

CHANGES IN LAND USE IN THE LAST CENTURY IN THE SOUTH PART OF MOLDOVA PLAIN

Ionuț MINEA¹

E-mail: ionutminea1979@yahoo.com

Abstract

In the last century in the south part of Moldavian Plain took place major land use changes, with irreversible repercussions on the geographical landscape. This changes can be evidenced by the success of the use of topographic maps at different scales, published in 1894, 1961, 1984, or of orthophotoplans made in 1970 or 2005. At the same time the use of specific programs related to GIS analysis (such as specialized software and ArcGIS or TNT Mips v. 6.9) allowed us to extract quantitative values of surfaces with different land uses. Correlating the data obtained and using classification system proposed by European environment Agency through the Corine Land Cover programme (in 2000 and 2006) for the southern part of Moldavian plain seen a series of changes in land use imposed by numerous legislative and socio-economic modifications. The most spectacular changes were observed in the occupied areas with wetland vegetations. These areas in the last century was occupied with parts of villages or towns (most of them in Iasi area) or with lakes or agricultural lands.

Key words: changes, land use, areas, Corine Land Cover, Moldova Plain

The studied area overlap to the south part of Moldova Plain with belongs to Bahlui drainage basin. In Romania, this basin is situated in the north-eastern part, covering an area with central-north-eastern position in the Moldavian Plateau, entering the hydrographic system of Middle Prut River (fig 1). In this idea, Bahlui is a right tributary of Jijia, in its sector of common floodplain with Prut. This situation gives Bahlui basin a certain genetic, evolutionary and hydrological autonomy in relation to those of Jijia and Prut, manifested during time and in the mode of water resources' formation and evolution, as well as in the role of the human factor in their management.

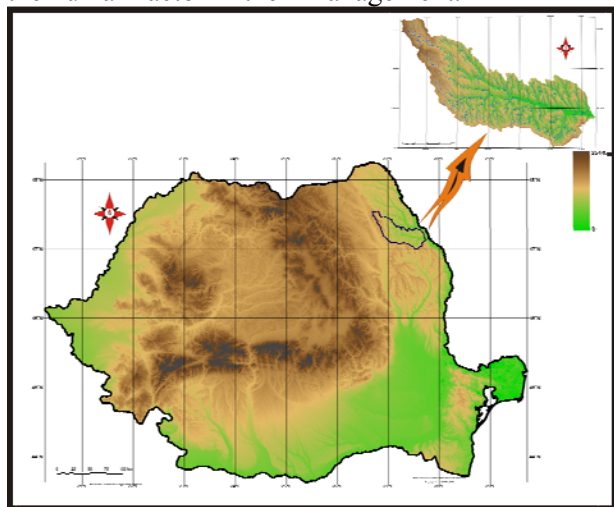


Figure 1 Location of the research area

Being considered one of the most human-managed basins in the country, 71% hydrotechnically managed (Savin Nicoleta, 1998), Bahlui basin may be considered as model in the efficient management of water resources in the eastern part of Romania, model that may be extended at the level of the entire space between Prut and Siret. In this sense we had in view the analysis of the land use changes in the last century and the human factor's impact above

MATERIAL AND METHOD

In the present study we tried to evidence the changes brought in the structure of land use in the last century. In this idea we departed from the topographic maps scale 1:50.000, edition 1894, or 1:25.000 edition 1961 or 1984, as well as from a series of Landsat TM satellite images from 1970 and 2000 or orthophotoplans made in 1970 or 2005. Also we applied the methodology proposed by European Environmental Agency in the analysis of terrain utilization in the Corine Land Cover projects (with certain modifications), identifying 10 main classes of land use (villages, industrial areas, non-irrigated arable land, complex cultivation patterns, vineyards, fruit trees plantation, forests, pastures, lakes and wetlands). The classes identified have been extrapolated to the entire succession of topographic maps, satellite images and aerial photos.

¹ „Al. I. Cuza” University of Iași

The statistical data obtained regarding the distribution of areas with different land use at certain time intervals allowed for a spatio-temporal analysis at the level of the entire basin. At the same time have been obtained a series of correlations between the different land use categories, terrain altitude and slope declivity, from which conclusions were drawn regarding land use improvement.

RESULTS AND DISCUSSIONS

The socio-economic activities have led to changes in the geographical landscape from Bahlui basin through the process of terrains' agricultural use, through the action of development and industrialization of the human settlements and transportation' networks. The changes induced in the landscape influence directly or indirectly river discharge and the hydrologic balance at the level of the entire basin.

