

# LIMITING FACTORS OF SOIL FERTILITY IN THE ARANCA PLAIN

## FACTORII LIMITATIVI AI FERTILITĂȚII SOLURILOR DIN CÂMPIA ARANCA

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**Abstract.** The area is represented by a single relief unit, the plain, which has the aspect of a wide alluvial area of subsidence and divagation, on which parasite numerous abandoned waterbeds representing the old water courses of the river Aranca and of its affluents. The impact and action in time of soil and climate factors (relief, rock, climate, hydrology) as well as man's intervention through important hydro-ameliorative works started more than 200 years ago, determined the existence itself of a cover of soils with strong complexity and diversity.

**Rezumat** Zona prezintă o singură unitate de relief, cea de câmpie, cu aspectul unei largi arii aluviale de subsidență și divagare, pe care parazitează numeroase albușuri părăsire, reprezentând vechile cursuri ale râului Aranca și ale afluenților acestuia. Influența și acțiunea în timp a factorilor pedogenetici (relief, rocă, climă, hidrologie), ca și intervenția omului prin importante lucrări hidroameliorative începute cu mai bine de două sute de ani în urmă, au determinat existența unei înveliș de soluri cu o accentuată complexitate și diversitate.

**Key words:** limiting factors, salinisation, humus reserve, compactness, moisture excess  
**Cuvinte cheie:** factori limitative, salinizare, rezerva de humus, compactitate, exces de umiditate

### INTRODUCTION

The increase of yield and of soil fertility is directly determined by a detailed knowledge of soil-formation processes, of the evolution and of the state of ensuring soils with main nutrients. Previous researches concern numerous analytic data for a period of over 40 years, an interval in which numerous changes occurred both in soil properties and in research methodology, in mapping and in appraisal works. As soil features are dynamic and in close relation to soil-formation conditions, it is necessary to re-evaluate physical and chemical properties, nutrient ensuring state and yielding capacity of the main crops in the Aranca plain area.

### MATERIAL AND METHODS

In this paper, we aim at presenting the main soils, limiting factors of fertility, the productive potential, and the problems of valorising soil resources of the studied area.

Interpreting data, characterising the natural frame, analysing limiting factors of fertility, as well as assessing agricultural lands have been done in accordance with the *Metodologia Elaborării Studiilor Pedologice* (vol. I, II, and III) and the *Sistemul Român de Taxonomie a Solurilor* elaborated by the I.C.P.A. București in 2003.

### RESULTS AND DISCUSSION

#### *Soils*

The main characteristic of the soil cover is the dynamics differentiated in time and space as resulted from natural conditions of formation and evolution.

Because of the soil and climate, processes there appeared a soil cover of the mosaic type, visible also in the main soil types identified in the studied area (Table 1).

Table 1

Main soil types in the Aranca Plain

No	Class	Type	Area (ha)	% of the studied area
1.	Protisoils	Aluviosoil	3.505	18.6
2.		Entiantroposoil	151	0.8
3.	Chernisoils	Chernozem	2.658	14.1
4.		Faeoziom	772	4.1
5.	Cambisoils	Eutricambosoil	283	1.5
6.	Pelisoils	Vertosoil	6.313	33.5
7.	Hydrisoils	Gleyosoil	1.471	7.8
8.	Salsodisoils	Solonets	433	2.3

**Limiting factors**

Analysing limiting factors consists of enumerating them by synthesising them and by analysing each of them in relation to the way each behaves in different points of the studied area, i.e. for each soil unit and for each land. The goal of this analysis is to supply a global image of the phenomena within some elementary units of the soil and climate landscape, which show the general strategy concerning the ensemble of current improvement or cultural measures concerning the achievement of a sustainable agricultural, forestry, and cultural use.

The main limiting factors that affect the quality of the soil cover are measurable in salinisation, which asks for severe measures on 3.9% of the area, moderate on 7.9%, reduced 47.3%, unlimited 41.9 % (Figure 1); alkalisation – extremely severe 0.3%, severe 10.3%, moderate 11.5%, reduced 55.1%; acidity – moderate 1.5%, reduced 8.3%; humus reserve – moderate 1.2%, reduced 16.7%; compactness – severe 22.1%, moderate 32.0%; stagnant moisture excess – severe 11.6%, moderate 8.1%; flooding – very severe 0.3%, severe 0.6% .

