

## CONDITIONS AND CAUSES IN THE EVOLUTION OF AGRICULTURE IN THE GIURGEU DEPRESSION

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**Key words:** Giurgeu basin, climate, agriculture, sustainable development, eco-tourism.

**Cuvinte cheie:** Depresiunea Giurgeu, climă, agricultură, dezvoltare durabilă, agroturism.

### **ABSTRACT:**

The climatic factors and the configuration of the topography in the Giurgeu - Ciuc intramontane basin, situated at the contact between the Mesozoic crystalline and the Neogene-Quaternary volcanic rocks cause variables on the medium and long-term practice of agriculture in the hearth of Giurgeu basin. Continuous adaptation of the population to restrictive circumstances imposed by natural factors have created the preconditions for preserving some traditions that fall within the specifics of ecological farming, based on application / implementation of the basic principles of sustainable development, long before their consecration, at theoretical and conceptual level, on a global scale.

The cold climate specific to high mountains which last over 6 months per year, the persistence of temperature inversions as factors of natural risk have determined a passive adaptation of the inhabitants to these environmental conditions. The rural society from this basin, on the whole, has some specific features based on its seniority and traditions and, most often, the relationship being sustainable, reinforced by habits and interests of the community. Traditions, with reference to the way the land is parceled and used, to the organization and improvement of the agricultural land, are reflected in all daily activities and also in the spiritual life.

Continuous adaptation of the population to restrictive circumstances imposed by natural factors have created the preconditions for preserving some traditions that fall within the specifics of ecological farming, based on application / implementation of the basic principles of sustainable development, long before their consecration, at theoretical and conceptual level, on a global scale. Functional analysis of the medium and long term development of rural communities in Giurgeu Depression has as main target the strengthening of agricultural traditions and the superior development of characteristic values of the local landscape by the development of eco-tourism. We tried to identify how the factitive, as a principle of research in geographical sciences, determines certain facts, while the conditional ensures the permanent habitation and maintenance of local traditions. From a factitive and conditional point of view, we sought to identify the features that characterize best the rural landscape of Giurgeu basin, which, in its most part, is profitable to a satisfactory level. We consider that the analysis of the way in which every local community fits into the announced policies of The National Strategy for the Sustainable Development by 2030 and in The National Strategy for the Development of Ecotourism - in project, but with deadline till the end of 2009 - will make all the factors of decision more responsible on the immediate priority, and will determine the rethinking of the strategic goals of local development in the spirit of the community values.

## **1. The rural landscape in Giurgeu basin. Theoretical and practical aspects**

The rural society, on the whole, takes some specific features based on its age and tradition, most often, the relationship being sustainable, reinforced by habits and interests. The traditions make reference to the way the lands are parceled and used, to the organization and improvement of the agricultural land (*Cândeș, 2005*). These traditions with ancestral value are preserved in almost all parts of the Giurgeu basin, being the result of the circumstances of environmental factors that put their permanent fingerprint on the rural landscape: the negative relief of the basin, the climate, the excess of moisture in the meadows and the development and use of soil, this one being resulted in time by the property over land. Economic, cultural development, the communications development led to the intensification of relations between individuals and between social groups, strengthening the consciousness of unity and the common destiny (*Donișă, 1977*), without diminishing the differences, the local or regional particularities which are kept in time and are visible in the elements of the anthropogenic landscape. The geological systemic analysis, for spatial planning should be seen as an added value in the evolution of rural landscape and not as a trend towards standardization, increased by the forced equal distribution of resources (including the use of the land) or elitist at the functional level. The facile access of as many people as possible in those facilities (*Ungureanu, 2005*) can provide the functionality of the natural or derivative landscape.

