

RESTRUCTURING LAND USE AND AGRICULTURAL CROPS DEPENDING ON THE CURRENT STATE OF CLIMATE AND SOIL RESOURCE OF ROMANIA

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Abstract

The evolution of the current climate has caused many changes in terms of environmental components, including the soil. Aridization process led to the depreciation of its fertility traits for example: de-structuring of aggregates, compaction, consequently decrease of the amount of humus reserve, soil water constant changes. This led to restructuring of land use, replacement of other crops, energy, land improvement systems in rethinking and rehabilitation.

This paper having personal support of some researches in several agro-ecosystems of Romania aims to bring the current concerns regarding the current status of the land, soil support and conservation status of soil and not least the current cultures and future crops.

INTRODUCTION

The research of agrarian space presents, from our point of view, several components, the most important being: geo-topographic location, pedological resource, all hydro climatic conditions and land use. The last three decades are characterized as the climate issue, both through extensive changes in the global and national territory.

The temperate zone, in which we are situated, has suffered for the period to which we relate many perturbations of temperature, precipitations, changes in the status of vulnerable land and deepened continuously.

If we have to take into consideration the proposed scenarios for the next 20 - 50 years, following the increase in value of temperature, 0.8 °C, as is currently the Central and Eastern Europe will have a similar thermal regime of northern African continent. Also finds that in many countries of the Mediterranean and the Balkans or Black Sea basin. The year 2003 was the warmest of the latest century, with incalculable losses to agriculture, and unfortunately many human lives.

The weather is expected according to the calculations to have an average annual warming of 0.5-1.5 °C until the year 2030.

Continued global warming will result in +3 °C melting of polar glaciers and raise sea levels by 1 m planet. At 4 °C in addition, Scandinavia will become Europe Mediterranean and northern Canada the most fertile agricultural area of the world.

For the year 2035 are expected in the current rate of warming, melting glaciers and the total since the current five degrees above average temperature, thermal shock will be that mankind will not last.

Our natural question is: who will be the answer to the impact of soil future thermal shock? It will degrade the fertile layer? How and in what rate? How will react to its physical and chemical components to stop the phenomenon and what measures are necessary for improvement?

Therefore, for the present situation we intend to point such phenomena, in various locations in our country and having a specific pedology support.

The pragmatic side means the restructuring of land use, accompanied by their subsequent replacement to other species than the traditional ones. At the same time, it takes into account the translating of the culture of grain, with more energy as alternatives to time.

THE PURPOSE AND METHODS OF RESEARCH

What has followed? First of all, the crops evolution of current land use status according to the pedology resource. Research has the high-impact of aridization process where soil vulnerability is evident.

We have focused on certain soil types, namely: psamo-soils in southern Oltenia, kastanoziom in Dobrogea and chernozems in limestone in the south of Moldova. Sites are in correlation with the forecast sketch (with additions) of moisture regions in Romania (USD Soil Conservation, 1994).

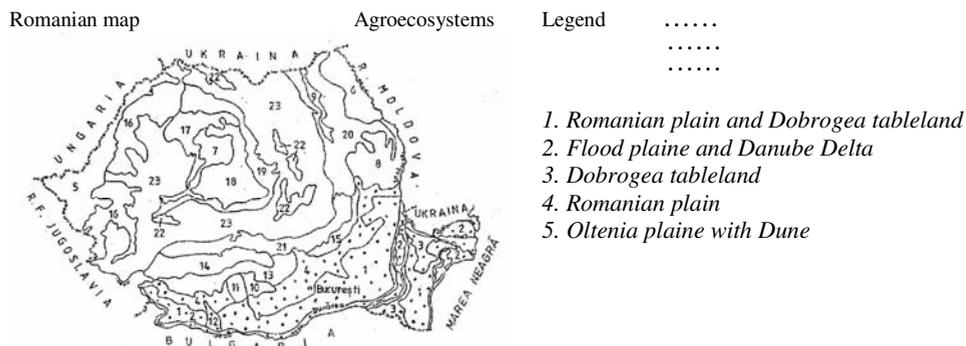


Fig. 1. Agroecosystems affected of pedological aridization with degradation sustainability from land crop

