MODELS OF EVOLUTION OF ARTIFICIAL AGRICULTURAL TERRACES ON THE RIGHT SIDE OF CRISUL REPEDE RIVER (ORADEA-ALESD AREA, BIHOR COUNTY)

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Abstract:
The terraced slopes on the right side of Crisul Repede river represents one of the most active former agricultural areas of Bihor county. The evolution of the terraced slope is controlled by different factors such as geology, structure, degree of vegetation cover, type of vegetation but the most important controll factor is the human intervention which could turn the evolution of the slopes towards completely new directions and implicitly towards new forms.

Key words: agricultural terraces, slope evolution, type of use, direction of evolution

INTRODUCTION

The directions of evolution of the terraced slopes turn, in the last years, to completely new direction taking into account the general and specific conditions. The geological and structural conditions represents one of the key factors (Istocescu D., Ionescu Gh.,1970) involved in the evolution of the terraced slopes but other factors, involving the human factor prove to be decisive, (Berindei I.O**.,** 1977) mainly in the last years (Ionită I**.,** 2000). The importance of the human factor turn to be a decisive one, leading the evolution to new directions. In this case, the ignorance and misunderstanding of natural processes, of control factors, and the general pattern of land property prove to have negative consequences.

MATERIALS AND METHODS

There have been few attempts to examine the variability of some controll factors on different type of terraces on the area. The methodology adopted in the study was designed to examine some of these controll factors . Following the shape and form of the terraces, soil texture, slope angle, geomorphological processes, we tried to find the most significant direction of evolution of the terraced slopes.

RESULTS AND DISCUSSIONS

The evolution of this type of slope is characteristic for the area situated between Oradea and Alesd, on the righrt side of the Crisul Repede area. In the evolution of this slope type one could notice three different stages:

a. the evolution of the slope in the stage of intensive agricultural use
b. the evolution of the slope after the abandonment of the agricultural use of the terraces
c. the evolution of the slope after the distruction of agricultural terraces

a. The evolution of the slope in the stage of intensive agricultural use corresponds to the intensive agricultural use of the terraced slopes for agricultural purposes. After 1989, mostly, thise systems of terraces were abandoned, destroyed but there are still areas where the terraces were preserved and still offers a great stability for the slopes.

The evolution is performed on different sectors, the agricultural terraces being geomorphological thresholds conditioning the evolution of the slopes. The use of the terraced slopes was mainly orchards or vineyards. Within a slope one could distinguish two elements:

- a horizontal surface, in length of about 5 m, analogous to treads of fluvial terraces
- the batter, in length of about 2 m, analogous to risers of the fluvial terraces

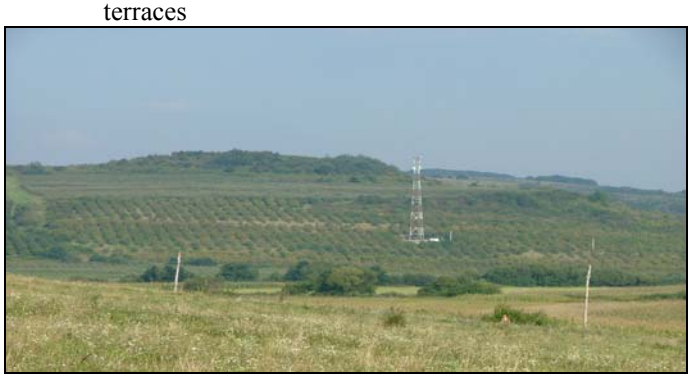

Fig. 1 Terraced slope with active agricultural use in Alesd area (source, Nistor S.)

In the case of this type of slope one could observe two situations: agricultural terraces with a present agricultural use, these terrace systems being preserved and thus offers an efficient anti-erosional protection and a low dynamic evolution (see fig. 1). The most characteristic area in which agricultural terraces are still present is around Alesd and Lugasul de Jos localities.

A particular way of appearance of these agricultural terraces is around Oradea, on the right side of Crisul repede river. In this area the system of terraces were abandoned, there is no longer an agricultural use of the slope, but the existence of the former orchards, now abandoned, still give a relatively high protection of the slope in terms of low morphodynamic.

Fig. 2 Terraced slope with abandoned orchard next to Oradea (source, Nistor S.)

