THE DISTRIBUTION OF SOILS AND FOREST SITES IN THE TURKEY OAK AND HUNGARIAN OAK STANDS OF OLTENIA PLAIN

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Keywords: forest sites, soil, Oltenia Plain

ABSTRACT

The main objective of this study is represented by the analysis of the Turkey Oak and Hungarian Oak stands in the Oltenia Plain, considering the edaphic and site conditions, based on the data from the forest management plan. This analysis was possible as the forest management plans describe the forested lands and they also realize a very detailed description of the forest stand, which is an homogenous land surface from a site point of view. The study researched, based on a large amount of data from the forest management plans, the edaphic and site conditions in the Oltenia Plain, reflected by the forest soil types and subtypes, as well as the site types on which the Turkey Oak and Hungarian Oak stands grow. Thus, it was observed that the soil types on which the Turkey Oak and Hungarian Oak stands in the Oltenia Plain are growing belong mostly to luvisols (80%), of which the majority are reddish luvisols and reddish-vertic luvisols, both with 24%. The great diversity of the geomorphological, geological, climate and soil conditions which describe the studied area (Oltenia Plain) led to the identification of 13 forest site types, grouped into two physio-climatic regions (forest plain and forest steppe). The most common forest site types are : *Forest plain of Turkey Oak-Hungarian Oak Pm, brown and reddish brown podzolic, diverse pseudogleyzed middle edaphic* (code 8.3.1.2.), which represents about 36 %, followed by *Forest plain, podzolic pseudogleyzed III/III-II,* with 31%. It was also observed that superior index forest sites represent more than half of the studied area (55%), the middle index forest sites represent 32 %, while the inferior index forest sites represent 13 %.

1. INTRODUCTION

Oltenia Plain has a crescent form and looks like an appendix of land which connects at North with the Getic Plateau through a conventional line under the shape of an arc of a circle of about 180 km, and at West, South and East by a belt of water, also shapes like an arc of a circle (fig. 1).

The studied area is under the alternate influence of two large masses of air: one mass of cold air, of arctic origin (from the Northern part of the continent) and one mass of hot air, of Mediteraneean origin (from South).

The alternate action of these two great masses of air leads to a quite high value of thermal amplitude (around 25°C).

Regarding the action on forest vegetation of these two masses of air, the more significant effects are related to the hot air mass, which can induce high temperature during the season of vegetation, with direct influence on evapotranspiration. If these high temperatures connects with the lack of rainfalls or with an air movement activation (strong winds) then the negative effects on the vegetation can

amplify. That is how the triggering and amplifying of the local drying phenomenon at the two studied species (Hungarian Oak, Turkey Oak).

In the Oltenia Plain the Turkey Oak occupies 10061.9 ha, and the Hungarian Oak 4655.0 ha (Table 1).

One can observe that along with Turkey Oak and Hungarian Oak other species with very small percentages like Pendunculiflora Oak (2,8%), Pubescent Oak (1,4%), Ash (1,3%), Linden (2%), Pedunculate Oak (1,1%) and some other species - Northern Red Oak, Sycamore, Black Locust, common Walnut, maple tree, Manna Ash - (3,6%).

Both Turkey and Hungarian Oak in a proportion of over 40% of the total of the surface identified as being occupies by these species in the forests of the Oltenia Plain are found within the range of Perişor Forest District (Fig. 2). Next is Vânju Mare Forest District, where the two species gather 26%, and last comes Craiova Forest District, because only a single forest body which comprises Turkey and Hungarian Oak belong to the Oltenia Plain (Coşoveni body).

The variability in time of the physical-geographycal conditions and the related ecological fators are generating a great site diversity, both under physical-geographycal and ecological aspect. This diversity imposes the study and complex characterizations of forest sites, which are an existence conditions and also a component part of the forest ecosystem.

The close knowledge of the site conditions (ecological factors and determinants), as well as their intercorellations is absolutely necesary in order to establish the nature and intensity of silvicultural interventions towards leading the forest stands (composition, density, structure) and the environmental factors with the purpose of ensuring forest ecosystem continuity (Chiriţă, 1977).

