

GIS - TECHNOLOGY IN AGROCLIMATIC RESOURCES ESTIMATION IN REPUBLIC OF MOLDOVA

BY

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Abstract: It was possible to evaluate heat and humidification resources with different pretability grade of agricultural development on Republic of Moldova's territory thanks to Geographical Informational Systems as a research instrument. Similar investigations can be elaborated basing on elaboration certain estimation criteria of climate's pretability grade for cultural plants while taking into account their concrete biological particularities.

Key words: model, climate, cartographical modeling, GIS.

1. Introduction

Actual climate changes force humankind to undertake certain measures in order to adapt to them in all branches of human activities, not excluding that of agricultural development. Taking into account Republic of Moldova's agricultural orientation, the estimation of agroclimatic resources in the context of actual modifications of regional climate is a matter of great importance.

Moreover previous evaluations included in Agroclimatic Resources [1] do not cover recent period, and agroclimatic indexes that were used for the basis of agroclimatic regionalization (reflecting heat, humidification and wintering conditions) were as follows: active temperatures sums, Seleaninov hydrothermic coefficient and air temperature's absolute minimum. The possibilities offered by GIS technologies allow expanding the whole specter of agroclimatic indexes thus contributing to specification of spatial distribution areas for heat and humidification resources.

2. Materials and Methods

Actual investigations are based on climate's pretability grade estimation for agriculture's development using the system of grading that supposes a complex study of a great variety of agroclimatic indexes [2]. According to this

qualificatory, the highest grades („4”) are obtained by the most optimal agroclimatic conditions. The most non-pretable climatic resources for certain cultural plants development are graded with lowest points („1”). Thus, according to this system agroclimatic resources are grouped as follows:

- optimal (3,5-4,0)
- favorable (2,9-3,4)
- pretable (2,3-2,8)
- less pretable (1,7-2,2)
- non pretable (1-1,6)

Assuming a climatic favorability grade for certain cultural plants cultivation, we have elaborated estimation criteria for landscape's climatic conditions from Republic of Moldova (Table1) that reflect *heat resources* adequately (frost period duration, non-frost period duration, active temperature's sums ($T > 10^{\circ}\text{C}$), number of days with $T > 5^{\circ}\text{C}$), *humidification resources* (atmospheric precipitations' annual sums, atmospheric precipitations' sums in warm year's period, atmospheric precipitations' sums in cold year's period, Seleaninov's hydrothermic coefficient), and also *wintering conditions* (snow cover maximum height, 10% assurance of year's absolute minimum).

Table 1

Agroclimatical Resources Estimation's Criteria for Republic of Moldova

bal	Min abs	pp anuale (mm)	Suma pp perioada caldă (mm)	Suma pp perioada rece (mm)	CHT	Durata perioadei cu îngheț (zile)	Durata perioadei fără îngheț (zile)	Înălțimea stratului de zăpadă	Suma $t > 10^{\circ}\text{C}$	Nr. de zile cu $t > 5^{\circ}\text{C}$
1	-28 - -26 -26 - -24 -24 - -22	450-500	350-400	85-95		90-95 85-90 80-85	270-175 275-280	9-11	2800-2900	220-225
2	-22 - -20 -20 - -18	500-550	400-450	95-105	0,7-0,9	75-80 65-70	280-285 285-290	11-13 13-15	2900-3100	225-230
3	-18 - -16 -16 - -14	550-650	450-600	105-115	0,9-1,1	65-70	290-295 295-300	15-17 17-19	3100-3200	230-235 235-240
4	-14 - -12 -12 - -10	> 650	> 600	135-145 145-155	1,1-1,8/	60-65	300-305	19-21 21-23	> 3200	240-245 245-250

On the basis of multiple analysis the equations of regression were obtained, which together with Relief's Numeric Model were used as a basis for above mentioned agroclimatical indexes' cartographical modeling. Thus, we elaborated 10 digital maps that were overlaid with the layer of geographical regions and subregions, elaborated by collaborators of Landscapology Laboratory from IEG, and this allowed indentifying agroclimatical resources

with different grade of pretability for agriculture's development in physico-geographical regions (Table2).