This stability of the slope in a relative one, the slope being in an intermediate evolution state, between an human-controlled evolution and a natural one of the terraced slope.

b. The evolution of the slope after the abandonment of the agricultural use of the terraces. The evolution of the slope is conditioned by two situations:

- the evolution of the slope under the conditions of the existence of agricultural terraces but without the existence of the initial agricultural vegetation (orchards and vineyards)
- the evolution of the slope under the conditions of distruction of agricultural terraces

Under the condition of the existence of agricultural terraces, one could notice an differential evolution of the slope, the terraced area itself and the evolution of the slope situatead between the terraced slope and the interfluve. In the first case, the evolution of the agricultural terraces takes place under the condition of existence of three subsystems: the subsystem of the riser of the terrace, the subsystem of the tread of the terrace and the subsystem between the terraces and the interfluve.

Fig. 3 The riser and tread subsystems of an agricultural terrace next to Uileac village (source, Nistor S.)

The riser of the terrace evolves under the impact of geomorphological processes such as small dimension landslides. The dimension of the scarp is 0.30-0.50 m and the mean volume of slided mass is 0.75 – 1.25 m^3 (Nistor S, 2006). From the moment of disappearance of the uniformity of the tread, under the conditions of implicit destruction of vegetation cover, the water-controlled processes plays an important role, under favorable geological conditions (sandy clays, sands, slightly consolidated marls).

The tread of the terrace is characterized by a relative stability, its evolution being defined mostly by accumulation processes of the materials from the riser of the upper terrace. The dynamic of these subsystems is directly dependent on the evolution of the upper subsystems, the disequilibrium which appears here directly conditioning the evolution of these subsystems.

The evolution of the slope subsystems situated between the agricultural terraces and the interfluve, completely differs, both in terms of dynamic and in terms of characteristic processes. If in the case of former subsystems the processes were small as

dimensions and dynamic, in this case the processes are big in dimension and are very active (see fig. 4).

Fig. 4 Landslides affecting the space between the terraces and the interfluve village (source, Nistor S.)

The land slides are the main processes which condition the evolution and the dynamic of these subsystems. From dimensional point of view tha scarp of these landslides are relatively small (2.5-4 m) but very dynamic. The speed of evolution is directly liked by the value, character and the seasonal repartition of the rainfalls

c. The evolution of the slope after the distruction of agricultural terraces, completely redefine the natural processes, the evolution of the slope being completely different compared with the evolution of previous subsystems. The evolution of the slope takes place under the condition of appearance of larger systems, in which the energy, geological, structural conditions are completely different. Is relatively difficult to predict the future evolution of these slopes taking into account that the period of time passed since the moment of completely destruction of the slope is relatively small, in terms of geomorphological time.

The evolution of the terraced slope goes through different stages:

- the destruction of the agricultural terrace through plowing. In this case the slope has an relatively degree of protection (see fig. 5)
- the appearance of vertical erosion with an irreversible direction of evolution (see fig. 6)

Fig. 5 Destroyed agricultural terraces next to Uileac village (source, Nistor S)

The structural and geological conditions very soon lead the slope to a very rapid turn in terms of specific geomorphological processes: if in case of stage one the dominant geomorphologic process is given by sheet erosion, in the second stage of evolution the dominant processes are the vertical erosional processes - rill, gully erosion (see fig 6.). In this case the geomorphological processes are irreversible and the most important consequence of the change of the dominant process in the impossibility of any agricultural use. In terms of slope evolution this stage means the change of conditional factor, from a factor controlled by the presence of the agricultural terrace, to a factor controlled by the base level of the slope.

Fig. 6 Slope affected by gully rill and gully erosion next to Alesd (source, Nistor S.)

CONCLUSIONS

The future of the agricultural terraces in the study area is an uncertain one because of several factors: the most important one is the poverty of the owners who are not able to preserve and maintain functionally the terraces, the lack of knowledge in preserving the terraces-, the small dimension of agricultural plots this resulting numerous owners, with different financial potential, the distrust of the owners towards any kind of collective

associative forms a.s.o. Probably the most important factor is the financial one taking into account that a typical terrace costs including seeding range between $2.50 to 3.25 per meter of length. Average total costs for a terrace system with suitable outlets are $250 per hectare (http://www.gov.pe.ca). Even if these calculation are relatively, taking into account the surface area initially covered by agricultural terraces, the possibility of restoration seems to be very reduce.

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