Celsius degree (°C). The minimal temperature during the winter season reaches up to -17.8 °C. The driest months are July and August while the most wet are January and April.

The quantity of annual precipitation reaches the values of 730-766 mm (year). The quantity of the sunny hours results in the values 2200-2300.

Thermal changes and the fluctuations in the hydric system have changed the volume of the lake water. The amplitude of the lake's water level for the period of time from 1950 – 2000 results to be 4.67 cm (852.9-848.23).

The natural vegetation is highly diverse, where we can distinguish the *Quercus* plantations, the beech areas and the alpine pastures. The natural forest occupied a

small place in the area of Dry Mountain and the environs of lakes. This area is predominated by shrubs.



Figure 1. Map of Area Prespa

The agriculture has a traditional character, a real basis for the development of agro-tourism and ecological agriculture. The cultivatable vegetation consists of cereals and horticulture. Characteristic activity of this area is fishing.

## MATERIAL AND METHOD

### 2.1 Remote sensing method

The study of territorial resources and agro area of Prespa is based on the method of remote sensing, which takes into consideration the cartography of the area, filed data, analysis and interpretation. [8], [10].

#### a. The Cartographic Process

The photographic and cartographic study determined:  
mountainous area  
hilly area  
field area

For each area the following elements were defined:

- the geology of lands
- the vegetable cover: forest, shrubs, agriculture
- the virgin lands
- the urban lands
- the water environment

### **b. The filed work**

The study of soil resources was performed by applying the procedures on:

The real finding of the areas defined by the cartography.

Evaluation of the vegetation (plant associations).

The opening of land profile and taking of patterns for the areas being studied.

Observation and definition of the land horizons is based on the soil survey division

1993 technique.

The classification of soils based on visual parameters of FAO and USDA.

The valuation of erosion.

The microclimatic evaluation.

### **c. Laboratory work**

Examination (scrutiny) and tests are fundamental data for the identification of the environmental unit and they play an important role in the determination of parameters according to the capacity and the suitability of the area.

The following laboratory tests were conducted:

The determination of physical-chemical indicators of the patterns for the profiles of soils.

Soil observations and the tests are the fundamental data for identifying the environmental unit and play an important role in defining the parameters regarding the area's capacity and sustainability. The physical and chemical indicators were determined with the following techniques:

The analysis of texture was done with the technique of sediment (Kunze, 1965).

The total quantity of carbonates was found by the using of calcium-meter Dietrich - Fraehling.

The nitrogen is been analysed by the technique of Carlo Erbe Nitrogen Analyser 1500.

CEC (The variability of the cationic exchange) was analysed by the extraction of the acetate of Na with ph 8.2 according to the technique of Perkin Elmer -Plasmemo Emission Spectrometer. CEC is based in the changement of Al and H with the buffered KCl solution (Coleman 1959).

PH has been evaluated with the indicator colours.

## **2.2 Data from areas, profiles and laboratory tests**

The data and their analysis give the following picture:

The capacity of the Prespa eco area.

Evaluation of the soil resources.

The present state and the future possibility for the use of agro-ecology resources.

**Soil surface description:**

**Table no. 3**

Soil profile, Relieve no. 103 Liqenas, 2004

Horizon O	cm	0-3
Horizon Ap	cm	3-30
Horizon A-B	cm	30-65
Horizon B	cm	65-90
Horizon C	cm	
Hydrological Characteristics:		
Drainage : Medium		
Surface of the humidity: Dry		
Soil depth: 90		
Slope grade : 25 %		
Classifications:		
FAO: Dystric Cambisols		
USDA: Udic Ustocherepts		

**Table no. 4**

Soil profile, Liqenas, Relieve no. 103, 2004

Horizon	1 O	2 Ap	3 AB	4 B	5 C
Lower boundaries	3	30	65	90	
Moisture status	S	s	s-m	s-m	
Colour	dark brown	dark brown	dark brown	dark brown	
Rock fragments	small	small	small	small	
Structure	no	no	prismatic	no	
Texture	SAM	SAM	AM	SAM	
CaCO <sub>3</sub> (HCl)	yes	yes	yes	yes	
Roots	no	yes	yes	no	
Voids	few	medium	few	no	
Ph	6.9	7.2	7.1	6.7	
Biological features	no	yes	yes	yes	

