



THE DYNAMIC OF USING THE RIVERS ENERGY FROM REPUBLIC OF MOLDOVA TERRITORY

DIANA BRAGA¹

ABSTRACT – The dynamic of using the rivers energy from Republic of Moldova territory. One of the least explored and tapped energy sources in Moldova are the inland rivers. Considering the critical condition of the country regarding energy sources, it would be highly necessary to study the feasibility of hydraulic energy reserves. Although Moldova has no major rivers with a large flow of water, the network of small tributaries of its two large rivers, Dniester and Prut, could be used to a certain extent for partial power supply to villages situated along inland watercourses.

The first scientific developments concerning the hydropower potential of the rivers in Bessarabia belong to professor D. Pavel. Around 1933 he was suggesting a series of hydro-technical facilities on Prut and Dniester rivers and their tributaries. Subsequently, in the '40s of the 20th century the first power plants were built on small rivers. After World War II some small hydropower plants, built during the interwar period, had been restored and some other put into operation. These include the plant at Dubăsari with a capacity of 48 MW that started operating in 1954 on Dniester River, and the hydroelectric complex at Costești -Stâncea with a capacity of 16 MW, in 1978 on the River Prut. Nevertheless, the leverage of hydroelectric resources is not significant, only 23 being used nowadays, which is 7% of the hydropower potential - a rather modest number compared to other states.

Keywords: hydropower resources, water mills, hydropower plants, hydro-electric power station, hydraulic energy.

1. INTRODUCTION

Rivers have been used in the area between the Dniester and Prut rivers since ancient times through the use of water mills. The statistical data testify that before the implementation of massive steam engines and internal combustion engines, water mills were particularly spread in Moldova.

2. HISTORICAL AND GEOGRAPHICAL ASPECTS

Most water mills were on the Hotin hill and in Codri on the Raut River. In medieval writings one would often encounter the term “jalovania mlinov” or places where they were built. These sources witness that throughout Moldovan principality, already in the 15th-16th centuries, there was a significant number of

¹ The Tiraspol State University, Faculty of Geography, Chisinau, Moldova,
e-mail: dianabrg3@gmail.com



water mills used to produce food and industrial products: flour, oil, textiles, timber, etc. They belonged to the great feudalists, to Moldovan rulers, to monasteries and the clergy (Bossy, 1937).

Although in the Middle Ages, on the territory between the Dniester and Prut Rivers a relatively large number of hydraulic facilities were operating, their existence was recorded only on some large and medium scale maps of the late 18th century – assigned to the territory of Moldova of that time – the map of Bawr, Büschel, Otzellowitz J. Liechtenstern - as well as some plans and estates.

Historical and ethnographic research and documentary entries of the time show that in Moldova, throughout the 18th century, there were more types of hydraulic facilities in use. These categories were: water mills for grain milling, most of them located near water banks, including the banks of the minor river beds or on ponds above the dams, including floating mills installed on large rivers; the oil mill - called “tescuri”, used to obtain oil out of pumpkin seed, flax, hemp; fulling mills, sometimes called hives, used for felting woven wool and obtaining cloth; „steaza” and „dîrsta” - for finishing fabrics.

Still, in the Middle Ages, the generic term “water mill” was very widespread and attributed to several kinds of hydraulic installations. Therefore, in order to make a difference, additional features were often added resulting into such terms as: paper mill, tanning mill, saws mill, “aparcaş” mill, “prav” (rifle) mill, etc. In addition to this, no maps or plans of estates provide a clear distinction between the kinds of hydraulic facilities, and there are no adequate explanations in maps legend.

Thus, Bawr’s map enlists 166 hydraulic facilities on the territory of Moldova, of which only 72 are known to have the symbol of a watermill, which is the only explained in the legend by the generic term of “mouline” (= moara). The remaining 94 symbols are marked by a plan symbol, but have no explanation in the legend.

Based on this data the map “*Moldova’s hydraulic facilities in the 18th century*” (Fig. 1) was elaborated. It roughly shows the geographical distribution of these installations. Thus, there are 951 hydraulic facilities charted on the map.

According to the map the majority of these hydraulic facilities functioned in the western half of Moldova, an area with the most dense network of rivers and with a permanent flow.

Taking into consideration their geographical distribution of longitudinal zones, from the West to the East, it is possible to notice that 775 of them, i.e. the majority, were to the west of Hotin line, in the Siret River valley, 122 were on the plateau area between Siret and Prut and only 54 in the area between the Prut and Nistru Rivers. Their distribution was closely linked to the physical-geographical and socio-economic conditions. According to the map, the fewest hydraulic facilities were in the eastern half of Moldova, especially in the provinces of the south - east, with a low and slightly fragmented landscape, a poor hydrographic network and a slower and irregular flow, caused by the dry continental climate. During the late Middle Ages the same territories were frequently threatened and invaded by the armies of the neighboring empires, a fact that disturbed a favorable social-economic development.