As a result of the extent to which they are represented and of the way how the ecological factors and their determinants link inside the site, in each elementary site area a physical-geographical assembly is created (geotop) and, as a consequence of that, a certain ecological complex (ecotop), which determinates itself the ecological specificity of the site or the smaller or greater capacity of the site to provide the plants with nutritional elements, water, air, warmth etc. (Chiriţă, 1977, Tîrziu, 1997).

2. MATERIAL AND METHOD

In order to elaborate this study one has used data from the forest managements of the forest districts managed by RNP Romsilva, situated in the Oltenia Plain, which have Turkey Oak and Hungarian Oak in their composition (F.D. Amaradia, F.D.Caracal, F.D.Craiova, F.D. Segarcea and F.D. Vânju Mare).

Out of the forest managements of the identified forest districts we selected the stands having Turkey Oak or Hungarian Oak in their composition. Based on the information extracted from the managements we have analized the soil and site conditions (the ecological factors and determinants) specific for the Turkey Oak and Hungarian Oak forests of this part of the country.

The calculation and the graphics were made through Excel application.

3. RESULTS AND DISCUSSIONS

3.1. Edaphical conditions

The natural conditions in the Oltenia Plain consisting of lithological sublayers, geomorphological, hidrology and climate conditions and under the influence of the vegetation led to the formation of certain genetic soil types, particular to the studied area (forest plain, forest steppe). Their productiv potential depends on the soil subtype, as a result of their evolutionary process, which continues in the present time.

3.1.1. The evidence and territorial spread of soil types and subtypes

In the studied area, because of its geographical positioning, geolocical, geomorphological, hydrological, climate and vegetations conditions, a diversity of soil types formed.

The soil types and subtypes with Hungarian and Turkey Oak identified inside the studied area are presented in table 2, of which's analysis one can notice that the soils on which Turkey and Hungarian Oak stands grow inside Oltenia Plain belong mostly to the class of luvisols (80%), followed by the class of cernisols(19%).

The following soil types and subtypes prevail: reddish and vertic reddish luvisols (24%), reddish-stagnic luvisol (14%), cambic chernozem (10%), vertic-stagnic reddish luvisol (10%) and argic chernozem (7%).

In relation to the lithological layers cinsisting of loess, soft clays or loessoid argyles and quartz sands of eolian origin and to the geomorphological found conditions, several soil types resulted:

- soils belonging to the class of chernisols (cambic or argic chernozem, etc.) which favoured the appearance of some Oak sp. Stands (Pedunciliflora Oak, Turkey Oak, Hungarian Oak and less often Pedunculate Oak), where the proportion in which they participate varies a lot, and they may also include linden, ash, field maple and field elm;

- soils from luvisols class – respectively reddish preluvisols, reddish luvisols, etc. – which eased the apparition of some Turkey Oak and Hungarian Oak (pure or blended), in which you can still find, in a smaller proportion then the previous case, the Pedunculiflora Oak;

In both named cases, the productivity of these forest stands is closely linked with the thickness of the humus accumulation layer and with the depth where the clay accumulation layer appeared and developped.

- soils of protisols class, therefore arenasols – on sand dunes – which represent one specific case and situation, conditioned by the presence on quartz sands and the levell of progress which those soils presently reached.

- inside the meadow area, where the lithological sublayer consists of sand and gravel, the soils also belong to the protisols and luvisols classes respectively. Here we can find peduculate Oak stands (both pure as well as mixed with various other species – ash, linden, field maple, sycamore).

3.2. Site conditions

The great diversity of the geomorphological, geological, climate and edaphical conditions which describe the studied teritory (the Oltenia Plain) reflects also within the great number of site and forest types where the Turkey Oak an Hungarian Oak stands of this part of the country fit.

The site types where determined as teritorial units, ecologically and productivelly identical or equivalent, bearing similar physical-geographical traits (geology, geomorphology, topoclimate), whith ressembling soils, both as genetical and physical – mechanical properties. Also, the site types have vegetal associations expressing the same trophicity, humidity, airing, warmth and soil regime, and which are fit for the same forest vegetation, reacting in the same manner to the silvicultural interventions (Chiriță, 1977).