Table 2
Climate's Pretability Grade's Estimation in Physico- Geographical Regions (Republic of Moldova)

Regiuni fizico-geografice													
			pp anuale	pp perioada caldă	pp perioada rece	CHT	Perioada cu îngheț	Perioada fără îngheț	Asigurarea a cu 10% a mm abs.	Înălțimea stratului de zăpadă	Suma t >101°C	Nr. de zile cu T>5°C	
1	Podișul Moldovei de Nord	A1	3,5	3,0	3,4	4,0	1,0	1,0	1,0	3,8	1,0	1,4	2,3
2	Podișul Nistrului	A2	3,9	3,0	3,6	4,0	1,0	1,0	1,5	4,0	1,3	1,6	2,5
3	Cîmpia Prutului de Mijloc	A3	3,2	2,8	3,3	3,9	1,5	2,0	1,3	3,7	1,9	2,5	2,6
4	Cîmpia Cîboltei Inferioare	B1	2,5	2,8	2,7	3,9	1,5	2,5	1,2	3,0	1,5	1,9	2,4
5	Dealurile Cînlucurilor	B2	2,8	2,9	2,9	3,9	1,8	3,0	1,6	2,9	2,0	2,4	2,6
6	Podișul Rîbniței	C1	3,0	3,0	3,0	3,8	1,5	1,5	1,5	3,7	2,0	2,5	2,6
7	Podișul Codrilor de Vest	D1	4,0	4,0	4,0	4,0	2,0	2,0	2,8	3,9	2,3	2,8	3,2
8	Podișul Codrilor de Nord	D2	3,9	3,9	3,9	4,0	2,2	2,4	1,9	3,8	2,4	2,7	3,1
9	Podișul Codrilor de Est	D3	3,9	3,9	3,8	4,0	2,6	2,5	2,7	3,9	2,5	2,9	3,3
10	Podișul Codrilor de Sud	D4	3,8	3,9	3,8	4,0	2,8	2,9	3,0	3,9	3,0	3,0	3,4
11	Depresiunea Săratei	E1	2,2	2,2	2,7	2,5	3,5	3,0	3,4	2,5	3,5	3,2	2,9
12	Colinele Tigheciului	E2	2,3	2,8	2,8	2,9	3,7	3,5	3,8	2,4	3,7	3,6	3,2
13	Cîmpia Bîcului Inferior	E3	2,3	2,8	2,8	2,9	3,3	3,0	3,2	2,4	3,4	3,0	2,9
14	Cîmpia Cogîlnicului de Mijloc	E4	2,4	2,9	2,8	3,5	3,2	3,1	3,0	2,6	3,3	3,0	3,0
15	Cîmpia Hadjiderului Superior	F1	2,0	2,0	2,4	2,0	3,5	3,5	3,0	2,5	3,7	3,0	2,8
16	Cîmpia Cahulului	F2	1,8	1,8	2,3	2,8	4,0	3,8	4,0	2,0	4,0	4,0	3,1
17	Cîmpia Ialpușului	F3	2,0	2,0	2,3	2,6	3,8	3,4	3,8	2,4	3,8	3,8	3,0
18	Cîmpia Nistrului Inferior	G1	1,5	1,5	1,5	1,5	3,5	3,5	2,9	1,8	3,5	3,0	2,0

3. Obtained Results

Thus, on the basis of digital maps that reflect humidification resources we state that on Republic's territory annual sums of atmospheric precipitations varies from 450-500 mm (graded by 1 point according to their pretability grade) to more than 650mm (graded by 4 points – the highest grade according to their pretability). Atmospheric precipitation's sums in the warm year's period vary from 350-400 mm (getting 1 point according to their pretability grade) to more than 600 mm (getting 4 points according to their pretability grade); atmospheric precipitation's sums in the cold year's period vary from 85-95 mm to 135mm and are being graded by the same grading system as shown above. Aridity grade estimation from the humidification resources' point of view throughout the year were executed using Seleaninov's hydrothermic coefficient which varies from 0,7-0,9 (getting qualificatory 2) to 1,8 (with qualificatory 4). Snow cover's height optimal for multiannual cultures' wintering on Republic's territory is 19-21cm (Fig.1).

