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THE LANDSCAPE POTENTIAL IN SLOVAKIA FROM THE CLIMATE INFLUENCE VIEW POIN ON THE AGRICULTURE

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Le potentiel géoécologique pour l'agriculture au point de vue du climat de la Slovaquie a été calculé au moyen des degrés de convenance des éléments climatiques adéquats de la température et de l'humidité en tant que facteurs optimaux jusqu'à limitant pour l'extension et la récolte des cultures agricoles. On a délimité 7 propriétés potentiels du paysage: avec l'agriculture très bonne, bonne, favorable, moyenne, peu favorable, défavorable et le paysage sans l'agriculture.

In the recent time there is a constantly increasing demand for the material, cultural and sanitary satisfaction of the society, especially in a constant growth of population and its standard of living. This problem corresponds closely with the material resources to satisfy the needs of the society in a natural landscape and with the orientation of natural sciences to the knowlege of antropogeneous influences on the landscape. By the analysis of man's relationship to nature are known the conditions of the landscape to respond to the required economic use, i. e. the landscape potential is known for its use on the one hand, and on the other conditions are determined for achieving a harmony between the demands of the society and the landscape potential. This prevents man's destructive intervention in the landscape, and consequently incorrect results in the economic activity are avoided.

Man's relationship to nature is analyzed in natural landscape — geoecological spaces, because these have independent natural laws and potential with regard to man's economic activity. The landscape potential is composed of partial potentials, representing relationships of individual economic activities to the landscape, or relationships of some one of the landscape element to the activities.

A relatively very close relationship have the climate and the weather to the agriculture, in our country mainly temperatures and moisture [1, 4, 5]. Further on we give a concise analysis of the partial geoecological potential with regard to the relationship between the climate and the agriculture in Slovakia.

With regard to considerable altitudes and by it also to temperature diffe-

rences of landscape in Slovakia with warm to very cold climate, the dominant factor of processes in the landscape of slovakia are the temperatures. For example, from the agricultural view point to such an extent that meanwhile there are widespread also some thermophilous agricultural plants of the subtropic zone, in the cold to very cold climate the agriculture is non existent. In contrast the moisture which in the landscape types of Slovakia is sufficient to very great, the landscape processes are but modified by it. It is why the temperatures in our country determine and limit the extension of agricultural plants, meanwhile the moisture, or other climatic elements determine their crope [4, 5]. They can limit the occurrence of some culture only in some unfavourable, mainly very dry, or very wet year.

For the evalution of relationships between the climate and the agriculture, necessary to know the geoecological potential, we do not use traditionally calculated average values of the climatic elements, by which are expressed only the laws of the course and extension of the elements themselves, characterizing the climate, but we use adequate agroclimatic elements, i. e. climatic elements in a form in which they immediately act on the extension and crope of agricultural plants, in an optimum to limiting way. Similarly, as it is necessary to use optimizing to limiting forms of other elements of the landscape in the research of the landscape potential with regard to other activities. The span of the geoecological potential is determined by the values of the span between the optimum and the limit of the climate influence on the agriculture.

Adequate climatic elements, by which we determine the geoecological potential with regard to the agriculture in Slovakia, are in accordance with the agroclimatic analysis [1, 4].

1. The sum of temperatures of the period with the average daily temperatures above 10 °C (further on the sum of temperatures),
2. the number of days without frost,
3. average winter absolute minimums of temperatures,
4. annual amount of rainfalls.

The best indicator of assurance of the occurrence of agricultural plants by temperature is the sum of temperatures. In warm plain landscape of Slovakia, where the sum amounts to about 3000 to 3200 °C, in our country is optimum for the occurrence of our most exacting thermophilous plants. In contrast in a cold to very cold mountainous landscape of Slovakia in above sea level altitudes about 850 to 950 m the temperature sum below 1600 ° limits all the agricultural plants.

