

THE CLIMACTIC PREMISES OF ORGANIZING THE AGRICULTURAL AREA OF GIURGEU DEPRESSION

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ABSTRACT. - The Climactic Premises of Organizing the Agricultural Area of Giurgeu Depression. The Giurgeu Basin is one of the coldest microregions both of the country and Middle – East Europe. Its ecological infrastructure follows the specific climatic particularities, and it presents a characteristic flora, fauna and soils. Among the natural conditions required by agriculture, the climate is of decisive importance. The agro-structure of this microregion has never been too varied. In the past 50 years, however, it has become more restricted, and the exchange of agricultural products has increasingly become more and more deficitary. Agricultural production must be laid on new bases. In the process, of a great importance is defense against risk factors, and also an ever – increasing put into value of the southern and south – western slopes, which show a more favorable climate. Thinking in microregional terms, we cannot have in view a market – centered agriculture. The only way to proceed is to create a multi – functional agriculture, with a deep ecological basis, which is able to follow the specific ecological infrastructure of the basin.

1. Introduction

It is a well-known fact that intra-mountainous depressions from East-Transylvania – Giurgeu depression among them- are characterized by a specific cold and wet, topoclimate, excessive at times. This topoclimate has a decisive impact on the overall landscape, and, implicitly, on all the components of the socio-economic area.

It is obvious that in all instances, the climate influences the other elements of the geographic area – yet, in our case, it determines, limitates in a very evident way the developping possibilities of the region. The formulation of a conception and that of programs of organizing and developping the depression area, must begin with the evaluation of climactic factors, especially of those of risk – their underestimation inevitably leading to the failure of the activity.

The Giurgeu Depression is a rural space par excellence and is at present characterized by an overwhelming predominance of traditional forms of special organization.

The structure of agricultural production is poorly diversified, owing to harsh climactic conditions as well as to an unprecedented pauperization of agricultural area over the last 50 years.

*Riscuri și catastrofe**Victor Sorocovschi*

The structure of agricultural production has been reduced to growing potatoes and flax. The agroterraces with favourable pedoclimactic conditions have been gradually abandoned, and many valuable mountain pastures have been left unused.

Restructuring and re-launching agricultural production is at the moment a primary target for the Giurgeu Depression, having in view that – at least at present – other branches have restricted development possibilities. To achieve this aim requires the sorting out of numerous problems. One of them is the zoning of agricultural production at the micro-regional level, according to topo and microclimatic conditions, with the purpose of diversifying the agricultural structure.

Relying on hard facts observed and measured at meteo –stations in Joseni, Toplița, and Bucin and on data resulting from expeditionary observations at different points of depressions and its versants, as well as on a relatively vast bibliography in the field, we want to present some basic features of the topoclimate of the depression, which we must have in view in envisaging a multifunctional agriculture, with a diversified structure and a solid ecological basis.

2. Main Characteristics of some Climactic Elements

From an agro – meteorologic point of view, those climactic processes and phenomena are of interest, which take place in the inferior atmospherical stratum. They directly influence agricultural activity, while those processes and phenomena, which occur at higher levels have only an indirect role.

2.1. Air Temperature

Air temperature is the main climactic element which decisively contributes to the forming of ecological infrastructure. It also conditions the development of mountain – region activities.

The geographic space of the Giurgeu depression fits into the mountain forester and sub – alpine vegetation. The level of conifers characterizes the depression, above the termic inversion stratum. In the presence of favorably positioned mountain ridges, beech trees can be found, too. Under – alpine vegetation and alpine pastures are rare, they can be found especially where forests have been cleared away for a longer time.

The need for warmth of culture plants differs according to species and different developmental stages. The most favorable termic values for the majority of these plants vary between 20°C - 25°C. In the case of the plants grown in the depression, these values are lower.

Table 1. Optimal temperature and humidity of some different plant species
(After Mandy, 1972).

The plant to be cultivated	Optimal temperature(°C)	Optimal humidity(mm.)
wheat	19,5* - 6,4**	61* - 236**
rye	21,0 - 4,3	114 - 332
autumn barley	21,8 - 5,3	55 - 324
oat	19	140
spring barley	18	100
peas	12	75
beans	19	110
flax	12	70
potatoes	17	180
clover	18	250

* germination period

** vegetative period

In the conditions present in the Giurgeu depression the climatic risk factors which considerably reduce the vegetation period of plants – and, implicitly – give a partial explanation for their weak variety – are hoarfrost and early or late frosts. In the case of hoarfrost plants suffer and their productivity is sensibly reduced. With early and late frosts the crop is in most cases compromised.

Table 2. The date of first and last frost ($t_{\min} \leq 0^{\circ}\text{C}$) at the ground level
Duration of frostless period (1961 – 2000)

Nr. crt.	Station	Last frost			First frost			Frostless period		
		Average date	Earliest date	Latest date	Average date	Earliest date	Latest date	Average duration	Maximum duration	Minimum duration
1.	Toplița	17.Mai	18.04. 1983	25. 06. 1994	17. 09.	14. 08. 1975	14. 10. 1984	123	163	88
2.	Joseni	23.Mai	23. 04. 1996	27. 06. 1993	11. 09.	16. 08. 1994	2. 10. 1962	111	149	70

The effect of frost at the ground level also depends on the vegetation stage in which the plants are.