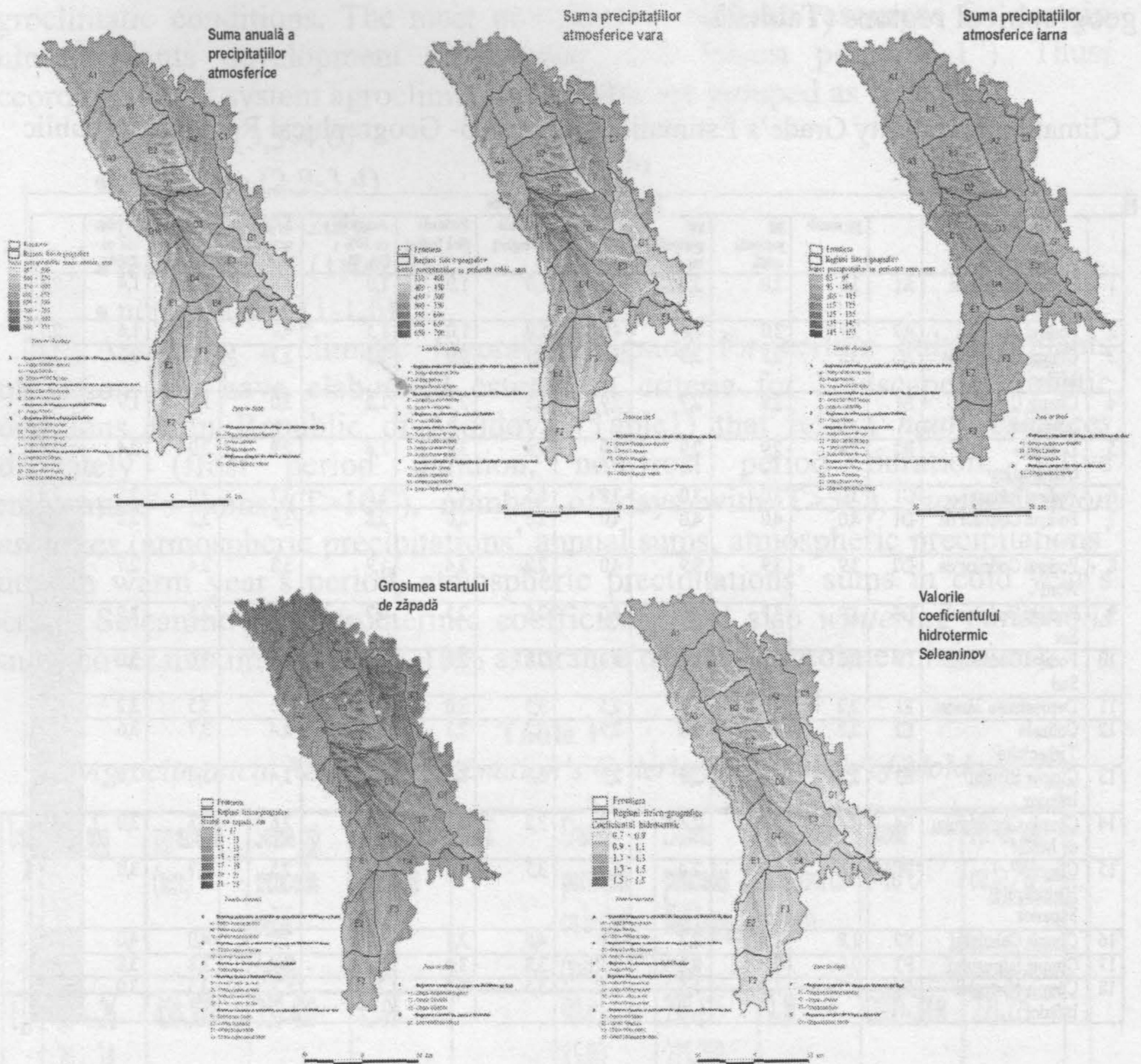


Fig. 1 - Cartographical modeling of agroclimatic indexes that characterize humidification resources for physico-geographical regions in Republic of Moldova.