Another temperature indicator of the geoecological potential with regard to agriculture is the length of frost-free period within the vegetation of all, but mainly thermophilous cultures. The greatest number of frost-free days in Slovakia has the landscape of warm plains and the least number of days the landscape of some mederately cold and mainly cold basins and slopes in the mountain ranges. The length of a frost-free period in Slovakia decreases in general from West to East as a result of increasing continentality which, in spite of sufficiently high summer temperatures, has an unfavourable influence on the occurrence and fenological character of culture. Approximately similar spatial extension as have temperatures in a warm half-year, have in the landscapes of Slovakia also average winter absolute minimums, con-

Table 1

Temperature sum in °C	Degree
>3000	1
3000—2800	2
2799—2600	3
2599—2400	4
2399—2200	5
2199—2000	6
1999—1600	7
<1600	8

centrated mainly in moderately cold and cold basins. They are important in freezing autumn sowing and fruit trees.

In our country the crope of agricultural plants in the geoecological potential is ensured by the moisture which we expressed by an annual amount of rainfalls. The highest cropes are in a warm plain landscape with annual rainfalls between about 560—600 mm, which are optimum. With increasing rainfalls in a basin and montane landscape the cropes decrease, meanwhile of an important influence on the crope are also the decreasing temperatures with the altitude above sea level. The greatest rainfalls on the upper limit occurrence of our agriculture amount to 1000 mm annually which affect the cropes of cultures very unfavourably. At low temperatures and a very small evapotranspiration there is a detrimental excess of moisture. Increasing rainfalls decrease the crops of agricultural plants also through their influence by worsening the quality of the agricultural soils. Landscape with annual rainfalls less than 560 mm, occurring in the central, climatically the driest part of the Danubian Plain, as a result of increased drought in some of the years lacks optimum moisture and partially also soil conditions from the agricultural, but also landscape view point.

Determination of the landscape potential for agriculture according to similarly evaluated climate is made by the system arrangement of the suitability of climate for the agriculture according to degrees. The given adequate climatic elements from groups of degrees, arranged according to the extent of positive or negative influence on the agriculture. Positive influences of clima-

Table 2

Frost-free days	Degree
>180	1
180—165	2
164—150	3
149—135	4
134—120	5
<120	6

Table 3

Average of winter absolute minimums of temperatures in °C	Degree
> —18	1
—18 — —20	2
—20 — —22	3
—22 — —24	4
< —24	5

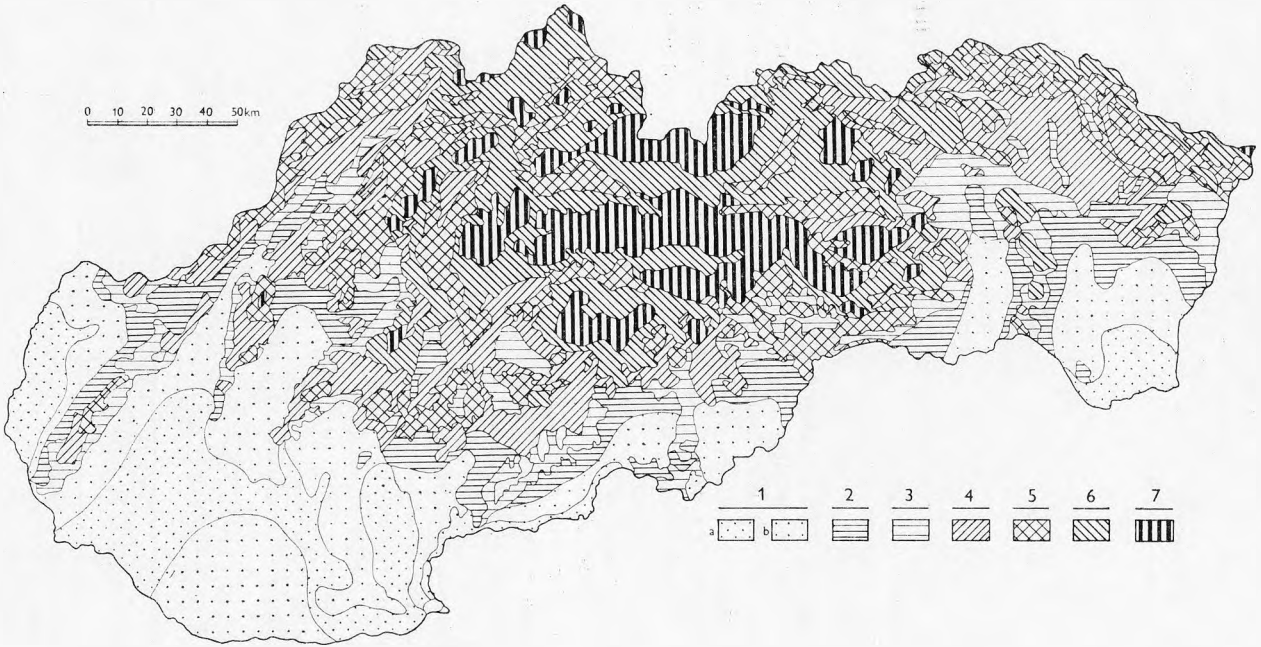
tic elements have low degree numbers and negative influence have high numbers. They are given in Tab. 1 to 4.