Improving and valorising the productive potential of agricultural lands in this area can be done in the conditions of an integrated approach of current hydro-ameliorative, agro-pedo-ameliorative, and cultural measures that aim at ensuring an optimal, functional air-water regime in the soil.

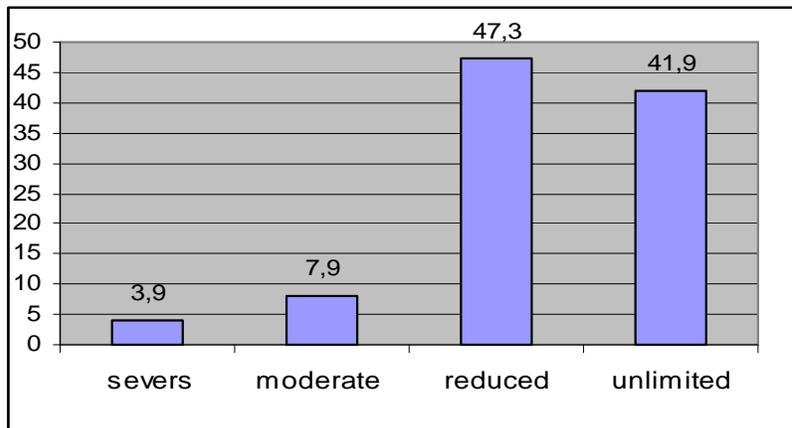


Figure 1. Limitations because of salinisation (%)

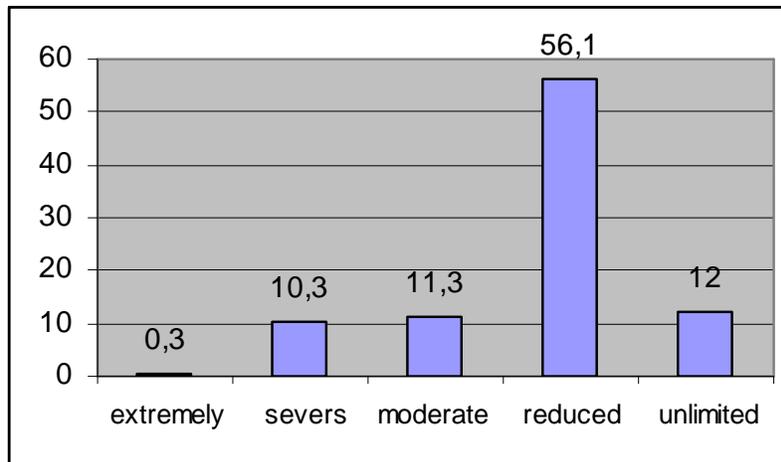


Figure 2. Limitations because of alkalisation (%)

## CONCLUSIONS

Because of studying the Aranca Plain area, we can draw the following conclusions concerning the natural frame of formation of the area:

- morphologically, the relief is represented by a succession of depressions made up by constitution subsidence following the physical maturation of argyle deposits;
- the studied area is located in the hydrographic basin of the river Aranca, i.e. in the Aranca drainage-drying system.

In the context of conservation and improvement of agricultural lands we need to make a detailed analysis of the limiting (restricting) factors of soil fertility in the area:

- salinisation and alkalisation processes diminish considerably the yields on the agricultural lands on solonets and on other strongly salinised soils;
- gleysation and stagno-gleysation manifest strongly on hydro-soils;
- the level of phreatic water and of water courses have suffered in time essential changes that are partially present in the soil profile: in this area it is not impossible to have soil evolutions during the periods when phreatic water is close to the surface or at small depths;
- the presence of argylous fractions of the smectic type confers vertic features to these soils.

Other aspects of importance are their location and impact on yields: it is known that the edaphic factor has different impacts on different crops; this is why we think that the synthesis of the soil grouping into suitability classes (depending on these limiting factors and on the proper improvement measures) be done for the lands suitable for the present (the moment of soil mapping) uses.

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