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STUDIES FOR RURAL DEVELOPMENT PROGRAMME ELABORATION IN THE CRISURI BASIN

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Abstract
The studied area has a potentially favourable rural agricultural economy whose recovery is increased by the environmental characteristics whose annual growth does not meet the requirements of agricultural technology. The analysis of the natural factors has resulted in determining the stress level imposed upon the crops, which can lead to human intervention so that the environmental conditions should match the farming conditions. For this purpose, we should develop facility improvement programmes and appropriate measures.

Key words: *lack of humidity, limiting factors, risk factors, rural development, water catchment area*

INTRODUCTION

The vast majority of rural economic activities are conducted outdoors, under the direct effect of environmental conditions, where climate variability influences the physiological processes of the plants, the growing conditions of the animals, and the work of those involved in conducting such business processes (Maracineanu, 2003).
However, in order to take place under optimum conditions, each category of activities requires certain environmental conditions, most of them depending on the climate. The increased climate variability of the recent decades, characterized by extreme events, is a natural limiting factor for the rural activities taking place in the natural environment, especially in large spaces. Besides this direct influence, the climate influences the other environmental factors such as soil quality and evolution, the hydrological and hydro-geological regime, and land degradation processes due to heavy rain, high temperatures and strong winds.

MATERIALS AND METHODS

Located in the western part of Romania, the Crisuri water catchment area is bordered by the Somes basin to the North and North-east, the Mures basin to the East and South, and the Republic of Hungary to the West (figure 1), i.e. between 47°06' and 47°47' north latitude, and 20°04' and 23°09' east longitude. It includes the following main rivers: Barcau, Ierul, Crisul Repede, Black and White Cris, which are gathered two by two on the territory of Hungary, forming one course that confluences with the Tisa. Most of the Crisuri water catchment area is in Bihor County (Pop, 2005).

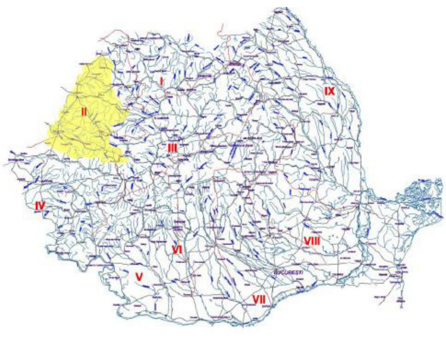

Figure. 1 Crisuri water catchment area

This area has a valuable potential for rural development, as it is supported by natural conditions which often present a development in time that does not fully satisfy the specific needs of the different categories of rural activities, particularly the exploitation of arable land. Sustainable development cannot be designed only based on the protection of

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agricultural natural resources, soil and water, plus the specific biological resources of cropped plants. The protection of the agricultural natural resources and the best use of the biological resources require a better correlation between the environmental offer and the optimal conditions of resource protection and capitalization through the most suitable ameliorative techniques (Constantin, 2006).

For the study area, we analyzed the climatic risk factors and the limitations of soil quality. The assessment of the climatic factors as risk factors was made by using various types of climate classifications whose comparative results allowed conclusions with practical effects. For a more realistic assessment of how climate affects rural capitalization, we used several climate classifications that are used worldwide in specialist studies (Dogaru, 2012).

Soil and land degradation result from the poor management applied to those two complex systems considered in interaction: the natural ecosystem and the social system human. The soil is considered degraded when its specific qualities are reduced, and shows a process of decline due to its misuse by the human factor. The assessment of soil degradation in the study area was based on studies conducted by the OSPA (Office of Pedological and Agrochemical Studies) Bihor.

RESULTS AND DISCUSSIONS

The six methods of processing the raw climate data highlighted the stable character of the climate in the Crisuri Plain, and also the tendency to become a more arid climate - Table 1. Thus, according to the Martonne index, the Lang precipitation factor and the ICPA classification, the climate became more arid in the last decades, a trend which reduced the amount of water that precipitations made available for the crops. The significant water deficit required more extensive technological interventions, such as irrigation and the use of more resistant plants in order to preserve the water reserves in the soil to a greater extent.

Table 1 Comparative climatic indices of Crisuri water catchment area

Climatic index		Calculation period			
		1896-1955	1990-1999	2000-2009	Class limits
Gorczynski Index	value	84	79	84	> 34 Continental
	Climate type	continental	Continental	continental	
Martonne Index	value	31	31.6	28.6	25-30, moderately arid; 30-35, sub-moist
	Climate type	Sub-moist	Sub-moist	moderately arid	
Lang Precipitation factor	value	60.0	50.9	54.2	56-180, semiarid area; 21 – 55, Arid area
	Climate type	Semiarid area	Arid area	Arid area	
Martonne-Gottman Index	valoare	32.9	30.8	32.5	30-59 Moist climate
	Climate type	Moist climate	Moist climate	Moist climate	
Thornthwaite humidity global index	value	-1.8	22.0	9.0	
	Climate type	Sub-dry		Sub-moist	0 ÷-20 Sub-dry 0-20 Sub-moist
ICPA clasification	value	I_b=82mm,i_h=114%, i_a=32	I_b=88,8mm,i_h=116%, i_a=32	I_b=16mm,i_h=97%, i_a=28	
	Climate type	Overflow, moderate overflow	Overflow, moderate overflow	Overflow, low overflow	

Tables 2 and 3 highlight the modification of the annual precipitation production rate and average air temperature may indicate the development tendency of climate. Therefore, the last four decades considered for the comparative study, 1970 - 2010.