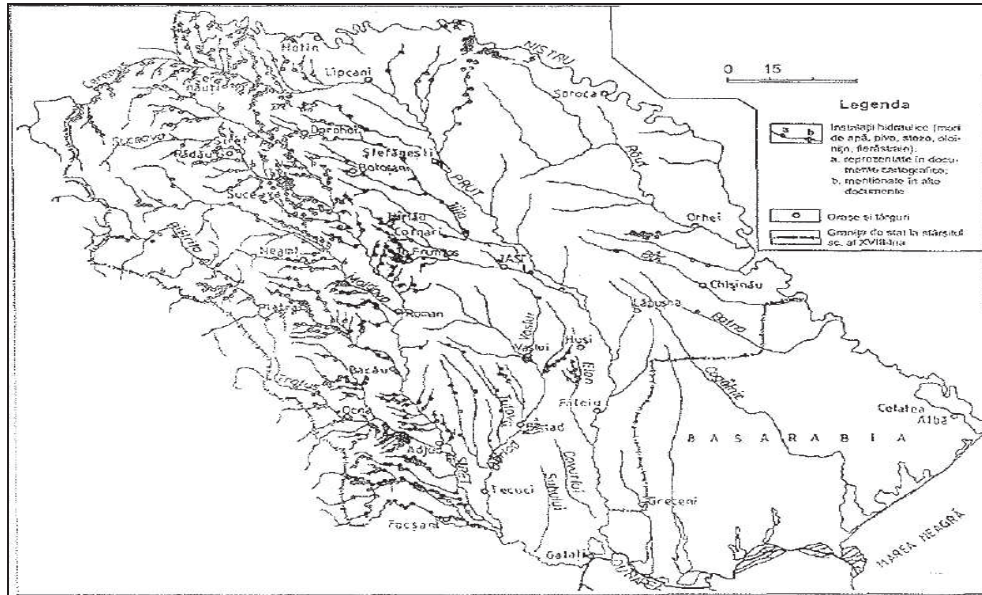


Fig.1. Hydraulic facilities in Moldova in the 18th century

Later research work allows us to reconstruct in more detail the manner and distribution of water mills across the former (Russian Province of) Bessarabia. Thus, by the 19th century water mills were most common in the central and northern parts, areas with a fairly dense network of rivers.

During this period their classification becomes more frequent. Thus, water mills were divided into stationary mills and mobile pontoons.

Stationary water mills were built on large and small rivers, on ponds, thus comprising the majority of water mills. Depending on the construction of the wheel they were divided into “moriști” mills and beaters (“colesuhi”).

“**Moriște**” were the oldest and simplest types of water mills. They are distinguished by a simple structure and being installed on rapid rivers and streams.

In a more or less similar form these Moriște-mills were encountered until recently on Ciugure River in Proscureni and Costesti villages, Riscani district. Most often these were owned by individual peasants, while some others were for the common use of village inhabitants.

Beater-mills looked stronger and more founded, representing mills with huge vertical wheels mounted on a horizontal axis. Depending on the various parts of the wheel structure, the way the water was administered and the way they would be turned on, the beater-mills were divided into upper intake and lower intake mills.

These kinds of mills were encountered in Ciorna river valley near the Glinjeni village, on Ciugure river near Duruitorii Noi village, on Nistru river, near Tipova village, Rezina district. During floods, they have been damaged and were not restored.



Floating water mills used rafts or boats as foundation. Most of them were situated on the Prut and Nistru rivers, in places where the flow velocity was significantly higher compared to other rivers. N.N. Puzîrevskii affirms that "being in a large number on the Nistru River, a few hundred, they were hindering greatly the shipping (Станчу, 1979).

It is most likely that floating mills were known long ago on the territory between Dniester and Prut Rivers, but the time of their first use could not be stated (Fig. 2).

However, it is known that in 1837 residents of the Gremești, Țițcani and Perera villages, of Hotin district, as well as those from Tomeștii Vechi, Balti district, were allowed to build new floating mills on Prut river, and some old mills had to be replaced from the Bedreac village to Bogdănești village and from Perita village to Țițcani village of Hotin district, because of bank erosion. Peasants of Gancești village were allowed to build a floating mill on the Prut river, where "one already existed" (Станчу, 1979).