As a consequence of site diversity, the Turkey Oak and Hungarian Oak stands in the Oltenia Plain are mostly spread in the Forest Plain (13241.7 ha), while the difference of 3515.4 ha is in the Forest Steppe (fig. 3).

3.2.1. The evidence and teritorial spread of the site types

Based on the pedological and site research, correlated with climatic data, the vegetation and the geomorphological landforms units, according to the study Stațiuni forestiere (1977) in correlation

with the classification in „Sistematica tipurilor de staţiuni“ (1972), inside the studied area 13 site types were identified, each containing at least one of the two studied species (table 3).

We can see that the most common site type is the Forest Plain of Turkey Oak-Hungarian Oak stands Pm, brown and reddish brown podzol, divers pseudogleyzed, middle edaphic (code 8.3.1.2.), which occupies 36%, followed by Forest Plain, pseudogleyzed podzol III/III-II (code 8.3.2.1.) with 31% and Internal forest steppe of mesoxerophilic-xerophilic oaks Pm(i), altered chernozem on soft clays (code 9.5.3.0.) which take 16%.

About the site index, 55% of the identified sites ore of middle site index, while 32 % oare of inferior site index (fig. 4).

4. CONCLUSIONS

Studying the edaphical and site conditions is of great importance for substantiating the technical solutions which must be adopted through the forest management and the knowledge of their effects on the managing process regarding the size, quality and structure of the forest land.

As a result of the multitude of processes which took place within the forest ecosystems and vegetation layers (of plain and forest steppe) wher the studied area is located, the soils, as a main factor of the ecosystems, show a pretty large variation, such as it emerges from their territorial spread and description. (Table 2). The great diversity of the soil types is emphasized by the microland units and other local conditions (the location within the microland, the inherent limits in between physical-chemical traits of each soil type cand differ).

Given these conditions the soil - as main element of the forest ecosystem - has a great influence on the forest vegetation. The natural existent species find here favourable conditions of growing, as a result of a long adaptation process.

Summarizing the shown data regarding the edaphical and site conditions one can formulate the following observations and conclusions:

- the geomorphological conditions are characteristical to the plain area, prevailing the plain lands, horizontal and only in a small extent the slopes, all short and of very small tilt (below 10^0 C);
- in appearance of their depth, the Oltenia Plain soils vary from mid-profound(arenasols) to very profound (chernisols and luvisols);
- by the class to which they belong, the soils texture is either clayey to clay-argile (luvisols) either sandy (arenasols);
- the soils depth - and therefore - the useful edaphical volume varies, also, related to the soils nature, being higher in the case of chernisols and arenasols and lower at luvisols, depending on the presence of B_t layer;
- the moisture regime comes mainly from rainfalls (very rare of ground origin which is mostly in the river meadows), specific to physio-climatic floors inside the studied area, forest plain and forest steppe respectively;
- the potential trophicity varies depending ond the soils nature, being high for the dystric and molic chernozems and arenasols, mean to the dystric brown reddish soils and dystric brown redish luvisols and mid-low for the other soils;

Out of the restricting physical-chemical attributes of the soils for the forest vegetation the following may be remembered:

- the clay depositing layer s compactness and impermeability for the luvisols, which may result in altering the water and airing regime of those soils;
- the high percent of sand and the lack of argile in the case of arenasols gives them o very large permeability for air and water. The excessive permeability for the water represents, in this situation, a restriciting element for the vegetation, given that in the absence of water retention (argile), the water dissipates

rapidly, either by infiltration or through evaporation;

- the appearance of pseudogleyzing in the case of some preluvisols and luvisols.

The natural forest stands index is the direct result of the restricting and compensatoryg factors in the area.

There is a tight interrelation between the variance of the parameters which describe the factors and both the ecological determinants and forest stands index.

It can be generaly said that the existing soils on the studied area give auspicious conditions to the developping of forest vegetation consisiting of Turkey Oak anf Hungarian Oak, still following the increase of the index of the stands and the correlation on ecological requirements of the species with the soils attributes.