The Giurgeu basin, in terms of taxonomy of natural landscapes, could be classified in the type of agricultural and forest landscapes with anthropogenic influence. (*Dinșă, 2005*). The rural and mining landscape (*Teaciu, 1983* quoted by *Dinșă, 2005*) are the most visible changes in the extensive natural landscape of the basin, having similarities, in some places, with the features of anthropogenic-natural landscape. In that place, where the human intervention for covering "injuries" produced by the operation, sometimes aggressive, of natural resources (deforestation, mines, quarries, etc.), by ecological reconstruction, there is an attempt to restore the pre-existing natural landscape. We can conclude that we are dealing with an integrated rural landscape in the Giurgeu basin, resulting from the interactions of biotic, abiotic and anthropogenic factors. The factors that bring disturbance and put their footprint on some small territorial units have been corrected by the environmental self control and positive anthropogenic intervention by the practical intensification of sustainable development principles. Results in improving the environmental quality and implicitly, the value of the current landscape, including the rural areas, gives, on the short and medium term, opportunities to positive multiply and even a specific know-how, best practices (examples the quarries for rocks used in construction from Suseni, Voșlobeni, Ciurani; the sterile areas in Jolotca Török, Belcina valley).

The pseudo gleying process of soil has an impact mainly on the evolution of the soil profile at surface, where a temporary web of water from rainfall or groundwater is formed over a layer of clay. During the periods with excess of

moisture, in spring and summer, reactions of reduction occur and lead to partial mobilization of iron and manganese, which precipitate in rust stains and little round accumulation, after water withdrawal, through re-oxidation (Lupaşcu, 1998).

The gleying process is installed under the influence of freatic water, very reducing. The iron accumulates itself in the profile base, under the form of ferrous carbonate or complex salts. In the acid environment, the iron is transformed into white glei by lateral drain. During the summer, with dry weather (July-August), on the background of decreasing the hydrostatic level, the capillary lifting of iron, which precipitates as rust spots on the oxido-reduction horizon, takes place. Some of gleisols are associated with the formation of alluvial humus (on the border of eutrofe / oligotrofe rabies), but these have a secondary role in the development of minerals in the soil profile. Practically, the actual land for agriculture without restrictions has a reduced area, and extends especially on bridges of dry terraces and inter-fluvial areas in the middle of depression.

## **2. Climatic risk and its implications in agricultural landscape**

The climatic phenomena of risk, occurring in the cold season of the year, have a common feature, namely the existence of negative temperatures they generate and maintain (Bogdan, Niculescu, 1999), in the areas of geographical disruption in the Eastern Carpathians (Mihailescu, 1968) and, have conditional effects on the activity of population and on rural landscape.

The climatic risk caused by negative temperatures (average monthly values, minimum media) that influences the socio-economic activities, is manifested through:

- air pollution in the hearth of the basin;
- reducing the period of growing crops;
- trigger some morphological processes, resulting in an adaptation and specialization of human activities;
- the use of land;
- the discomfort brought to the population by temperature inversions by daily and seasonal tone; bioclimatic effects.

The average annual days with temperature inversions from 60 to 80 days, practically explains the specific causality of intramountain negative relief and even the vulnerability of some economic activities.

The climatic risk caused by negative temperatures (average monthly values, minimum media) that influences the socio-economic activities, reducing the season of growing crop, allowing the triggering of some morphological processes, resulting in an adaptation and specialization of some human activities, the use of land and a constant adaptation of humans to the restrictive environmental conditions as described.

Taking into consideration the taxonomy of atmospheric and fluid phenomena at risk (by Grecu, 2004), in the phenomena of slow impact and release on population (and / or the environment) the temperature inversions and their related phenomena such as fog and cold were identified.

The negative form of relief that fosters ongoing accumulation, sedimentation and stagnation of cold air during anticyclonic weather, is the cause of massive cooling that is installed in the low part of the depressions. Thus, the temperature inversions are produced in association with other hydrometeorological phenomena, especially with fog, which causes the installation of the so called "Lakes of Coldness" (Bogdan, 1978), vertically stratified and, which can be seen from the altitude of the mountain peaks from the border of Giurgeu depression, such as Pângarați (Bicaz), Creangă (Borszek) or Bucin pass. The cooling and ultra cooling of the air is continuous, by associating the most favourable conditions with persistent snow and nocturnal radiation, forming and maintaining the radiation inversions.

Radiation fog which is formed during the temperature inversions in Giurgeu Depression includes two types:

- low radiation fog, at night, which usually does not exceed 100 meters thick, and which is being dispersed a few hours after sunrise, or due to wind speeds of 4-6 m / s, but this happens very rarely;
- high radiation fog, vertically developed from low radiation fog, which can reach thicknesses of 200-800 m., due to maintenance of the temperature for a longer period (days and weeks in a row). The duration of the inversion layer "adjusts" the intensification of radiation cooling constant increasing of its thickness, as well as, a greater stability of fog.