Cartographical modeling of agroclimatic indexes that characterize heat regime show that, for example that qualificatory 1 corresponds to the biggest number of days with frost (>85 zile) and, on the opposite, qualificatory 4 is attributed to the biggest number of non-frost days (300-305 days) according to the pretability grading system. The lowest thermic values of absolute minimum that are manifested once in 10 years (-22,0-28,0) correspond to grade 1 of pretability, as they will install non-prettable conditions for certain multiannual thermophilic cultural plants' wintering. As well, less prettable grading means installing climatic conditions where the duration of average diurnal temperatures higher than 5°C will be shorter (220-225 days), and active temperature's sums (2800-2900) will be the lowest (Fig.2).

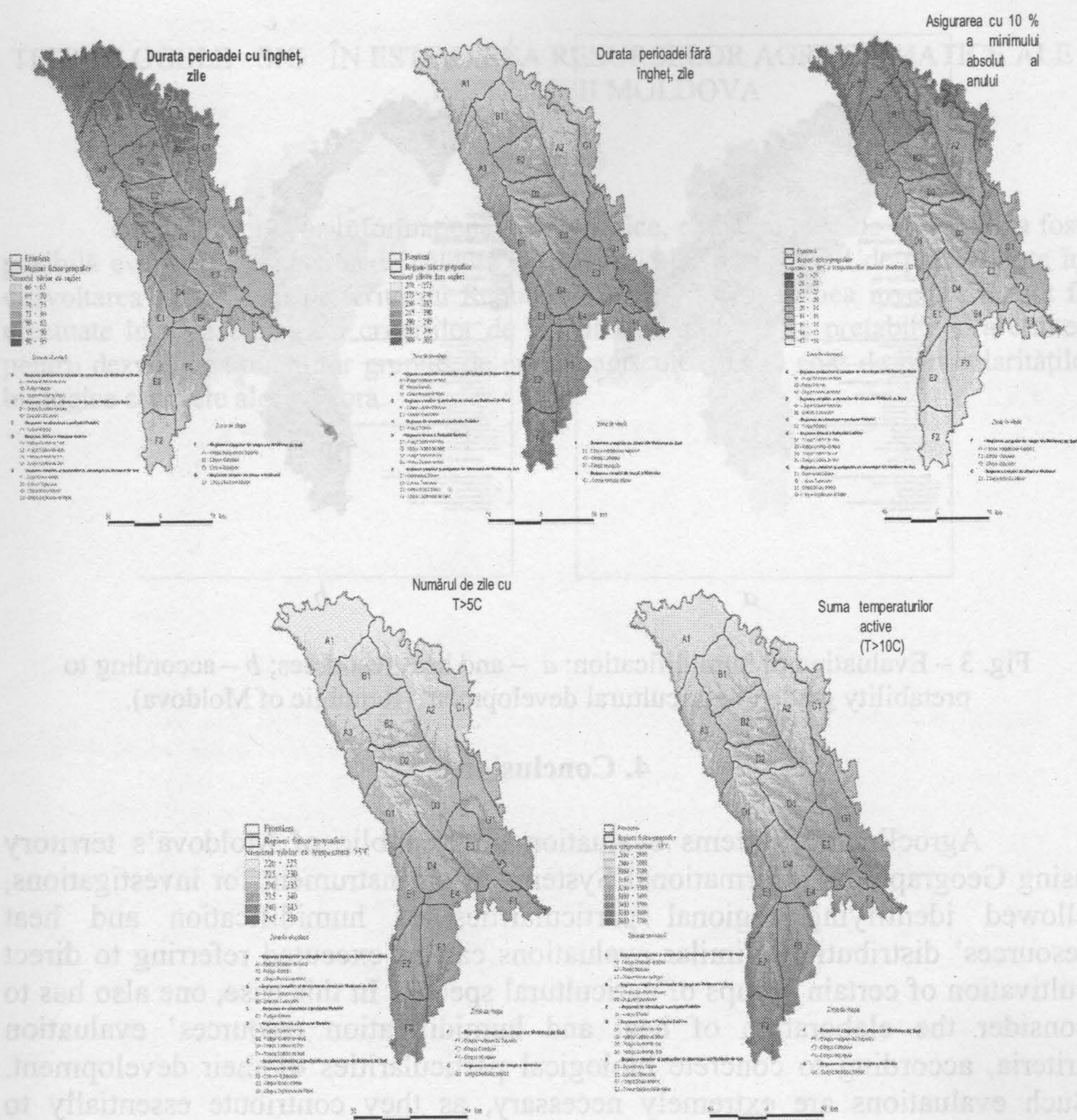


Fig. 2 - Cartographical modeling of agroclimatic indexes that characterize heat resources.