Table 3. Critical temperature levels (°C, after Maximov)

Culture plants	Critical temperatures	
	germinative period	ripening period
barley	-10, -12	-4
oat	-9, -11	-4
peas	-8, -10	-4
flax	-7	-4
beetroot	-8	-
beans	-1, -2	-2
Potatoes	-2, -3	-3

The multi – annual air temperature average is of 5.4°C at Toplița, 5.0°C at Joseni and 3.6°C at Bucin station. Being a synthetic parameter, yearly and multi – annual average temperature shows the termic potential of different geographical areas. The Giurgeu depression area has a much more reduced termic potential than that of the surrounding areas. From the point of view of projecting both agricultural and non-agricultural activities, the full knowledge of yearly and seasonal – temperature system is much more important.

Table 4. Monthly average air temperatures (1961-2000)

Station Month	Toplița	Joseni	Bucin*
I.	-7.2	-8.0	-5.6
II.	-4.9	-5.6	-5.8
III.	0.0	-0.5	-2.6
IV.	6.1	6.0	-2.8
V.	11.6	11.3	8.6
VI.	14.7	14.5	11.6
VII.	16.1	15.8	13.7
VIII.	15.4	15.1	13.4
IX.	11.3	11.1	8.7
X.	6.0	5.6	4.3
XI.	0.4	0.0	-1.0
XII.	-4.5	-5.0	-4.7
Annual	5.4	5.0	3.6
Ampl.	23.3	23.8	19.5

*1984-2000

Data referring to the frequencies of the days with characteristic temperatures are very important with regard to the carrying out of agricultural activities. To know these climactic parameters is compulsory in projecting agricultural activity as well.

2. 2. Nebulosity and sunshine duration

Nebulosity and sunshine duration are two climactic elements of an utmost agro-ecological importance. Clouds are very important for other climate factors. Their action is obvious – the duration of sunshine decreases. The radiating – caloric balance of active surface and atmosphere is modified. Terrestrial radiation diminishes during nighttime and so does the termic amplitude from day to night. From the point of view of agricultural activity even a reduced nebulosity can have positive effects, especially in April, May and September, October – months when late or early frosts generally occur. The ecologic importance of sunshine duration is well known. From data analysis referring to this parameter, it results that its values – rather low – seriously limit the diversity of agricultural structure.

The yearly average nebulosity and sunshine duration in the Giurgeu depression are 6.5 fractions respectively 1785 hours.

2.3. Precipitations

In the conditions of the Giurgeu depression, neither the quantity, nor the distributions of precipitations are usually risk factors. It is true that the quantitative values are lower than those for the surrounding regions or regions with a similar altitude, but the relatively low evapotranspiration, owing to low termic values and a high frequency of calmness, makes humidity be sufficient for the cultures. From meteorological data in the depression, it results that, especially in the last two decades, the frequency of rainfalls followed by hailstones has been on the increase, and this compromises mainly the potato and vegetable cultures. The negative effect of rainfalls is even greater in the case of the cultures at the base of the mountain ridges. Here quite often the cultures are covered by sediments, which originate in the deforestation of mountain – region territories.

Although it is a relatively small space, the depression benefits in its two sectors (western and eastern), of notably different yearly quantities of precipitations. This is due to the specific interaction of the relief with the general atmospherical circulation. The predominantly west/north-west circulation of air determines the enforced ascension of air masses on the western slopes and their descendance on the eastern slopes. This leads to the dissolution of fronts and adequate cloudy formations. Thus, the left bank of Mureș lies in a “precipitation shadow”, while on the right bank of the Mureș, towards the ridges of the Giurgeu Mountains, precipitations progressively increase. Comparison of data from Joseni and Bucin stations sustain the above statements.

In the timespan between 1961–2000, the number of snowy days is 175 on the average and the snow layer persists around 150 days/year. The first snows can occur during the second decade of September (Joseni, 16.09. 1970), and the last snows occur at the beginning of June (Joseni 14.06. 1980.)