The farming risk, caused by climate of the depression, was solved by adapting the planted varieties with high and average sensitivity to the freezing of the soil. There are cultivated plants with a short period of growing from varieties resistant to the stringent environmental conditions in the mountains depression. In the hearth of the basin on dry land, there are small plots planted with spring wheat, rye, potato, cabbage and fodder beet.

On the slopes with eastern or southern orientation from the northern and western sections of the basin, there are cultivated fruit trees (plum-41%, apple-35%, pear-15%, sour cherry -7%), extensively, at an altitude that is usually above the average of the layer of inversion.

### **3. The vulnerability of soils and the impact on farming practices**

The analysis of the vulnerability and implicitly the risk of soil is related by its cause to other factors and direct or derived components of the social-geographic-system that can generate and trigger, alone or in combination, adverse effects on the geographic soil carpet.

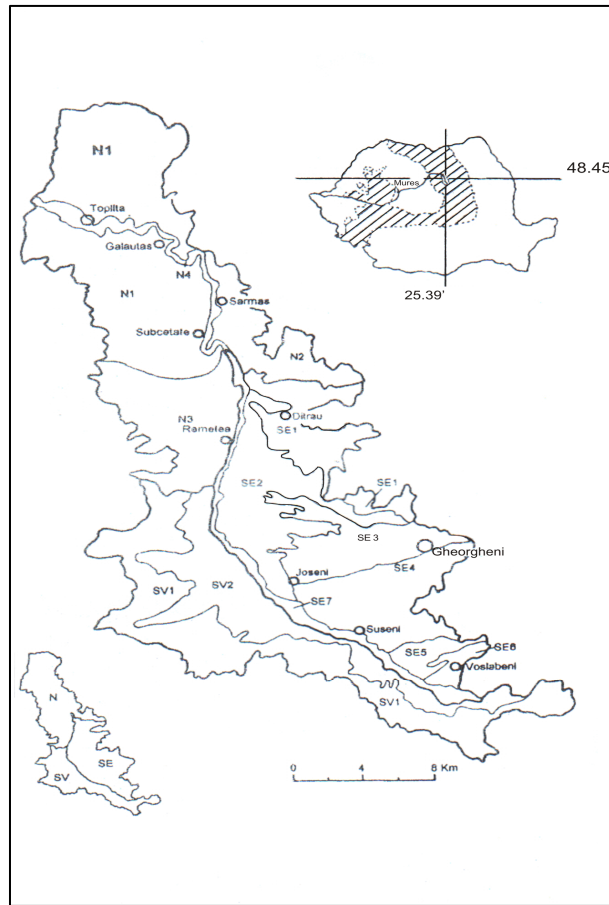
The map of soils in the Giurgeu depression made by the Perepeliță and Băcăințan, in 1998, includes three sub-sectors, redefined by the new system of classification, SRTS, in 2008:

- The northern sub-sector, of Luvisol (white luvisol and luvic brown soil), on a relief predominantly of terraces and glacis;
- The south-eastern sub-sector, Luvosol (luvic brown soil) and Gleisol (gleic soil) developed on a relief predominated by proluvial cones and alluvial of Mures;
- The south-western, of Luvosol (white luvisol) and Preluvosol (argiloiluvial brown soils), developed on proluvial cones and glacis.

The first two sub-sectors occupies the most part of the basin (about 80%). The main limiting factors of a soil and which , can be considered as factors of vulnerability of the soil in the Giurgeu depression are:

- Hydromorphy / excess of moisture;
- acidification;
- low volume of edafic.

To these factors of risk on soil we add the limitations and risks imposed by climatic and fluid factors. Hydromorphy is the most obvious of the soil process, by the existence of a reducing environment due to excess of moisture. This process causes the reduction and degradation of local freely Fe through a permanent or temporary saturation of soil pore with reducing water.