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Table 1

The species structure of the stands having Turkey Oak and Hungarian Oak in their composition in the Oltenia Plain (Cojoacă, 2010)

Forest district	Surface	Specii									
		Turkey Oak	Hungarian Oak	Pedunculiflora Oak	Pubescent Oak	Pedunculate Oak	Linden	Ash	Hardwood	DM	Total
1	2	3	4	5	6	7	8	9	10	11	12
Vânju Mare	ha	2650.5	1202.4	303,0	4.6	38.1	304.7	31.8	89.8	2.6	4627.5
	%	57.3	26.0	6.5	0.1	0.8	6.6	0.7	1.9	0.1	100
Amaradia	ha	237.6	510.0	-	-	18.0	-	6.8	32.2	-	804.6
	%	29.5	63.4	-	-	2.2	-	0.9	4.0	-	100
Craiova	ha	27.1	76.9	-	-	6.0	1.4	6.0	8.3	-	125.7
	%	21.5	61.2	-	-	4.8	1.1	4.8	6.6		100
Perişor	ha	4685.7	1992.7	71.6	162.5	9.4	0.8	59.4	121.8	-	7103.9
	%	65.9	28.1	1.0	2.3	0.1	-	0.9	1.7	-	100
Segarcea	ha	2124.7	667.0	68.2	66.6	94.7	27.7	88.1	293.3	3.9	3434.2
	%	61.9	19.4	2.0	1.9	2.8	0.8	2.6	8.5	0.1	100
Caracal	ha	336.3	206.0	31.4	-	15.6	-	19.0	52.9	-	661.2
	%	50.9	31.1	4.7	-	2.4	-	2.9	8.0	-	100.0
Overall	**ha**	**10061.9**	**4655.0**	**474.2**	**233.7**	**181.8**	**334.6**	**211.1**	**598.3**	**6.5**	**16757.1**
	%	**60.0**	**27.8**	**2.8**	**1.4**	**1.1**	**2.0**	**1.3**	**3.6**	**-**	**100.0**

Table 2

Soil types and subtypes found in Turkey Oak and Hungarian Oak forest stands in Oltenia Plain (Cojoaca, 2010)

Soil class	Soil type	Soil subtype	Code	Layers	Surface, ha	%
Chernisols	**Chernozems**	dystric	1201	Amca-ACca-Cca	18,6	-
		cambic	1210	Am-Bv-Cca	1685,5	10
		argic	1211	Am-Bt-Cca	1133,4	7
		cambic vertic	1223	Am-Am/Bvy-Bvy-Cca	232,7	1
		argic-vertic	1224	Am-Bty-Cca	195,4	1
		OVERRAL			**3265,6**	**19**
LUVISOLS	**Preluvosol**	reddish	2103	Ao-Bt-C	421,4	3
		reddish-mollic	2115	Am-Bt	233,9	1
		reddish-vertic	2116	Ao-Bty-C	503,2	3
		OVERRAL			**1158,5**	**7**
	Luvisol	reddish	2203	Ao-El-Bt-C	3948,3	24
		reddish vertic	2218	Ao-El-Bty-C	4030,6	24
		reddish planic	2219	Ao-El-Bt-C	94,0	1
		reddish stagnic	2233	Ao-El-Btw-C	2442,7	14

		reddish vertic stagnic	2234	Ao-Elw-Btyw-C	1722,9	10
		OVERRAL			**12238,5**	**73**
	OVERRAL				**13397,0**	**80**
PROTISOLS	**Arenosol**	dystric	0301	Aodi-Cdi	22,6	-
	Alluvial soil	dystric	0401	Aodi-Cdi	9,2	-
		mollic	0403	Am-C	22,6	-
		gleyc	0414	Ao-Go-Gr	27,5	-
		mollic-vertic	0421	Am-Cy	12,6	-
		OVERRAL			**71,9**	**1**
	OVERRAL				**94,5**	**1**
OVERRAL					**16757,1**	**100**