The agricultural use of the terrains produced most and the profoundest changes in the landscape of Bahlui basin. Analyzing the structure of the land use fund at the level of year 1894 (Fig. 2) we see that arable terrains occupy over 45.000 ha of the basin, followed by forests (also 45.000 ha) and wetlands (32500 ha). A low percentage is detained by industrial areas (15 ha) and by lakes (862 ha).

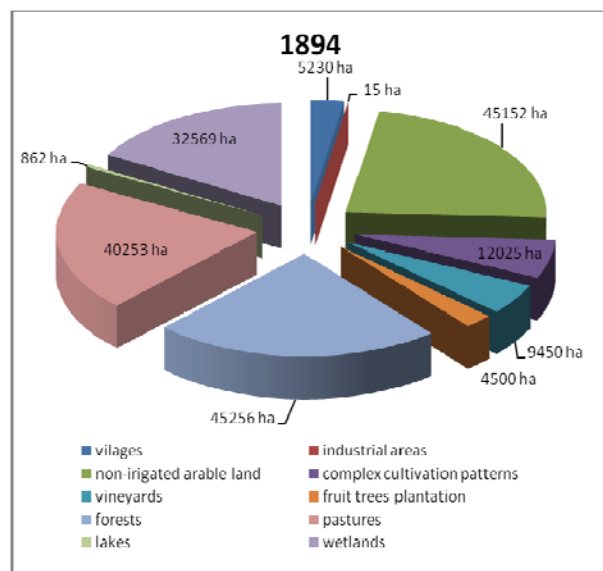


Figure 2 Main land use types in Bahlui drainage basin in 1894

In 1961 the surface occupied with villages increased to 13000 ha and the surfaces used like non-irrigated arable land increased to 62.000 ha. Also we see a modification in surfaces occupied by lakes with increase to 2000 ha (fig. 2). This is the effect of two stages of social and economical evolution in this part of the country.

In the realization of these accumulations (lakes) may be distinguished in the 20th century

two main periods. In the first half of the century the number of aquatic surfaces was reduced under the effect of the 1921 agrarian reform (that led to the disappearance of ponds, especially of the small ones, due to a bad management, most of them being clogged or even drained so as to increase arable surface). From the second half of the century (after 1955), their number increased significantly due to the process of territorial planning applied at the level of the entire basin. In this sense, existent aquatic units have been „reconditioned”, most of them being transformed into reservoirs, each of them having built a dam of impermeable materials (clay).

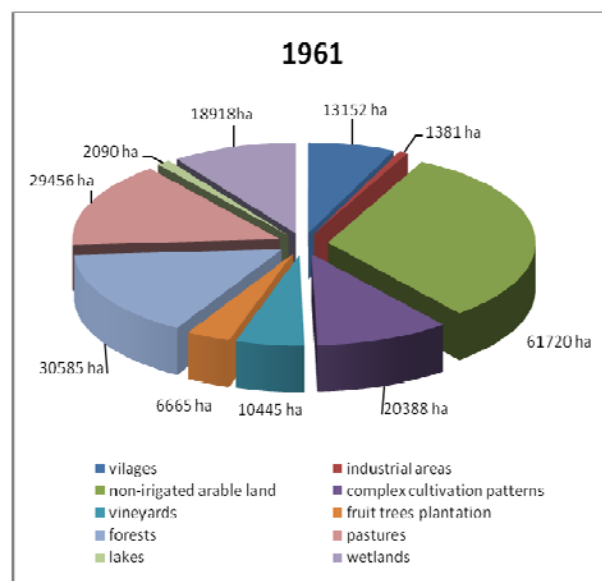


Figure 3 Main land use types in Bahlui drainage basin in 1961

According to the physico-geographical and socio-economical conditions, during time in Bahlui basin have been realized a series of land improvement works for the increase of water and soil use quality and for the increasing the surfaces used in non irrigated arabel land or like complex cultivation pattern. These works have regarded mainly a reduction in soil erosion, amplified in the last decades by human pressure and the often changes in land use.