**Fig.1.** The map of regional soil in the Giurgeu depression.

**Table 1.** The legend of the figure 1.

<b>Symbol Sector / subsector</b>	<b>The name of the sector / subsector</b>	<b>The specific geomorphology</b>
N	The northern sector of the white luvisols and of the brown luvical soils	Terraces and glacis
N1	The subsector of the white pseudo-gleycal luvisols and of the brown pseudo-gleycal luvical soils	Terraces and glacis
N2	The subsector of the brown pseudo-gleycal luvical soils and of the brown illuvial clay pseudo-gleycal soils	Idem
N3	The subsector of the brown pseudo-gleycal soils and of the white pseudo-gleycal luvisols	Idem
N4 SE	The subsector of the swampy gleycal soils and of the alluvial gleized soils	Mures's meadow
	The south-eastern subsector of the luvical brown soils and of the gleycal soils	Pro-illuvial cones and alluvial meadows
SE1	The subsector of the brown pseudo-gleycal luvical soils	Old pro-illuvial cones and terraces
SE2	The subsector of the swampy gleycal soils and of the typical alluvial soils	Alluvial meadow
SE3	The subsector of the gleized black acid soils and of the brown eumezobasic mollic-lytic soils	Alluvial meadow old pro-illuvial cone
SE4	The subsector of the brown pseudo-gleycal luvical soils with a B melanic horizon and of the brown clay-illuvial mollic –pseudo-gleycal soils.	Recent pro-illuvial cones
SE5	The subsector of the brown eumezobasic typical soils.	Recent pro-illuvial cones
SE6	The subsector of the white pseudo-gleycal luvical soils and of the brown pseudo-gleycal luvical soils	Old pro-illuvial cones
SE7	The subsector of swampy gleycal soils	Mures's meadow
SV	The south-western sector of the white luvical soils and of the brown clay-illuvial soils	Pro-illuvial cones and glacis
SV1	The subsector of the white pseudo-gleycal luvical soils	Glacis
SV2	The subsector of the brown clay-illuvial soils and of the brown eumezobasic andic soils	Recent pro-illuvial cones

#### 4. The vulnerability of soil towards the human activity

1. The replacement of natural vegetation (forests, meadows) with cultivated plants on the denuded ploughing land is vulnerable in the first years after deforestation, when some areas located on slopes (round and narrow peaks) were affected by surface erosion (Voşlobeni, Lazar, Suseni, Subcetate). After the soil cultivation, some structural changes take place, manifested by a decrease of the humus content and its nutrients (N, P, K), the level of decomposing the organic matter of the soil has become stronger, intensifying the water loss of the plants, etc.

2. The management of organic and mineral fertilizers and its amendments. The use of mineral fertilizer with N and K, for extended periods, determined the increasing of the acidity of soil. Amendments cause a profound, long and complex change of the characteristics of soil. Simultaneous administration of the amendments and organic fertilizers helps to the improvement of the condition of acid soils, the conditions of reactions and the regime of nutritional elements for a long period of time.

3. Work for the improvement of the fluid in the soil.

a) The work of draining and drainage on the surface of the soil had positive effects on the soils affected by the accumulation of the water from the rain on the west of the basin, on the terraces and on accumulative-eroded piedmonts. Works correctly performed favored the aerobic processes, by improving the aero-fluid regime. In the situations in which these works for the improvement of the fluid in the soil are not correctly carried, there is a substantial disorder in the soil (Voşlobeni, Ciumani, Suseni).

b) works of draining and drainage in the depth of the soil on organic soils (histosols) have resulted in areas where work has been done in excess, a process of excessive drainage, followed by the drying of peat and sometimes its accidental ignition (Ditrău).

c) works of settlement and embankment for Mures river and its tributaries (Toplița river upstream the locality with the same name, Belchia / Bekeny, east of the Gheorgheni city, on the valleys: Ditrău, Jolotca, Ciumani, Remetea) contributed to the removal from the flood of some important areas for agriculture and forestry. Works to strengthen the slopes, the concave banks and the oscillations of level of rivers and brooks with high slope are other proposed measures for improving the fluid in the soil and giving back the land for agriculture.