Table 1

Analytical data

Sandy salonetzc soil - Flood Danube plain; Potelu, Corabia											
Horizon	Depth (cm)	Clay %	Fine sand %	Humus %	Nitrogen %	Sodium m.c.	pH	CaCO ₃	Hidraulic conductivity mm/h	Aeration porosity %	Resistance to penetration Kgf/cm ²
Ao	0-15	6.2	74.5	0.88	0.021	0.43	8.5	8.60	105.2	32.3	10
A/C	23-32	4.1	66.8	0.30	0.010	0.43	8.8	9.70	121.4	34.6	7
C	35-45	3.3	73.4	0.17	-	0.43	8.8	5.83	137.9	36.4	7
	70-80	6.3	87.7	-	-	0.59	9.0	7.58	134.9	34.9	6
	90-100	5.1	89.5	-	-	0.59	9.0	13.35	-	-	-
Chestnut steppe soil - Dobrogea; Casimcea zone											
Horizon	Depth (cm)	Clay (%)	Fine sand (%)	Humus (%)	Nitrogen (%)						
Ap	0-13	24.6	6.9	2.1	0.13						
Am	18-33	24.0	8.6	1.7	0.13						
A/C _{ka}	35-50	24.4	10.1	1.5	0.11						
C _{ka}	75-90	23.3	16.1	0.9	0.05						
C	100-120	22.7	15.7	-	0.04						
Lithosol - Central Dobrogea											
Horizon	Depth (cm)	Grading		Chemical			Physical				
		Clay (%)	Fine sand + coarse sand (%)	Humus (%)	pH	Nitrogen (%)	Total porosity (%)	Aeration porosity (%)	Hydraulic conductivity mm/h		
A/R (rock)	0-17	20.6	54.5	5.70	7.8	0.31	59.9	24.9	134.7		
Rogosoil - South Moldova - Corvului plain											
Horizon	Depth (cm)	Grading (%)			Chimice		Fizice				
		Clay	Silt	Fine sand + coarse sand	pH	CaCO ₃ (%)	Hydraulic conductivity mm/h	Aeration porosity (%)	Resistance to penetration Kgf/km ²		
Ao	0-20	14.6	29.3	56.1	8.3	12.7	1.5	49.6	24		
A/C _k	22-33	12.8	30.5	56.7	8.4	14.6	10.4	54.3	20		
C	35-45	9.7	27.5	62.8	8.6	16.2	-	-	-		
	50-75	9.5	21.1	69.4	8.5	13.2	24.2	56.9	17		
	80-100	10.6	30.8	57.8	8.7	11.9	-	-	-		

In the last 25-30 years, the area (agro ecosystems) we refer to, belonged to a climate of xeric type.

Our methods of investigation were based on specific mapping, such as substantiation to draft L.I. (land improvement) (DES-DRE, CES, OT, etc.) and A scale covered were determined according to load and complexity of land.

Soil analyses were those of current laboratory practice, following in the dynamic modification of physical and mechanical attributes (DA, RP, K, PT, PA and others) for fertilization (humus and Rh, macro and micro elements) or soil chemistry (pH, V, carbon content, salts etc.).

The data are based on soil evaluation and land classification in soil fertility class. It was intended also to compare the present situation with the previous evaluation of soil notes, all related to land use and culture.

The available production data helped us to understand the real situation of vulnerability of land for agrarian economy.

THE CONTENT OF RESEARCH AND RESULTS

In Oltenia, the area investigated was the Danube meadow between localities: Dunareni-Bechet-Potelu-Corabia. Dominant soils are psamosoils (sandy soils) and some subtypes of alluvial sandy soil.

Their characteristics are low content of clay (<12%) and humus (subunit percent). Over time, in the process of farming these soils have been improved (irrigation, fertilizers, incorporation of clay, etc. Fertilizers were predominantly organic fertilizer and green manures. The effect was not the desired one, because of the strong mineralization of the incorporated material and the leaching of these on soil profile. Applied, for example, from the first decade of March to the end of spring, in May, they were completely mineralized and no trace or effect of their incorporation into the soil was identified. Humus still remained <1% and the reserve calculated on the first 50 cm 30t/ha - extremely small.

The values of soil surface temperatures in the South of Oltenia are often between 50 °C- 60 °C and it is continued throughout high value on control sections. Lack of water in the soil resulted in the most of plantation from the Danube to the root system atrophy, in some cases, even to necrosis. The effect: dry partially or totally hearths entire perimeter planted.

The transition from one regime type to one weak arid xeric, lithology means an extension of periods of dryness, from 4 months consecutively in a period of several months of dryness effective control of entire sections of land.

Here, in Oltenia, Mehedinti county territory, at Gogosul and other territories like Burila Mare, with sandy soils, specialists have taken measures replacing maize crop in 2009, with sorghum and triticale plants better adapted to new climatic

conditions. It is expected, that in a short time, in southeastern Oltenia to introduce also in culture citrus and fig trees.

On the fields of Dobrogea with pedology component of kastanozioms, in majority, and with other types or subtypes lithic (conditioned by VEU), vulnerability is extremely high, the report Penmann (P/ETP) being the most critical in Romania (<0.75).

In the Casimcea plateau land, the arable land restrains use, the place being taken by xerophytes pastures, pastoral worthless. Erosion as a process characteristic of vulnerability, removed only in the last two decades more than 5,000 hectares of set-aside.

Drought, as the defining phenomenon of aridization, between 1999 and 2003 led only to partial or total disaster of crops: wheat, barley, maize, sunflower and rape. The value of loss production was then tens of millions of ROL in Castelu, Medgidia, Poarta Alba, Basarabia, Valul lui Traian. Only for the wheat, for example, were losses of 9.3 billion of ROL, from Medgidia and 43.7 billion of ROL to Castelu.

In the sunflower crop in Castelu, in the same year (2003), the losses amounted to 36.5 billion of ROL same cause of vulnerability soil due to the impact of the phenomenon of aridization.