Cojocaru (2008) identified two periods in the realization of these land improvement works:

- the period between 1989, that witnessed a maximum during 1960-1985, when were conducted the main hydrotechnical works in the basin, anti-erosional works at the slopes level and complex management projects for representative hydrographic basins (case of Scobâlteni basin, where have been conducted projects that implied establishing the optimal road network for agricultural exploitations and adopting corresponding structures of crops). At the same time, have been held in view a series of

complementary specific works of preventing soil erosion, eliminating humidity excess (through drainage channels or decreasing the underground water level through deep plowing), or managing landslides-affected slopes (evacuation channels, drainage, planting etc.).

We may exemplify for this period the drainage works from Bahlui floodplain in Podu Iloaiei-Iași sector, the consolidation of the main courses' floodplains (both on Bahlui and the tributaries), realization of forestry plantations with acacia and fir for the protection of landslide-affected slopes (south of Târgu Frumos and on the left bank of Podu Iloaiei reservoir) etc.

Other hydrotechnical works have implied the realization of an irrigation system in the area of Belcești township, of over 1800 ha (between 1976-1980, today completely destroyed) or local / punctual irrigation systems on small surfaces.

All these works have been conducted for the increase of agricultural productivity on the terrains cultivated on slopes or for introducing in the agricultural circuit on unproductive terrains.

The present period (after 1989), when due to a lack of funds or even neglect have no longer been

conducted such works. More, a series of improvements made between 1989 have been destroyed or dissolved, the effects being felt in soil and water quality.

Analyzing the structure of the land use at the level of year 2006 we observed that the surfaces occupied by villages increase to 17500 ha (fig. 6). Their increase occurred in the disadvantage of quasi-natural surfaces, mainly of those with hygrophille vegetation (very many constructions have been emplaced in the floodplain of Bahlui, mainly after 1990, but also of its tributary Nicolina). This dynamic was accentuated during 2000-2009, when this sector took a special impetus. As a consequence of the implementation of Law 18/1991, increased also the percentage of surfaces occupied by arable terrains (less in the case of complex agriculture) and of pastures, in the disadvantage of those occupied by forests (that suffered a decrease of over 2500 ha at the level of the entire basin), orchards and vineyards or areas with hygrophille vegetation (Minea I., Vasiliu I., 2010).