The sums of temperature form a group composed of 8. degrees, which has a uniform progression. It has an accelerated progression between 6 and 7 situated in an articulated cold landscape. Annual rainfalls in a 7-degree group have in the second degree beside a regular progression of rainfalls 600—650 mm also a value below 560 mm, because a decreased moisture in this case decreases the agricultural quality of the climate to degree number 2. Frost-free period representing a 6-degree group and average winter absolute minimums, representing a 5-degree group, have a regular arithmetical progression.

The climatic values and degrees of their groups are represented in the analytical map of Slovakia by the method of isolines and by their means in the surfaces of the geoecological types of Slovakia on scale 1:500 000. Between the results of climatic quality on the maps of isolines and on the geoecological map there is a close spatial correspondence. By the method of summing the heights of degrees represented in the surfaces of geoecological types we obtained relatively different symbols, the so-called potential marks, by means of which we determined the geoecological potential of Slovakia from the agricultural point of view. According to the span of values of the marks on surfaces we grouped the geoecological types into seven degrees of potential. In these delineated geoecological spaces have not only all the elements of the landscape, but also the potential values of the landscape a spatial homogenity which as a rule is the biggest in the centre of the area, or it has a mosaical or zonal arrangement.

Table 4

Annual rainfalls in mm	Degree
560—600	1
560—<560 and	2
600—650	3
650—700	4
700—800	5
800—850	6
850—900	7
900—1000	



Map 1. The geoecological potential from the point of view of the influence of climate on the agriculture.
Potential qualities of the landscape:

1 — very good, *a)* expressively, *b)* predominantly, *2* — good, *3* — favourable, *4* — average, *5* — little favourable, *6* — unfavourable, *7* — without agriculture.

The delimitation of the geoecological potential with regard to the influence of climate on the agriculture, represented on the map, is as follows.

1 LANDSCAPE WITH A VERY GOOD AGRICULTURE

It has the sum of potential symbols between 4—8. The type occurs in plain of lowland and in the landscape of hilly countries and flood plains and partially in the hilly countries of the south slovakian basins. According to the sum of temperatures as a dominant differentiation factor it is divided into:

1.1 Subtype markingly very good, situated in the southern warmest part of the plain landscape in lowland and on the table part of the loess hilly countries, where are cultivated our most exacting thermophilous plants. The sum of temperatures of this subtype has a span about 3000—3200 °C.

