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THE ENERGETIC MODEL OF THE TRANSYLVANIAN PLAIN

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ABSTRACT. — In building up the energetic model of this geographical unit, we started by analyzing the energetic input and output. An excess energy balance resulted, which was turned into agricultural production caloric units. By extrapolating to national scale, it results that a production similar to that of the Transyvanian Plains can feed a population of 60—70 million inhabitants.

The Transilvanian Plain, extended on an area of 4.076 km² has a population of 268,493 inhabitants, that is 66 inhabitants per km².

With time, this region has undergone successive changes, marked by constantly amplified anthropic actions. Thus, the natural constituents have been, partly, substitued by the secondary ones in order to meet the requirements demanded by the human community and by the adjoining regions. The initial landscape of forests and natural pasture lands has gradually grown into an agrarian landscape, continuously invigorated structurally and qualitatively.

The natural phenomena characteristic of the plain take place along the lines of the same laws linked to the spatial distribution of energy at average latitudes and altitudes of 400—600 m. Within this space a „play" of the quantitative positioning of the structural components that define the plain has taken place, a phenomenon which tended to eliminate the primary components (the forest and the pasture land). This change has been forced upon as a, results of demografis expansion and tehnological development.

In the process of temporospatial evolution there is a first stage of anarchic development, when the region meets the requirements of isolated and somewhat weak commands from the interior.

The second stage is that of interferences, when interior „interests" join with external ones. To the equilibrium of interests corresponds an equilibrium of the spatial components.

The third stage, the present one, consists in gradually transferring the „points of command" from the interior to the external part of this area, phenomenon which has lead to the changing of the plain from a space of convergent interests to one with centrifugal functions and evolution, in the widest meaning of the word. The present structure of the way the land is used and the diminished demographic density, partially prove this fact (Table 1).

To demonstrate the evolution of this region as a „sistem of effluence" may be achieved by constructing a model of energetic balance.

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Table 1

S.T.ha	Agricultural ha	Forestry ha	Other areas
400760	326080	41575	39944
100%	80%	10.2%	9.8%

arable	pasture	hayfields	orchards	vineyards
220919	64400	27310	8968	4483
54.2%	15.8%	6.7%	2.2%	1.1%

As any open system, the space of the plain is subject to the exchange of substance and energy.

The energetic input in the system is achieved in two ways:

— the natural way, precipitations and solar radiation, which have been stable on the scale of historical time;

— the artificial way, by means of chemical energy released in the system, using chemical fertilizens and fuel convertible in energy used in mechanisation.

Out of the three sources of energy in the system, precipitations and chemical energy can be subject to man's regulating effect.

The question of achieving energetic balance on the territorial level, mostly on a large scale, cannot be easily solved due to the lack of experimental data as well as to the difficult way in which conversion of energy is achieved in agricultural systems.

This means that the question of an energetic model is from the outset a generalisation. Actually the theory of modelling asks for such an approach.