Table 3

Site types in Turkey Oak and Hungarian Oak stands in the Oltenia Plain

Nr. crt.	Tip staţiune		Categoria de bonitate				
	Cod	Denumire	Sup.	Mijl.	Infer.	Total	%
FOREST PLAIN (CF)							
1.	8.3.2.1.	Forest Plain, pseudogleyzed podzol III/III-II (Bi)	-	-	5246,2	5246,2	**31**
2.	8.3.1.2.	Forest Plain of Turkey Oak-Hungarian Oak stands Pm, brown and brown reddish podzol, divers pseudogleyzed, middle edaphic (Bm)	-	6057,2	-	6057,2	**36**
3.	8.3.2.2.	Forest plain of Turkey Oak-Hungarian Oak stands Ps/m, brown reddish podzol, high edaphic (Bs)	1270,9	-	-	1270,9	**8**
4.	8.3.3.1.	Forest plain, pseudogleyc, III (Bi)	-	-	6,3	6,3	**-**
5.	8.4.2.0.	Forest plain, slope Pm, brown reddish, middle edaphic (Bm)	-	345,9	-	345,9	**2**
6.	8.4.3.0.	Forest plain Ps, brown reddish, high edaphic (Bs)	231,2	-	-	231,2	**2**
7.	8.5.1.1.	Forest plain, medow Pm, brown ground humid gleyzed or semigleyc, middle – high edaphic (Bm)	-	71,8	-	71,8	**-**
8.	8.5.1.2.	Forest plain – meadow (Pm), ground humid, gleyzed or semigleyc, high edaphic (Bs)	12,2	-	-	12,2	**-**
OVERRAL			**1514,3**	**6474,9**	**5252,5**	**13241,7**	**79**
FOREST STEPPE (Ss)							
9.	9.5.3.0.	Internal forest steppe of mesoxerophilic-xerophilic oaks Pm(i), altered chernozem on soft clays (Bm)	-	2664,5	-	2664,5	**16**
10.	*	Internal forest steppe of mesoxerophile-xerophile oaks Ps(m) with Pedunculiflora Oak, altered chernozem slight podzol – pseudogleyzed (Bs)	628,4	-	-	628,4	**4**
11.	*	Internal forest steppe of Turkey Oak and Turkey Oak-Hungarian Oak stands Pm-i, altered chernozem, strongly pdozol-pseudogleyzed, on soft clays (Bi)	-	-	214,6	214,6	**1**
12.	9.6.4.1.	Forest steppe meadow Pm, zonal soil, ground humid, gleyzed and semigleyc not flooded or shortly flooded (Bm)	-	3,5	-	3,5	**-**
13.	9.6.4.2.	Forest steppe meadow Ps, zonal soil, ground humid, not flooded or shortly flooded or very rare and shortly flooded, very profound (Bm)	4,4	-	-	4,4	**-**
OVERRAL			**632,8**	**2668,0**	**214,6**	**3515,4**	**21**
OVERALL (C.F. + S.s.)			**2147,1**	**9142,9**	**5467,1**	**16757,1**	**100**
%			**13**	**55**	**32**	**100**	**-**