1.2 Subtype predominantly very good, extended on a less warm higher part of the plain hilly countries and south slovakian basins, and in the warm part of the Krupinská plateau. The sum of temperatures in this subtype is within the range of about 2800—3000 °C. The subtype occurs further in the flat driest central part of the Danubian Plain. In hilly countries are grown with a lesser ensurance only early variety of thermophilous agricultural products, meanwhile in the driest flat are grown our most exacting thermophilous products, however, the local soils must be irrigated in dry summers.

2 LANDSCAPE WITH A GOOD AGRICULTURE

The sum of potential symbols in this landscape has an extent of 9 to 13. The type is represented in the highest marginal hilly country parts of warm basins (Trenčianska, Ipeľská, Lučenská, Rimavská and Košická) and in the flood plain and the lowest hilly country part of moderately warm basins (Ilavská, Hornonitrianska, Žiarska, Rožňavská), Humenné valley and Krupina plateau. The sum of temperatures within the range of 2600—2800 °C gives the landscape less suitable conditions for growing thermophilous products, but suitable for sugar-beet, wheat and berley.

3 LANDSCAPE WITH A FAVOURABLE AGRICULTURE

The potential sums in this type have a range of 14—16. The type is widespread in the higher parts of the hilly countries of moderately warm basins (Ilavská, Hornonitrianska, Žiarska, Rožňavská) and as a result of low winter temperature also the lowest part of the Zvolenská and Pliešovská basins, then in the ridge of the Beskyds uplands (apart from the Humenné valley), in the low plateau uplands of the Šarišské highlands and in the Topla and Ondava floodplains. At the sum of temperatures of 2400—2600 °C, as well as at winter absolute minimums between —20 to —22 °C and average 150—165 days without frost, ends in this landscape the culture of thermophilous products, predominate cereals and potatoes and begin conditions for less warm exacting cereals (autumn rye).

4 LANDSCAPE WITH AN AVERAGE AGRICULTURE

This landscape is distinguished by the range of potential symbols between 17—18. It is representend in the central part of moderately cold basins (Žilinská, Turčianska, Hornádska), in the higher hilly country part of the Zvolen basin and in the highlands at above sea levels about 540—700 m. The sum of temperatures in the range between 2200—2400 °C, then average winter absolute minimums, acquiring an always greater importance and with the range of —21 to —22 °, as well as 135—150 days without frost in the vegetation period, limit in this landscape growing of wheat and enable the occurrence of oats, potatoes and autumn rye.

5 LANDSCAPE WITH LITTLE FAVOURABLE AGRICULTURE

The potential symbols in this type have the sum of 19—20. The type is represented by flat parts of the cold basins (Liptovská, Popradská, Oravská), the central part of the Hron valley and highlands. Their sum of temperatures ranges within about 2000—2200 °C, average winter absolute temperature minimums decrease to —22 °C, then in the landscape there occur 135—150 days without frost in the vegetation period, as well as about 850—1000 mm of annual rainfalls. These climatic conditions limit the occurrence of autumn rye, however, enable the growth of flax, potatoes, forage and the occurrence of pastures.

6 LANDSCAPE WITH UNFAVOURABLE AGRICULTURE

The potential sums in this type have a range of 21—22. It represents a higher highland part of the cold basins (Liptovská, Popradská), the eastern part of the Hron valley, as well as the cold hilly countries to above sea levels about 850—950 m. The sum of temperatures about 1600—2000 °C at average winter absolute temperature minimums between —22 to —24 °C then about only 120—135 days without frost and about 850—1000 mm of annual rainfalls, predispose this landscape as a marginal area for the agriculture, where is partially cultivated the flax, potatoes and oats with the predominance of pastures and meadows. The very low temperatures (the sum of temperatures 1600 °C) in the highest positions of the landscape limit completely the agriculture. In the Western Slovakia at the altitude about 850 m, in the Eastern Slovakia at 950 m above sea level.

7 LANDSCAPE WITHOUT AGRICULTURE

The potential symbols in this type have the sum above 22. Above all the sum of temperatures below 1600 °C, as well as a very short period without froest, falling below 120 days, form conditions without agriculture, which is limited by the thermic causes.