Net estimation for agroclimatic indexes that characterize humidification resources shows us that the most optimal conditions of humidification are in Moldova's North woody moores' plateaus and planes and in woody region of Codry Plateau. Less pretable conditions are in Cahul and Ialpuș planes. Non-prettable climatic conditions from humidification point of view are in Dniester's moore planes' Region (Fig. 3a).

The most optimal conditions from heat resources point of view, on the contrary, are in the Region of moore planes of Moldova's South. The heat resources on Moldova's North plateaus and Dniester plateau are non-prettable. Less prettable are heat resources in Moldova's North moores' planes and hills (Fig. 3b).

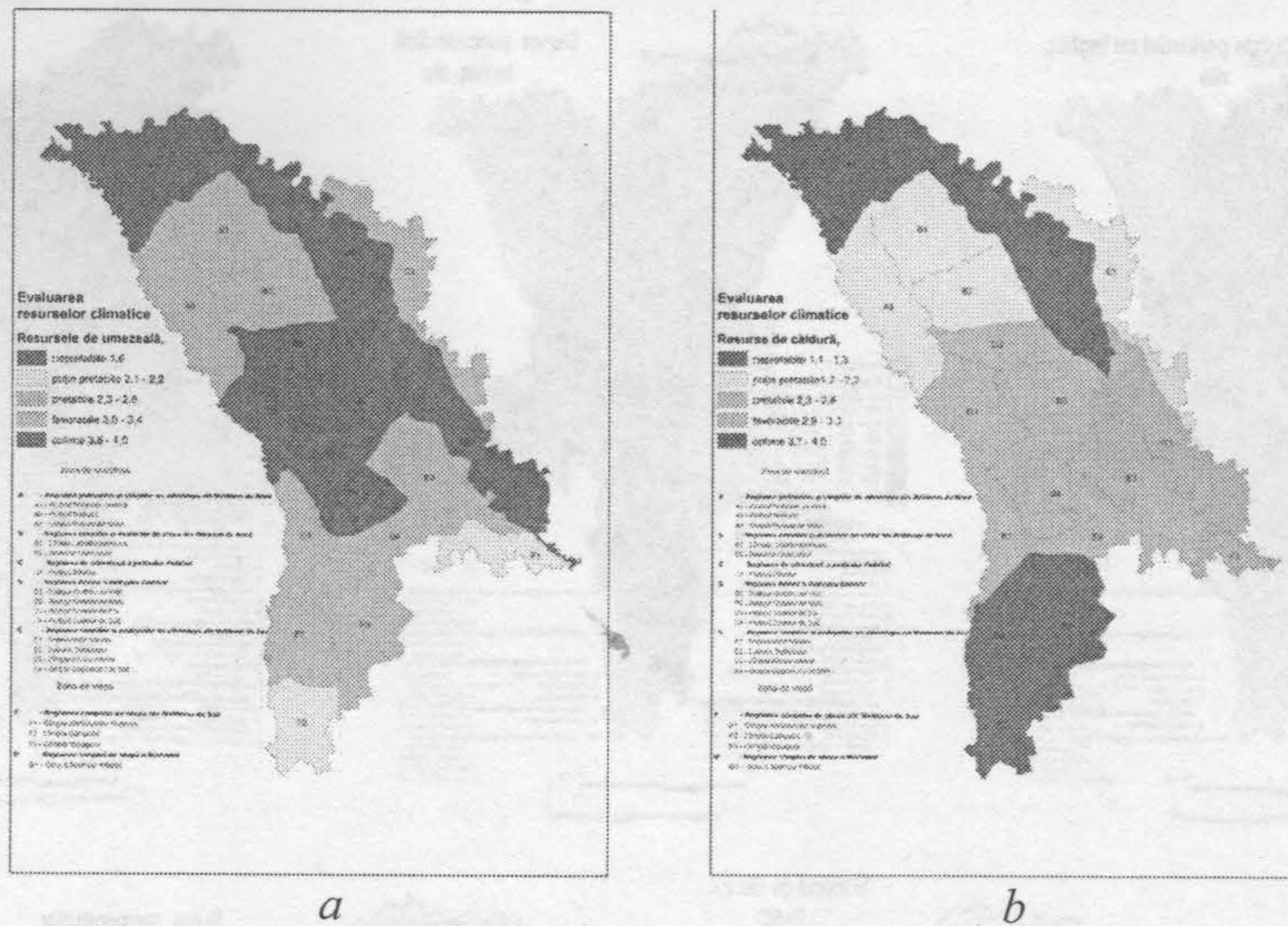


Fig. 3 – Evaluation of humidification: *a* – and heat resources; *b* – according to pretability grade of agricultural development (Republic of Moldova).

4. Conclusions

Agroclimatic systems evaluation on Republic of Moldova's territory using Geographical Informational Systems as an instrument for investigations, allowed identifying regional particularities of humidification and heat resources' distribution. Similar evaluations can be executed referring to direct cultivation of certain groups of agricultural species. In this case, one also has to consider the elaboration of heat and humidification resources' evaluation criteria, according to concrete biological particularities of their development. Such evaluations are extremely necessary, as they contribute essentially to effective usage of actual agroclimatic resources, increasing cultural plants' productivity.

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REFERENCES

1. Агроклиматические ресурсы Молдавской ССР - Л., Гидрометеиздат, С. 198, 1982.
2. Резникова А.В., *Агроэкологическое районирование как метод комплексного учета и оценки природных ресурсов при обосновании хозяйственных решений по рациональному их использованию (на примере юга Красноярского края)*. – В кн.: Материалы III Совещания по прикладной географии. – Иркутск, С. 37-39, 1975.

TEHNOLOGIILE SIG ÎN ESTIMAREA RESURSELOR AGROCLIMATICE ALE REPUBLICII MOLDOVA

(Rezumat)