* - without correspondent in the 1972 systematics

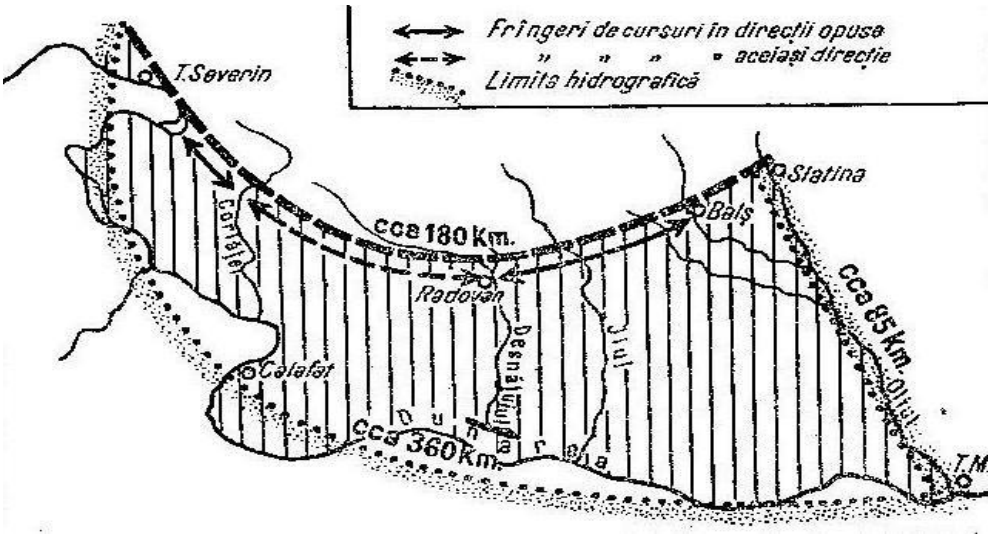

Figure 1. The shape and length of the borders of the Oltenia Plain (by Coteţ, 1957)

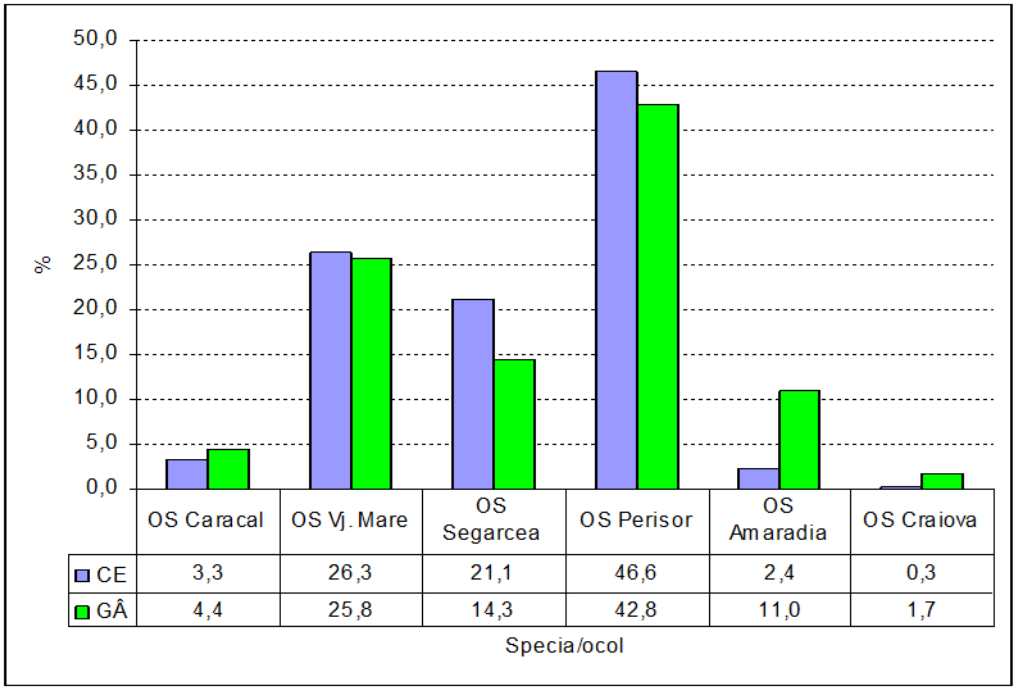

Figure 2 Participating proportion of Turkey Oak and Hungarian Oak in the forest stands composition per forest districts (by Cojoacă, 2010)