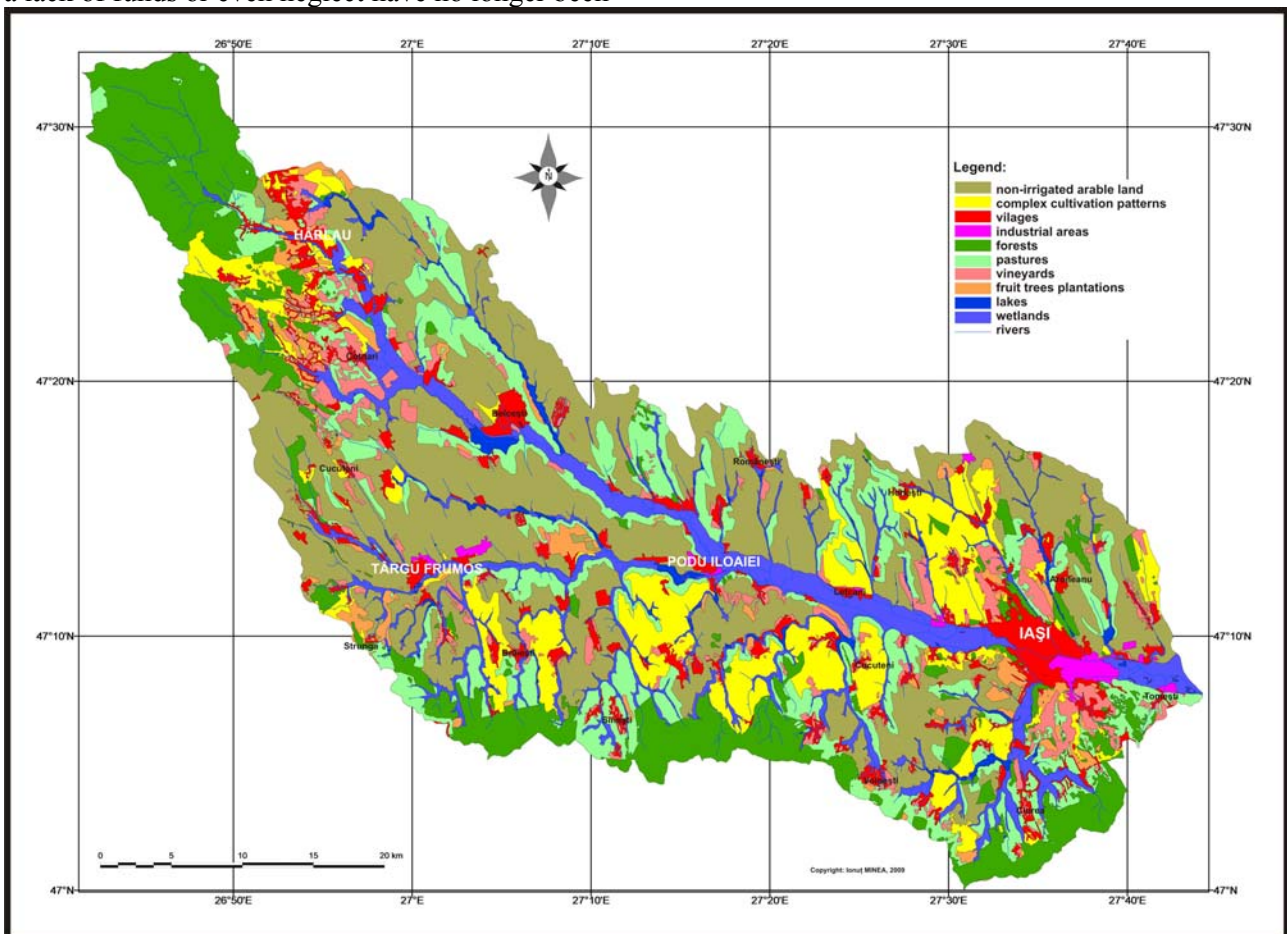


Figure 4 Land use in 1961 in Bahlui drainage basin

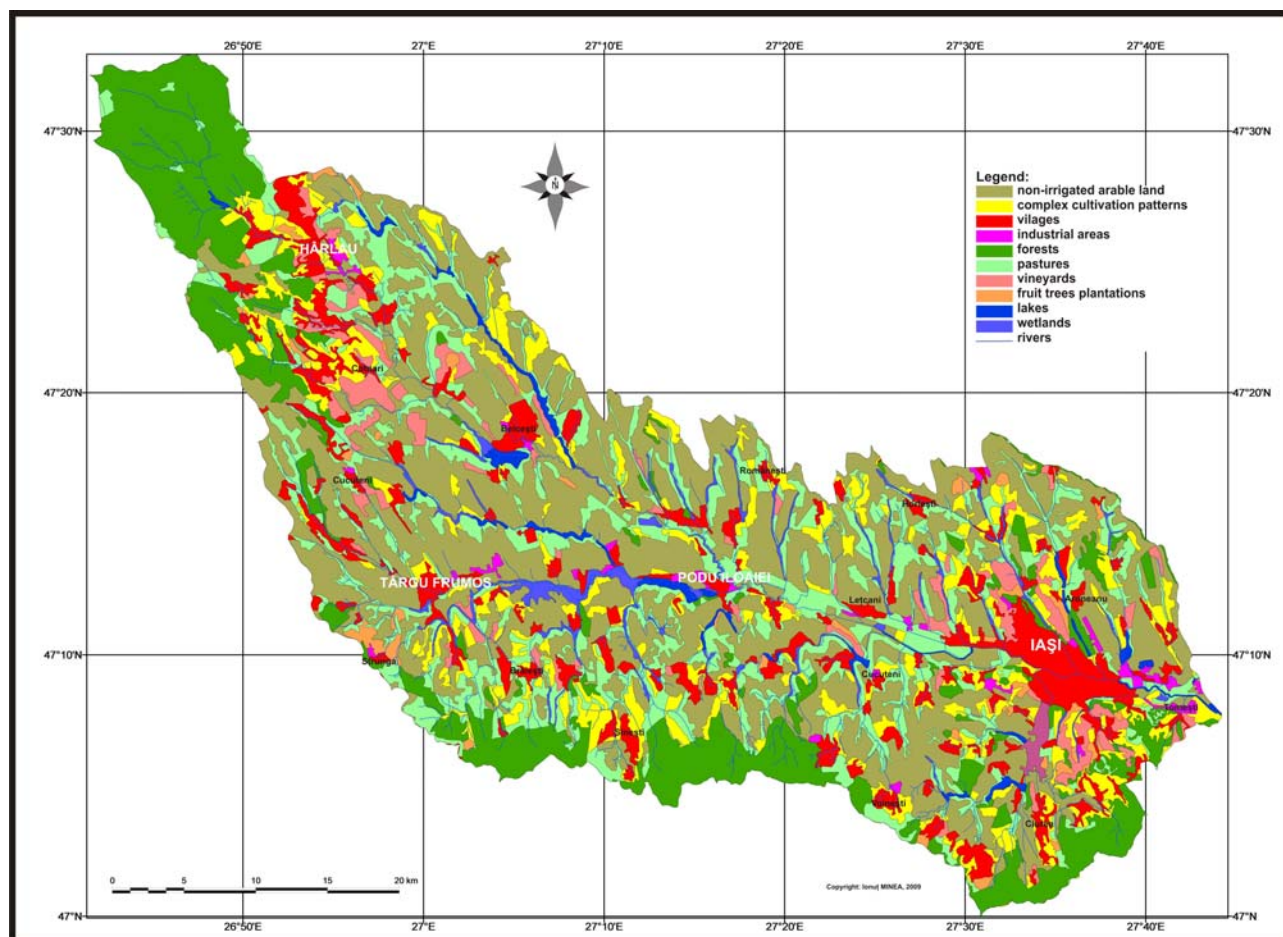


Figure 5 Land use in 2006 in Bahlui drainage basin

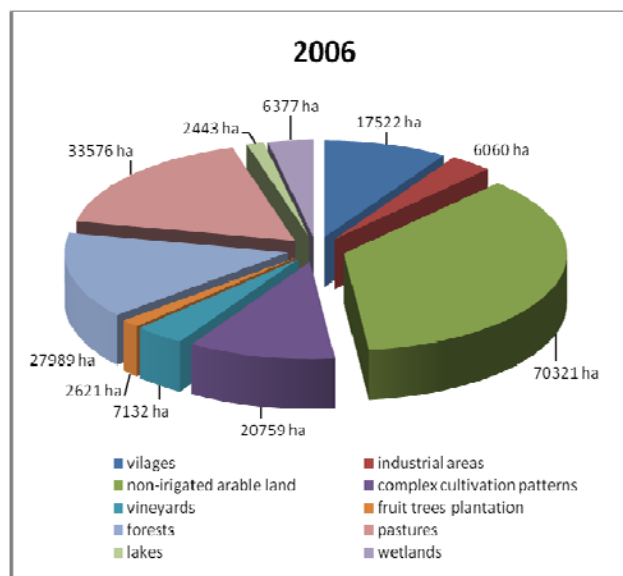


Figure 6 Main land use types in Bahlui drainage basin in 2006

The effect of this distribution is manifested on field through the intensification of erosion processes at the level of high slopes, where the soil cover is gradually removed, fact that favors the increase in the flash flood potential of small rivers and in the solid discharge.

After Romania's adhesion to the European Union in 2007 and the realization (in the future) of

some programs /projects of territorial planning on the basis of European funds, there is the possibility of modifying the spatial structure of use categories by restraining the fragmentation degree in the case of agricultural terrains, and through a better monitoring of the extension in constructed areas.

If we analyse the correlation between land use and altitude, at the level of year 2006, may be seen an accentuated diminishment of agricultural surfaces. The positioning of Bahlui basin at the contact of three physico-geographical sub-units of the Moldavian Plateau: Jijia Hilly Plain (under 150 m) and Sucevei Plateau in west, and respectively "Coasta Iașilor" to south (over 150 m altitude), leads to a situation where agricultural terrains have a large extension between 35 and 200 m (Fig. 7). In the same span enter also pastures, which often are emplaced on the cuesta fronts affected by geomorphologic processes (Cojocaru, 2008).

Areas occupied by forests have a high percentage at altitudes over 200 m, where occur natural forests specific to the Moldavian Plateau (in which dominate associations of *Quercus* and *Fagus*).

Under this limit, these areas occur rarely, being in fact forestry plantations of fir and acacia, with role in slope protection.