Grație Sistemelor Informaționale Geografice, ca instrument de cercetare, a fost posibilă evaluarea resurselor de căldură și umezeală cu diferit grad de pretabilitate în dezvoltarea agriculturii pe teritoriul Republicii Moldova. Asemenea investigații pot fi efectuate în baza elaborării criteriilor de evaluare a gradului de pretabilitate a climei pentru dezvoltarea anumitor grupuri de culturi agricole, ținând cont de particularitățile biologice concrete ale acestora.

BY

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Abstract. This paper presents an example of automation in the real estate cadastre of Suceava, based on digital cadastral plan.

Digital cadastral plan is moving to a new form of presentation only numerical cadastral data through the possibilities offered by automatic retrieval of their equipment.

The present work shows the advantages of using the GIS technology (Geographical Information Systems) in the special cadastre by giving an example, in a quarter of a place from Romania in which a territorial informational system was put into practice/implemented. The authors emphasize a few of the GIS exploitation facilities, namely: the query of the database (graphic and descriptive codes) by which one can make some analyses and statistics and can also obtain synthetic information.

Key words: relational database, cadastre automation, explorer database, GIS

1. Introduction

GIS is a powerful set of computer tools for collecting, storing, retrieving at will, and transforming spatial data from the real world for particular set of purposes. LIS is a GIS where that data are for land ownership [1].

When it comes to arranging the territory and the cadastral evidence, the Geographical Information Systems (GIS) also called (LIS) – Land Information Systems, are the most complex informational systems having the capacity to adapt to all the potential beneficiaries requests [3].

Frequently LIS includes parcel based information and cadastral data and generally refer to territorial administrative units strictly delimited, which in our case are: the commune, the town, city of the district and the country's surface, respectively. If such a system is completed with economic, juridical and descriptive data as regards the holders as well as with the manufacturing and