**Table no. 5**

Chemical contents, The area Liqenas, Relieve nr. 103

Horizon	1 O	2 Ap	3 AB	4 B	5 C
Depth cm	0-3	3-30	30-65	65-90	90
ph	6.8	6.9	6.8	6.7	
Organic matter%	1.21	0.98	1.13	0.78	
P <sub>2</sub> O <sub>5</sub> %	0.02	0.03	0.04	0.03	
K <sub>2</sub> O %	0.45	0.35	0.48	0.46	
N %	0.17	0.18	0.18	0.19	
Carbonate Ca	13.2	13.5	14.1	15.3	
Surface stoniness	5-10	5-15	15-30	15-40	
Soil stoniness	15	11	12	13	
AWC	45	55	65	45	

Sources: Laboratory data (Lab.Korça Institute) 2004

### **Water**

The park zone is supported with water partly by the basin of "Prespa e Madhe" and "Prespa e Vogel" lakes.

These lakes provide:

- Fish economy
- Balnear tourism
- Water sports
- Scientific tourism based on the endemic richness
- Biotypes diversity

## **RESULTS AND DISCUSSIONS**

### **3.1 Agricultural area**

Based on the economy character of the park, nowadays the support basis is the agricultural area. This area on 1984 has been 39.28 km<sup>2</sup> from which 22.38 km<sup>2</sup> were arable soils (fields, fruit bearing, and vineyards) and 6.9 km<sup>2</sup> were meadows and pastures.

The current data, on 1999 where the decision was claimed, show 39.28 km<sup>2</sup> of agricultural area. But there are changes in the structure of the arable area and meadows / pastures as in the following; 21km<sup>2</sup> arable area, 18.28 km<sup>2</sup> pastures/meadows. This as a consequence of the abandonment of the arable soils in the inclined slopes and along the trough. These soils are changed to natural pastures, especially at the zone of Zvezda neck, Lajthize - Zaroshke, Kallaman-Gorice e Madhe, Luadhet e Xherres, Rakicka and Cerja holes. In the pastures the main position occupy the alpine pastures, situated mainly at "Mali i Thate" and Ivan mountains. Inside the agricultural soils the main role has the arable and planted soils. This area constitutes only 7.5 % of the total area (soil - water) of the park, being in average from 1.4 ha per family or about 35000 m<sup>2</sup> per person. In the arable area the arable cultures occupy 92 % , fruit trees 5 % and vineyards about 3 %.The main culture at the arable soils is wheat 84 % , and partly the corn especially at Liqenas, Shueci, Gorica e vogel and Zaroshka sites. The yield of these cultures oscillates average respectively 12 and 5kv/ha. On 1985 , 54 % of the arable soils were under irrigation, and actually only 2.1 % of the soils is irrigated. This is a consequence of the pumping station destruction in Kallamas, Shuec, Zogradec (Buzeliquenas) sites. The main trees of the fruit bearing are the fruit trees (apple and plums). The changes of the arable cultures and fruit bearing production , show the change of the structure of the main production of the zone. Now there is no more multi branch structure and the cereals priority is no more applied in the total agricultural production.

Based on the study conducted in three local points of Prespa Park, where the agricultural activity is mainly concentrated, there have been obtained relatively the same data of which we can mention: The type of soils, the origin and the pedological parameters, natural vegetation, cultivated vegetation, bio-climate, erosion

### 3.2 The area points studied are:

The soils of Small Persia's micro area: Cerje, Rakicke, Shuec, Zagradec.

The soils of Big Prespa's micro area: Zaroshke, Lajthize, Liqenas, Diellas.

The soils of Big Prespa's micro area: Gollomboç, Small Goricë, Big Goricë, Besmisht.

### 3.3 The type of soils, origin and the pedological parameters

It is thought that the soils in the eco area of Prespa are of tectonic origin. Based on the pedological and agro-chemical parameters, the agricultural lands change with regards to the chemical elements. Thus, the lands of Zagradec have a low contents of Ca compared with the ones of Rakicka and Zaroshka, which are named Calcocambisoils. The types of soils are different from the depth of profile, texture, the content of Ca, Mg, N, and P. There are characterized by: Regosoils (Entisoils), Brown soils (Inceptisoils), Aluvialsoils (Vertisoils).

### 3.4 Natural Vegetation

**Forest richness.** Although the forest has faced damages, it constitutes flora, fauna and economic richness with considerable values.

This will influence on the general organisation of complex natural park, development of the tourism, development of the stock-breeding or traditional artisanship (wood processing).

**Alpine pastures** constitute valuable geographical and ecological environment for the stock - breeding development, sportive tourism, as well as medical plants gathering (about 100 species).