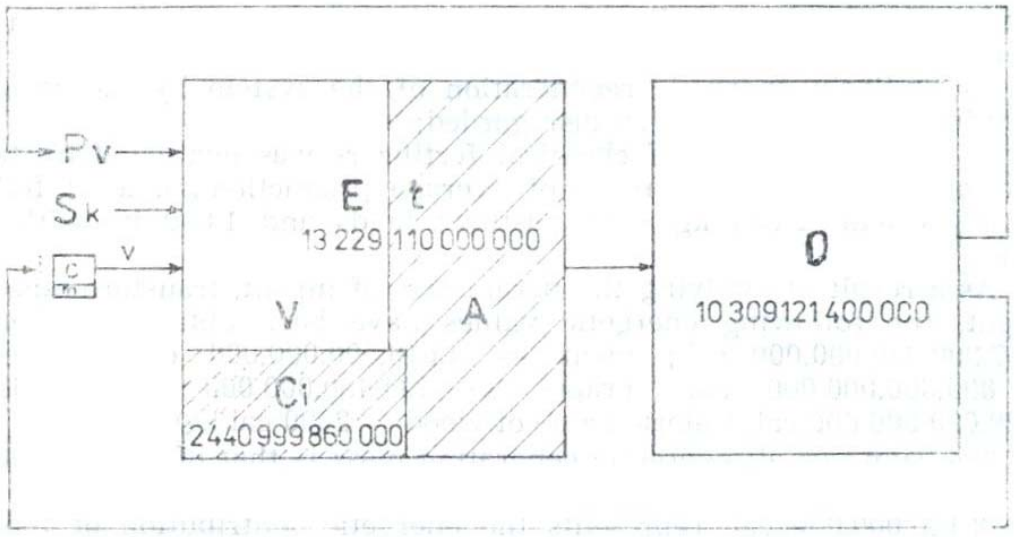

Fig. 1. The Transylvanian Plain. The Model of Energetic Balance. V — energetic value of vegetal production; A — energetic value of animal production; P — precipitations; S — solar radiation; i — input; C — chemical fertilizers; m — fuel for mechanisation; Et — transformed energy; Ci — internal consumption; O — output; v — variable · k — — constant.

In building up a *balance-model* the following parameters have been used as starting point:

— the present structure of the uses of the land;

— the hypothesis of cultivating wheat on the whole arable land, with an average production of 2,200 kg/ha;

— the productivity of the natural pastures is that of 6,000 kg/ha green fodder, per year;

— the productivity of biomass of the hayfields is that of 10,000 kg/ha;

— orchard area planted with apple-trees, with a production of 10,000 kg/ha;

— production of grapes — 2,000 kg/ha;

— forest regeneration within the plain — 0,5 mc/ha/year;

— 1 tractor to 75 ha arable land;

— fuel consumption tractor/year = 10 tons;

— relative demographic stability. (The extent of metane gas extraction on the plain has been not taken into account).

Starting from these premises, the following quantities of biomass is produced on the plain: 486,022 t wheat; 386,400 t biomass on the natural pastures; 273,100 t biomass on the natural hayfields; 8,9680 t apples; 8,966 t grapes.

Specific energy has been considered in units of measuring heat (calories) as it follows: 1 kg wheat = 1,500 cal.; 1 kg apples = 1,000 cal.; 1 kg grapes = 1,500 cal.

The energy produced by green fodder was determined by transforming into meat, with a caloric value of 3,500 cal./kg (conversion rate 1:50);

— with wheat production the possible losses of energy by conversion, as a result of indirect consumption have not been taken into account;

— similarly energetic regeneration of the system by means of organic fertilizers has also been disregarded;

— the contribution of chemical fertilizers was evaluated by taking into consideration the increase of average production/ha, as it follows: 400 kg wheat, 2,000 kg with pastures lands and 1,000 kg with hayfields.

As a result of applying the parameters of inprut, transformation and output, the following energetic values have been obtained: wheat = = 7,290,330,000,000 cal.; meat = 4,616,500,000,000 cal.; apples = = 896,800,000,000 cal.; grapes = 134,490,000,000 cal.; wood = = 29,099,000,000 cal. (caloric value of wood = 2000 cal/kg).

The sum per all energetic generating mass is that of 13229110000000 cal. If the generated energetic value of wood is subtracted, then 12,938,120,000,000 cal. represents the energetic contribution of food.

The input of the chemical energy of teh system inferred from the increase of production in crops is of 1.434.791.000.000 cal.

If we add the energy of fuels used in mechanisation, which is of 4,348,000,000 cal., an energetic input of 1,478,270,000,000 cal. results

(8,000 cal./l Diesel oil). Primary energy (solar and precipitation) has been not quantified, as transformed in crops, it results indirectly.

The input — internal consumption — output balance is the following: i = 1,478,270,000,000 cal.; Et = 12,938,120,000,000 cal.; Ci = = 2,440,999,860,000 cal. (inhabitants on the plain per one year); I = = 10,309,121,400,000 cal.

Under the hypothesis that 2500 cal./person represents the average daily food consumption, it means that there is the possibility of feeding 1,148,493 people. Starting from the premise that the area of the plain represents the 50th part of the national territory, and that the productivity could be similar to that of the plain, by extrapolating this to the entire area of the country, it means that feeding needs of a population of 57,424,650 inhabitants would be met.

In case that internal consumption is taken into consideration, too, the feeding possibilities of the entire territory would meet the needs of 70,849,300 inhabitants.

On the Transylvanian Plain 65% (174,520 people) out of the country's population woork in agriculture. The energetic balance shows that one field labourer can support 8 people as far as food is concerned.

This survey leads to two essential aspects:

— the Transylvanian Plain is undergoing a stage of systemic evolution, in which the „output" is predominant;

— the agriculture of this region, demands, in the future, intensive actions and a fair process of retroaction in order to raise the living standard within the region.

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