d) *Case Study: Voşlobeni village.* Through anthropogenic intervention, lateral drainage and organic amendments related to land, about 12 ha of land with excess moisture from the west of Voşlobeni were converted into agricultural land, and by monoculture with cabbage (a locally adapted variety) it gave the place the toponymical word, "Curechiște" (= *curechi*, meaning cabbage, a word specific to Moldavia, from where the current inhabitants of the village came, Voşlobeni). In this area, the soil is predominantly alluvial with cores of organic soil on the west. The analyzed profile soil, of average depth, was probably formed on the basis of transported sediments by The Fountain River, which crosses the area. Its water

temperature is higher compared to the temperature of the Mures and even in the most freezing winters does not freeze, maintaining a microclimate which keeps the grass green all the time. Here's how the adaptation of crops to specific environmental conditions shows us a higher profitability and specificity for a piece of land.

## 5. Conclusions

**1. Conditional**, meaning that is subject of conditions, includes all conditions of adapting people to the complexity of micro-climatic and soil conditions. Thus, the practiced extensive agriculture, focused mainly on animal husbandry, has ensured continuity of living and gives the rural landscape, through agricultural practice, the main shape of opening and maintaining the landscape and we believe it creates a favorable premise to a potential rural tourism that could generate significant mutations in the landscape of the depression. Favorable conditions for the cultivation of potatoes have been in decline (there are specialists, who correlates this with the global change of the climate and the expansion of pests), but not as much as in the case of sugar beet and textile flax, which are cultivated only on small areas because of the low market demand and low economic profitability.

**2. Factive**, concerning the cause, making reference to the expansion of agricultural land in the swampy plain areas and the conversion of some swamps into agricultural land. The causes that determine the effect on the natural landscape of swamps is anthropogenic, by expanding the settlements in the flooded meadow of Mures river, once with the increasing of the number of population and their permanent settlement in the hearth of the basin, as well. Basically, throughout the twentieth century, numerous settlements were established and developed through the draining, embankment or combustion on the slopes of the depression. Historical documents show how agricultural causality led to the development of other related activities, for the exchange of products such as wood and its derivatives, using the some small local wooden boats.

From the 17<sup>th</sup> XX till the 20<sup>th</sup> century, floating these small local wooden boats became the most profitable economic activity for most people in the Giurgeu basin with a higher impact in the development of the rural landscape.

**3. Conditional and factive** in the evolution of rural landscape in Giurgeu depression is reflected in the new configuration and delineation of the ownership over land, and determined in the last 20 years qualitative and quantitative changes on the land fund, including its ownership, with emphasis on animal husbandry and cultivated meadows, and secondly, on specific crops conditioned by natural factors (barley, rye, potato), and isolated on fruit trees grown extensively on the slopes and high terraces of the depression. (Ditrău, Ciumani, Voşlobeni, Subcetate, Toplița and in the neighborhood).

The treatment of soils with organic fertilizers is the main guarantee of obtaining a satisfactory crop and is always practiced in the region, and this is how the preconditions for the development of organic farming are created.



**4. And one last example that reinforces the conclusions;** the factory of industrialization the milk from Remetea, situated in the middle of Giurgeu basin, built during the communist period and put in service in October 1954, is profitable and goes through a continuous process of modernization, being a factor of stability of the rural and technologic landscape in the region and perpetuating the economic traditions throughout centuries. Please note that the invasion of Armenian population who arrived in the 20th century in the Giurgeu depression (Gheorgheni-Remetea area at the beginning) has determined also the bringing of the first milk cows in Voralberg and Tirol, Austria(1903). The *Melik* family was the one who wanted the domestication of Austrian cows from the Alps in Giurgeu basin for a higher economic, advantageousness, but also by taking into consideration a study of their adaptation, by comparing the environmental conditions. The factory from Remetea collects the milk from 25 localities from over 5,000 households in the territory, from the whole Ciuc - Giurgeu depression and even over the mountains (Praid, Corund, Tulghes, Bilbor). This company ensured in 2002, almost a quarter (24.5%) of the necessary budget in the food industry from Harghita county, and represented 31.5% of total in the milk industry in that county.

**5. The analysis of ways** in which national policies contained in the National Strategy for Sustainable Development by the year 2030 and National Strategy for the Development of Ecotourism another project with deadline by the end of year 2009 may be implemented by each community that has as main priorities the sustainable development and eco-tourism.

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