The vegetation associations of Prespa eco-area are almost authentic [4]. This vegetation has been adapted to the eco-climatic conditions and the belt of altitudes. There are no visible changes between micro areas. The most typical vegetation associations are:

For the altitude 800-1200 m: (Dry Mountains, Rakicke, Shuec, State boundars, Big Gorica, Small Gorica) Forest woods: *Q. petraea*, *Q. pubescentis*, *Q. fraiento*, *Q. ceris*, Shrubs: *Carpinus betulus*, *Ostria carpinifolia*, *Fraxinus arnus*, *Cartagus sp.*, *Cornus sp.*, *Rosa.sp.*, *Corylus sp.*, Herbal vegetation: *Orchis sp.*, *Lilium sp.* etc.

For the altitude 1200-1900 m (Dry Mountain): Forest woods: *Fagus sylvatica*, *Daphne mesereum*, Scrubs: *Corylus sp.*, Herbal vegetation: *Rubus ideaus*, *Urtica dioica* etc.

For the altitude over 1900 m, alpine areas (Dry Mountain), the herbal vegetation is predominant: *Sideritis syriaca*, *Festucetum basniacae* etc.

### 3.5 The cultivated vegetation

In the area of Prespa, there exists an extensive agriculture. From the ecological point of view this coincides with the traditional or natural agro-ecosystem. The advantage of this kind of agriculture is the future application of the system of ecological agriculture (biological = unpolluted food). This constitutes the basis for

agro-tourism development in that area. The agricultural area is situated near the inhabitable centres such as: Liqenas, Gorica, Rakicka, Shueci etc. The altitude of cultivated land is from 860-1468 m.

The cultivated in this area characterized from:

Fruit trees: *Malus* sp., *Prunus* sp., *vitis*. sp., etc.

Herbal vegetation: *Triticum* sp., *Hordeum* sp., *Zea mays*, *Medicago sativa*, *Phaseolus vulgaris*, *Beta vulgaris*, and the greens.

Arable soils, are situated in the brown soils generally, and partly in the meadow and alluvial soils. Their biological potential is limited (category over 5) and this need high expenses for fertiliser and irrigation. The most suitable agricultural cultures are fruit bearing and partly the vineyards. Based on the conditions we think the agriculture doesn't guarantee the future prosperity.

Agricultural activity can be improved and become a valuable part of development, inside the plural active development of the park.

### **3.6 The bioclimatic**

During the years 1950-2000 the climatic indexes that characterize the eco area, such as the temperature and precipitations have small oscillations in the reverse sense. The temperature has increased with 2-3 °C, the quantity of snow precipitation has decreased significantly and the volume of lake's water is reduced with 4.64 cm. In the micro area of Shuec, Liqenas and Gollomboç, the climatic conditions allow for the cultivation of plants in green - houses, this due to topographical position as well [5],[9].

### **3.7 The erosion**

The most obvious element in the area of Prespa is the movement of earth's particles and stones because of the precipitations during the winter season and the beginning of spring. This causes the corrosion of the earth or the erosion. The erosion is favoured from the great sloppiness of the territory, the intensity of precipitations, the vegetable density etc. [6]. The evaluation of erosion for each micro area facilitates the taking of measures with agro ecological character to decrease the scale of erosion, to keep, save and improve the agricultural land. The areas of Rakicka, Diellas, Zagradec, Lajthize, Liqenas, are the most exposed zones to erosion due to their sloppiness indicator ranging from 35% to 60 %.

## **CONCLUSIONS**

Based on the data obtained from the field and laboratory tests, the agricultural soils in eco area and all resources of Prespa Park indicate the following conclusions:

- Ecotourism in Prespa Park. The Prespa Park is one of the most important areas in Albania regarding tourist potentiality. This potential, entirely unexploited, is related to the very proper geographic and tourist position as a

knot among three neighbouring countries. Prespa covers an area with multicoloured and deeply contrasted landscape (lake, fields, troughs, forest, mountain peaks 2.000 m a.s.l. covered with snow for the most part of the year), great spiritual and material inheritance, with possibilities to produce livestock and agriculture goods for tourist consumption as well. Resting on the scientific and real valuation of this potential, we shall present a project-idea for the development of tourism in this area on the Eco-tourism principles and criterion.

- The soils are of a tectonic origin.
- The eco area of Prespa has typical natural vegetation.
- The cultivated plant is traditional.
- The soils are generally characterized by a depth of 40-80 cm.
- PH is on medium boundaries from 6.8-7.2.
- The erosion is quite at a high level due to great sloppiness and seasonal precipitations.
- The big quantity of stones with varying dimensions is a characteristic feature.

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