REFERENCES

1. KURPELOVÁ, M., COUFAL, L., ČULÍK, J.: Agroklimatické podmienky ČSSR. Bratislava 1975. — 2. MANNSFELD, K.: Zur Kennzeichnung von Gebietseinheiten nach ihren Potentialeigenschaften. Petermanns Geogr. Mitteil., *1*, 1978. — 3. MAZÚR, E., KRIPPEL, E,. PORUBSKÝ, A., TARÁBEK, K.: Geoekologické — prírodné krajinné typy. Bratislava 1977. — 4. TARÁBEK, K.: Výnosnosť kukurice na Slovensku vo vzťahu ku klimatickým pomerom. Geogr. Čas., *5*, 1—2, 1953. — 5. TARÁBEK, K.: Klimatické podmienky pre agrotechnické termíny siatia silážnej kukurice na Slovensku. Geogr. Čas., *14*, 3, 1962. — 6. TARÁBEK, K.: Delimitácia klímy Slovenska z hľadiska poľnohospodárstva a niektoré aspekty jeho zmien (v tlači).

Koloman Tarábek

POTENCIÁL KRAJINY NA SLOVENSKU Z HĽADISKA VPLYVU KLÍMY NA POĽNOHOSPODÁRSTVO

Zvýšená požiadavka na materiálne, kultúrne a zdravotné uspokojenie ľudskej spoločnosti rieši sa analýzou vzťahu človeka k prírode. Časť tejto analýzy je v poznaní potenciálu krajiny pre požadované ekonomické aktivity. Analýza sa rieši v geoekologických priestoroch, ktoré majú samostatné prírodné zákonitosti a potenciál vzhľadom na aktivity. V práci sa zaoberáme riešením geoekologického potenciálu pre poľnohospodárstvo z klimatického hľadiska.

Pre evaluáciu vzťahu medzi klímou a poľnohospodárstvom, potrebného pre poznanie geoekologického potenciálu, miesto tradične vypočítaných priemerných hodnôt klimatických prvkov, vyjadrujúcich samotnú klímu, používame edekvátne klimatické prvky, ktoré ako optimálne až limitujúce faktory bezprostredne vplývajú na rozšírenie a úrodu poľnohospodárskych kultúr. Sú to teplotné sumy, počet dní bez mrazu, priemerné zimné absolútne minimá teplôt a ročné množstvo zrážok. Patenciál sa vypočítava systémom stupňovitého usporiadania vhodnosti klímy pre poľnohospodárstvo. Rozpätie súm stupňov vhodnosti v geoekologických priestoroch je rozdelené do tzv. potenciálových znakov, ktorých na Slovensku rozlišujeme 7. Sú to: 1. krajina s veľmi dobrým poľnohospodárstvom s potenciálovými znakmi 4—8, 2. krajina s dobrým poľnohospodárstvom so znakmi 9—13, 3. krajina s priaznivým poľnohospodárstvom so znakmi 14—16, 4. krajina s priemerným poľnohospodárstvom so znakmi 17—18, 5. krajina s málo priaznivým poľnohospodárstvom so znakmi 19—20, 6. krajina s nepriaznivým poľnohospodárstvom so znakmi 21—22, 7. krajina bez poľnohospodárstva s potenciálovými znakmi nad 22.

Mapa 1. Geoekologický potenciál z hľadiska vplyvu klímy na poľnohospodárstvo. Potenciálna vlastnosť krajiny: *1* — veľmi dobrá, *a*) výrazne, *b*) prevažne, *2* — dobrá, *3* — priaznivá, *4* — priemerná, *5* — málo priaznivá, *6* — nepriaznivá, *7* — bez poľnohospodárstva.

Tabuľka 1. Teplotná suma v °C.

Tabuľka 2. Bezmrazové dni.

Tabuľka 3. Priemer zimných absolútnych miním teplôt.

Tabuľka 4. Ročné zrážky v mm.