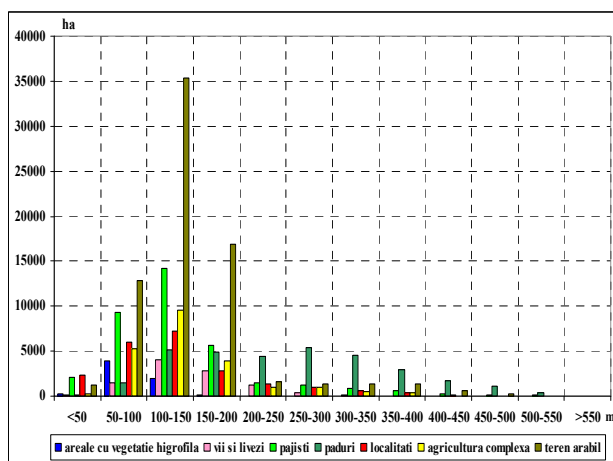


Figure 7 Distribution of land use types in 2006 according to altitude classes

If we have in mind the distribution of land use classes according to slope, we notice in general that all classes occupy surfaces that increase progressively disregarding the slope (with the exception of the areas with slopes over 18° , where may be found patches of forests with role of protection and for grazing, which cover the cuesta foreheads of high declivity), respecting the percentage they have in relation to the basin's total surface.

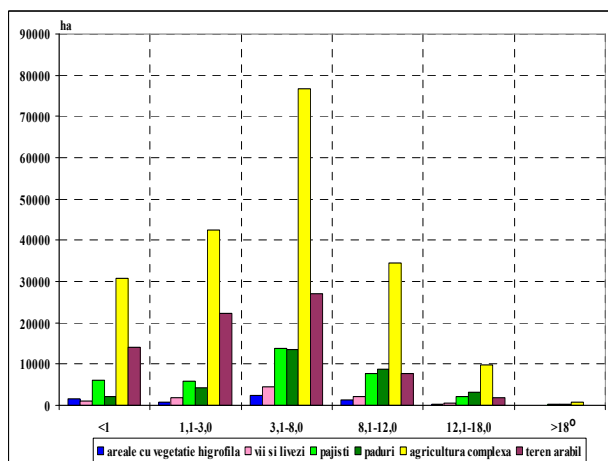


Figure 8 Distribution of land use types in 2006 according to slope classes in Bahlui basin

The same situation is found when correlating land use classes with slope exposition, when only the presence of forests (the same protection plantations) on certain slopes of western or north-western exposition does not respect this rule, due to the forestations conducted on cuesta foreheads

CONCLUSIONS

Analyzing the evolution of land use categories at the basin level during the last century, we notice a different spatial dynamics of surfaces occupied by settlements from 5.230 ha in the late nineteenth century, over 17.500 ha in 2006. This increase was achieved at the expense of quasi-natural areas, particularly of areas with vegetation higrofilă, which fell from 32.000 ha in 1894 to 6.400 ha in 2006 (very many buildings were made of the major river bed of Bahlui in the area Iasi, especially after 1990, but also its tributaries, like Nicolina or Cacaina). This dynamic has increased in the period 2000-2009, when the industry took a great momentum.

As a consequence of the implementation of Law 18/1991 increased the share of area occupied by arable land (less complex agriculture) from 45.000 ha in 1894 over 70.000 ha in 2006, to the detriment of the area occupied by pastures and forests (suffering a decline of over 17 000 ha, ha from 45.000 in 1894 to below 28.000 ha in 2006) and of areas with wetland.

AKNOLEGEMENTS

This work was supported by the European Social Fund in Romania, under the responsibility of the managing Authority for the Sectoral Operational Programme for Human Resources Development 2007-2013 (grant POSDRU/89/1.5/S/63663 „Rețea transnațională de management integrat al cercetării postdoctorale în domeniul Comunicarea științei. Construcție instituțională (școala postdoctorală) și program de burse – CommScie -”).

BIBLIOGRAPHY

- Cojocaru, R.I., 2008 - *Bazinul Nicolinei. Studiu de geomorfologie aplicată*, Teză de doctorat.
- Minea, I., Vasiliniuc, I., 2010 - *The role of the anthropic factor in the formation and evolution of water resources in the eastern part of Romania*, Geographica Timisensis, vol 19, nr. 1, 2010, Timișoara, pag. 361-376.
- Pantazică, Maria 1974 - *Hidrografia Câmpiei Moldovei*, Edit. Junimea, Iași.
- Savin, Nicoleta, 1998 - *Cercetări privind influența proceselor de colmatare progresivă a unor acumulări asupra funcționării la ape mari, cu referiri la bazinul Bahlui*, Teză de doctorat, Univ. Tehnică „Gh. Asachi”, Iași.
- ***, 1992 - *Geografia României*, vol. IV., Edit. Academiei, București.