Table 2 Frequency of average annual precipitation in the study area

Annual precipitations, mm	Frequency (number %) per decades			
	1970-1979	1980-1989	1990-1999	2000-2010
1000 - 700	2 / 20	1 / 10	4 / 40	2 – 20
700 - 600	1 / 10	5 / 50	1 / 10	4 - 40
600 - 500	3 / 30	2 / 20	1 / 10	1 -10
500 - 400	4 / 40	2 / 20	2 / 20	2 / 20
400 - 300	-	-	2 / 20	1 - 10

Table 3 Frequency of average annual air temperatures in the study area

Air temperature, °C	Frequency (number/ %) per decades			
	1970-1979	1980-1989	1990-1999	2000-2010
≥ 12	-	-		2 / 20
12 - 11	-	-	3 / 30	3 / 30
11 - 10	8 / 80	7 / 70	4 /40	4 / 40
10 - 9	2 / 20	3 / 30	3 / 30	1 / 10

During the 40 years, a trend developed, i.e. the production of a lower volume of annual rainfall since the decade 1990-1999. At the same time, the share of rainfall of 700 mm/year was maintained at the range of 10% - 40% of annual rainfall for each decade. There was a clear tendency of reduction in the annual rainfall, i.e. 500-600 mm/year, from 40% in the decade 1970-1979 to 10% starting with the decade 1990-1999. Also, low precipitations have occurred since the same decade, i.e. between 300 and 400 mm/year (Dogaru, 2012).

The dynamics of the annual average air temperatures showed a consistent trend of increasing annual average temperatures, from 10°C and 11°C to values higher than 12°C; thus, starting with the decade 2000-2010, they accounted for 20%. The average annual temperatures between 10°C and 11°C decreased from 80% to 40% which modified the thermal regime of the area.

These conclusions supported the interpretation of the climatic indices based on which the evolutionary trend of climate towards aridity is considered.

The forms and processes of land and soil degradation result in decreased soil productivity to a greater or lesser extent, depending on the number and intensity of the manifest restrictive factors. They are caused by natural factors (parent rock, climate, landforms, biotic factor and water) or human activity (agricultural or industrial), table 4. Water excess, fluid erosion and landslides, salt and acid excesses in the soil are risk factors for agriculture. There is another risk that can be added to these, i.e. the exploitation of the compacted soils or the soil with low nutrient content.

Table 4 Factors limiting the land productive capacity in Bihor County

Degradation process	Affected area, ha	
	Total	Arable
Permanent humidity excess in soil	148,983	89,390
Water erosion	43,234	31,561
Landslides	2,263	1,358
Excessive frame at ground surface	8,743	2,620
Salt land, of which:	38,549	11,565
- highly alkaline	822	482
Secondary compaction of soil due to inadequate tillage (plough sole)	-	-
Primary compaction of soil	-	-
Crust formation	-	-
Low reserve - very low humus in soil	312,689	229,211
Strong and moderate acidity	140,886	94,098
Providing poor and very poor mobile phosphorus	159,067	96,150
Providing low nitrogen	203,947	156,829
Pollution by wind-carried substances	-	-
Soil damaged by excavation	-	-
Soil covered with waste and solid waste	-	-
TOTAL	**1,059.2**	**996**

Data Source: Office of Pedological and Agrochemical Studies - Bihor 2011

CONCLUSIONS

- The increased climate variability in the recent decades, characterized by extreme events, is a natural limiting factor for the rural activities taking place in the natural environment;
- The Crisuri water catchment area has a valuable potential for rural development, supported by the natural conditions which often present developments in time that do not fully satisfy the specific needs of the different categories of rural activities, particularly the exploitation of arable land.
- By processing the climatic data and interpreting the results, we found the stable character of the Cris Plain climate and also its tendency to become a more arid climate;
- The tendency of climate evolution was assessed as the change in the production frequency annual precipitation and average air temperature for a period of four consecutive decades, and showed an evolution towards aridity.
- The forms and processes of land and soil degradation were caused by natural factors (parent rock, climate, landforms, biotic factor, water) or human activity (agricultural or industrial), among which the following were dominant: the permanent humidity excess in the soil, low reserve - very little humus in the soil, providing low nitrogen and mobile phosphorus, strong and moderate acidity.

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