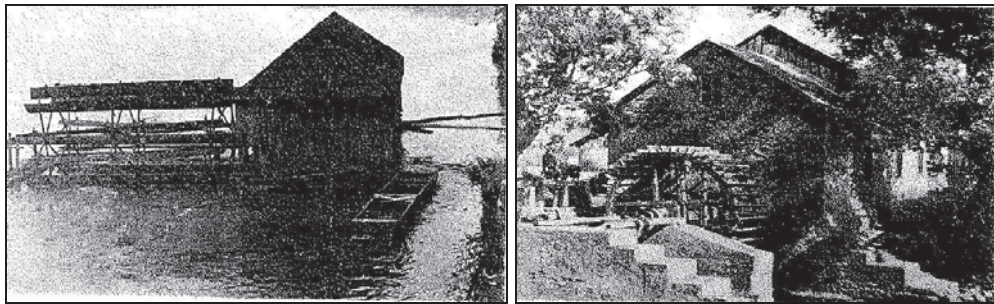


Fig.2. Water mills

The increase of grain production in the late 19th and early 20th century led to the development of milling as such, as well as to the diversification of mill-types. It is rather impossible to elaborate a complete study on water mills in the region during the early 19th century. Thus, a source mentions the presence of 1294 mills in the region by 1817, without focusing on their types. As a consequence it is virtually impossible to determine the number of water mills out of their total amount. However, it is known for sure that more than one half of these mills belonged to peasants and yeomen. The majority of mills were in Hotin, Codru and Orhei districts, i.e. areas with a developed agriculture.

In the years that followed, along with the increasing grain production and sale capacity, milling continued to develop. Statistics become more reliable starting with the second half of the 19th century (Гросул, Будақ, 1972) . The extent to which all types of mills were spread in the second half of the 19th - early 20th century are shown in the table below.



Table 1. Distribution of water mills in Bessarabia between 1850 – 1919

District	1850	1870	1880	1900	1919
Chişinău	53	66	62	19	-
Orhei	126	125	120	68	22
Bălţi	108	136	55	43	18
Soroca	136	198	202	196	70
Hotin	385	536	189	598	414
Bender	-	6	-	-	16
Akkerman	4	5	-	1	-
Ismail	-	-	-	-	-
Total	812	1072	628	925	540

As presented in the table, water mills were most frequently encountered in the central and northern districts. This situation may be explained by the fact that the water resources of inland rivers in southern Bessarabia were insignificant. These data indicate that the number of water mills had grown by 1870. During the years that followed their number started to decline sharply. In 1919 it was almost twice smaller compared to that registered in 1900. The territorial distribution of mills places Hotin district in the first place, followed by Soroca, Orhei and Balti.

This decline is logically explained by the development and use of the more sophisticated steam mills.

A more complex perspective upon water mills on the territory of Bessarabia in 1919 was elaborated by Giurgea (1919).

According to him, by 1919 there were 540 water mills on the territory between Dniester and Prut, of which about 414 were situated in the Hotin district and fewer in others: Soroca – 70, Orhei – 22, Bender - 16. In the other counties no mills were attested. By 1923 this number grew to 887, a fact highlighted in the analysis of the “Statistical Dictionary” for 1923. In time their number might gradually decrease, slowly disappearing from the country’s economic landscape, with few vestiges attested at present.

The first scientific developments concerning the hydropower potential of the rivers in Bessarabia belong to professor D. Pavel (1976). Around 1933 he witnessed a series of hydro-technical facilities on Prut and Dniester rivers and on their tributaries.

Subsequently, in the ‘40s of the 20th century the first power plants were built on small rivers.

After World War II some small hydropower plants erected during the interwar period were restored. The installations that operated before the war on Camenca and Beloci rivers, tributaries on the left of Nistru River, were also restored. In the years 1948–1949 two more power plants started operating on Camenca River in Cubota village.



During the '50s of the 20th century few more power plants were build in Brinzeni and Cazanesti on Raut River, with a capacity exceeding 100 kW. Later on, more small and medium scale hydro-plants were built on Jeloboc-Piatra on Raut River.

The use of hydropower resources of large rivers started in 1954, when the power plant at Dubasari with a capacity of 48 MW, started its activity.

At present this hydropower plant provides electricity only to the districts situated on the left side of the Nistru River.

The use of energy potential of the Prut River started in 1978, when the hydroelectric complex at Costești –Stânca, with a capacity of 16 MW, was put into operation in partnership with Romania.

3. CONCLUSIONS

Moldovan hydropower potential is favorable to the rearrangement of water mills and small hydropower plants (SHP). The issue of SHP construction in Moldova is more and more present with the increasing world prices for energy and concomitant lack of financial resources to purchase energy.

The degree of exploit of hydropower resources is insignificant. So far 23 have been used, which is 7% of the hydropower potential, a modest leverage compared to other states.

REFERENCES

1. Bossy R., (1937), *Mărturii finlandeze despre România*. București.
2. Giurgea E. „Situția generală a morilor din Basarabia după plase și județe”. Chișinău, 1919.
3. Pavel D.(1976), *Arhitectura apelor*. Editura Eminescu, București.
4. Гросул Я., Будак И., (1972), *Очерки истории народного хозяйства Бессарабии (1961- 1905)*. Кишинев.
5. Станчу Е., (1979), *Традиционные крестьянские промыслы Молдавии в XIX – начале XX век*. Кишинёв.
6. *** (1923) *Dicționarul statistic al Basarabiei*, Ediție oficială, Direcția generală a statisticii, Serviciul statistic regional din Chișinău. Ed. „Glasul Țării”, Chișinău.
7. *** (1984) *Documente și zapise moldovenești de la Constantinopol (1607 – 1806)*”. Iași.