Following soil indicators, the most affected were: humus and reserve humus, carbon content, hydro-physical and physic-mechanical constants. The indirect factors are found slope land and groundwater regime. Penalties included by these indicators for soil evaluation notes, go to 20% -70% (subunit coefficients of 0.8-0.3).

Where we located the use of pasture land, especially on the slopes of the valley Casimcea, listed indicators are useful add edaphic volume (VEU) - appearance of hard rock (limestone or green schist).

In the south of Moldova, Covurlui plateau area, investigating the climate impact on soil resource was noted by: intensive mineralization of humus horizon with dehumification softness, destructuring of the physical and the particular process area, suffosion in loess.

Land is now slightly arid climate, compared to the previous xeric, evidence of its extension northward.

The pedology shell is dominated by limestone chernozems (CZka), the plates and regosoils (RS) on the slopes. Degradation of the physical is obvious, both to the chemical. The recognized natural causes, joined and human action, through interventions such as deforestation, destruction or abandonment hydro ameliorative and ESC systems, pollution, etc. Emanation of dust from the factory steel plant in Galati, leading to contamination of thousands of hectares of farmland and

abandoned works to the highest of the IRI system (Terrace Covurlui-170,000 ha) have influenced land degradation in accelerated.

The reducing fertile led horizons by erosion and deforestation (especially in points of connection interfluvial slope-shelf) to change land use (from arable land to grassland or even in the future in non-productive land).

Another cause, the man-to-ground impact of the current climate, with repercussions on land use changes remains the new cadastral configuration. This led to fragmentation of the land, there are currently four million parcels cave regarding Romanian level. Changes in the geo-topographical drawing of boundaries of plots could not keep account of old hydro schemes and other works of land improvement, ameliorative recommendations from pedology methods.

Natural causes overlapping human interventions have reduced fertility potential of the soil, reaching the abandonment of approx. 1 million ha, with changes of use or other destinations. Approximate of the 7 million hectares are used for only 50% - 60% of the area (3.5 million hectares remaining, currently cultivated).

If the trend of global transformation will continue, Romania will have to draw up new agricultural areas and ecological pedology climate areas where crops in rotation to meet the resources of soil.

Restructuring will also replacing traditional crops such as wheat and maize, with several technical plants adaptable to new thermal conditions (e.g. sunflower, rapeseed), but also the introduction of specific types Mediterranean climate, e.g. sorghum, millet, triticale, future planning of olive groves, kiwi and fig trees. Some of them are already cultivated, occasionally the surfaces (the Ostrov area), and especially olive Mediterranean species and will be put into future concerns of specialists.

A new entrant in culture aside is artichoke, herbs and not only, as we shall see, and planted on former swamp alluvial soil of Ialomita, the SC Agrofarm Fetesti. Cultivation was done in 1000 ha in 2009, in order to test its energy value. Artichokes proved better adapted to new climate conditions on and support the underlying pedology of increasingly low in humus and nutritional substances.

On the cultivated area has achieved a production of about 20,000 t, which can then be used to manufacture "blade"-small solid bio-fuels. The equivalent in classical-diesel fuel is 2 kg pallets for gas oil 1l. Being a perennial, artichokes, exploit weak soils and potential environmental pedology and the profit rate can reach 700 euro / ha, compared with wheat which does not exceed 50 euro a ha.

The whole experiment of meadow reclaimed from the sea to the Danube, from Fetesti is not singular for Europe, because it is part of a general partnership called "Green Energy", with agricultural universities in the Balkans and beyond. The next phase will invest 3 million euro for building factory pallets and gradual transition to the use of bio-fuels, partly or wholly for agriculture.

CONCLUSIONS

1. Global warming is actually an undeniable phenomenon that, for agriculture in general and soil distinction in particular, will mean gradual but continuous degradation of everything that's sustainable land as a human food resource.
2. Vulnerability of agricultural land in Romania was identified after 1990, all studies of specialized international bodies (ONU-FAO, PNUD, UNISDR-United Nations International Strategy for Disaster Reduction) and materialized on the "Map of forecast moisture regimes soils" (1994).
3. For Romania, the impact is more obvious in the agro-ecosystems of South and East (Oltenia, Baragan, Dobrogea and South of Moldova), with such resources as soils: psamosoils, kastanozioms, chernozems limestone, lithic or regosoils types and subtypes.
4. The change in the soil moisture regime resulted in poor arid climate zones extending to the detriment of xeric.
5. Vulnerability of soils meant obvious changes in terms of physical, chemical and biological component, the most important being the mineralization of humus-acid huminic providing dark blackish organic matter, with repercussions on the state of fertility.
6. Some properties such as: acidity, degree of saturation in bases, total and active calcium content, this salt, etc. will undergo changes that will lead, predictably, to remove from arable land, save currently is replacing or changing assortment of cultural usage.
7. Agro-pedology restoration will mean adapting to rapid and extensive measures such as reconsideration of IRI and CSE systems, fertilization mainly organic radical; structured rotation with perennial plants and dominant; move limits by replacing traditional crops with plants easily adaptable to new climate conditions.

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