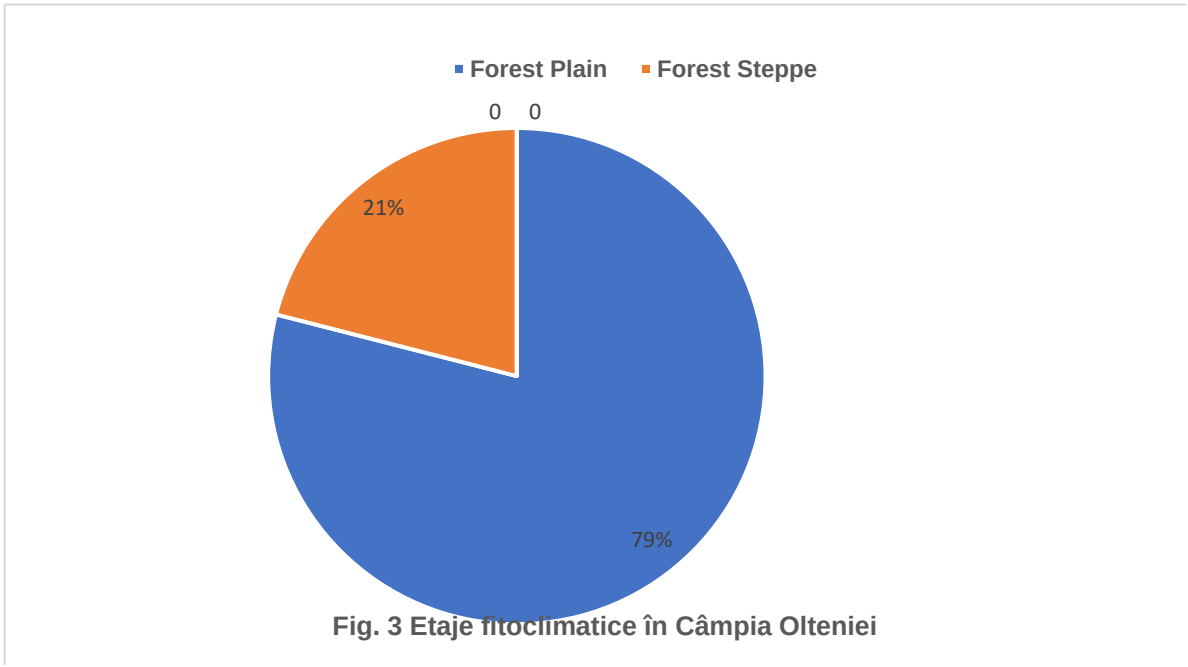

Fig. 3 Etaje fitoclimatice în Câmpia Olteniei

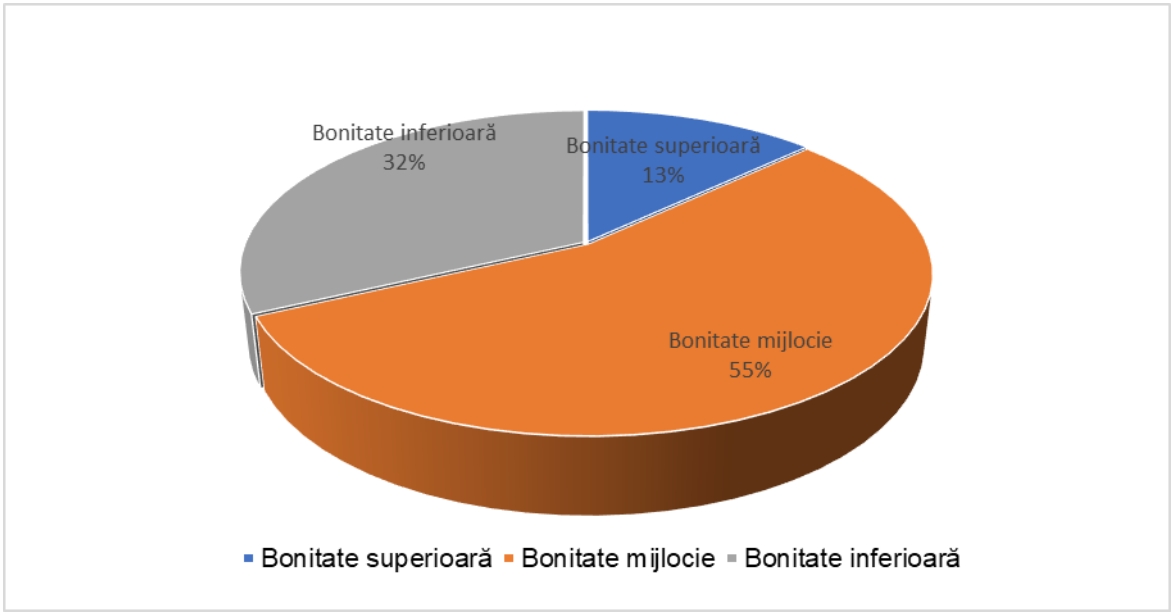

Figure 4 The distribution of the sites on site index classes