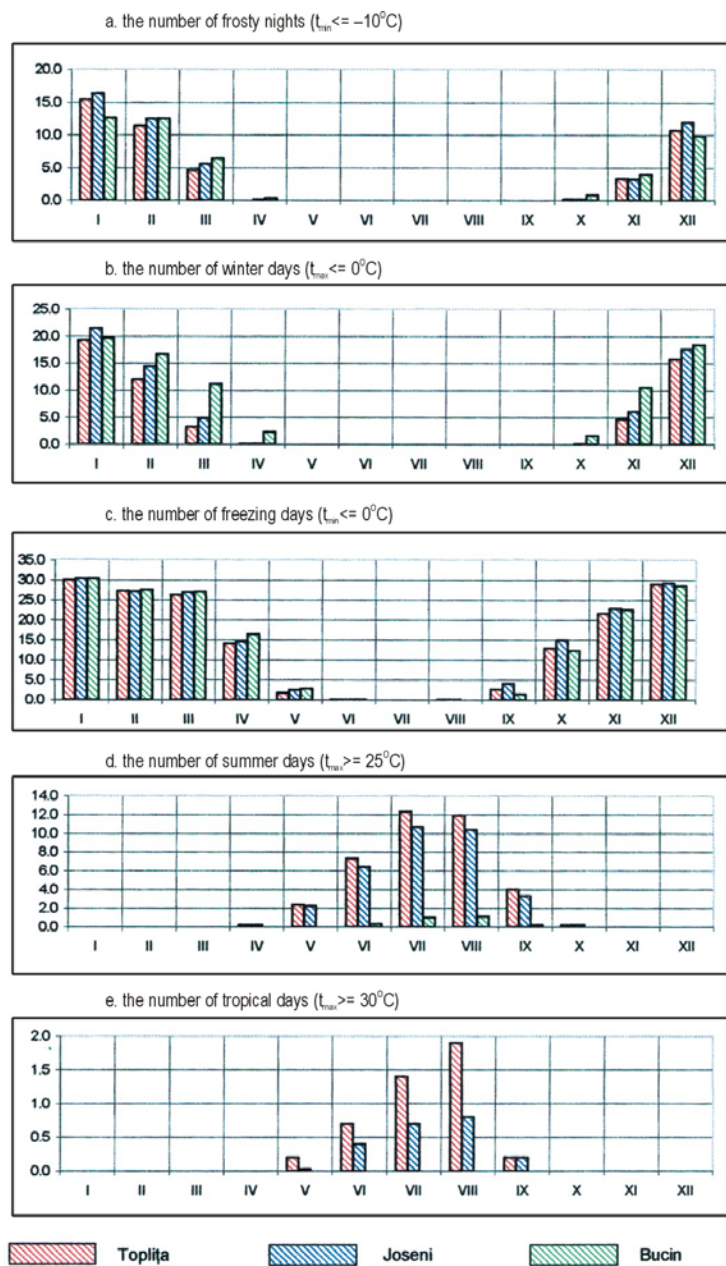


Fig 1. Frequency of days with characteristic temperatures (1961-2000)

Table 5. Average Monthly And Yearly Precipitation Levels (1961-2000)

Crt Nr.	Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
1	Toplita	31.4	27.3	30.9	48.1	68.9	45.3	48.5	64.4	44.2	37.4	33.6	39.1	596.1
2	Joseni	19.8	17.5	21.5	40.7	67.5	80.9	76.6	67.9	43.1	32.3	24.2	25.7	519.7
3	Bucin*	45.8	48.0	53.4	88.3	110.5	120.0	105.8	84.4	80.3	63.1	54.6	78.8	933.4

*1984-2000

3. The role of microclimates

Diversifying agricultural productions structure and that of agricultural productivity in the Giurgeu depression, imposes taking full advantage of the possibilities offered by different favourable microclimates. The half-time and long time agricultural development strategy must envisage a new zonal distribution of cultures based on different criteria, the agroclimatic ones included.

The economico-geographical limit of the depression is approximately situated in the mountain watershed, that mountain-space up to which matter, energy and information exchange can be detected. From the overall surface of 1620 km², 30% is represented by the depression proper and 70% by the mountain ridges and the adjacent mountain frame, which are part of the administrative territory of the settlements in the depression. 59% of the agricultural territories are situated in the afferent mountain region. The majority of these surfaces is represented by the pastures and mountain grazing fields. The arable soil constitutes only a small part of the territory.

From among the microclimates, of interest are the mountain ridge and valley microclimates. The wild – sloped mountain ridges with southern, south-west and south-east exposition, which are exploited at present mostly for their pastures and grazing lands, could be used for field cultures.

The abandoned mountain ridge agro-terraces with a favourable microclimate, must be used for cultivation of wheat, barley and oat, cereals cultivated at present especially on excessively humid and cold soils, at the bottom of the depression. The valleys, especially the downs of Mureș, are inadequate for field cultures, owing to the high frequency of termic inversions occurring right during the vegetative period of the cultures.

REFERENCES

1. Berbecel, O. și colab. (1970), *Agrometeorologie*, Ed. științifică, București
2. Bogdan, O., Niculescu, E. (1999), *Riscurile climatice din România*, Academia Română, Institutul de Geografie, București
3. Ianoș, I. (1994), *Riscul în sistemele geografice*, Studii și cercetări de geografie, tomul XLI, București
4. Moldovan, Fl. (2003), *Fenomene climatice de risc*, Ed. Echinox, Cluj
5. Seer, M. (2004), *Așezările și organizarea spațiului geografic în Depresiunea Giurgeului*, Teză de doctorat (manuscris), Cluj.