USING CARTOGRAPHIC DOCUMENTS AND GIS FOR FOLLOWING THE EVOLUTION OF THE PONDS - AREA OF CEFA AND MĂDĂRAS COMMUNES - (BIHOR, ROMANIA)

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Abstract: Starting from the problems of identifying some of the pond names in the Crisurilor Plain, which over time have been mentioned by various authors by different acronyms, we wanted to identify and locate them by studying maps and cadastral plans dating from the late 19th century until present. Using modern means of mapping (GIS) we superimposed a very wide range of cartographic materials and studied a wide range of textual documents that have succeeded to clarify the changes that these ponds have suffered over time.

Key words: cartography, Western Plains, hydrography, ponds,

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INTRODUCTION

Crisurilor Plain has been a sector which favored the development of lacustrine basins. Due to an accumulation of natural factors (areas of almost flat land, often swampy, where groundwater is near to the surface, and the rainfall water stagnates a long time in micro-depressions, reduced possibilities of rivers to discharge water coming from flash floods - slow flowing and low transport capacity). Some anthropogenic causes were added (creating artificial obstacles in the river beds through water mills dams, hemp melt etc). Since the nineteenth century, has been added the construction of a dense network of canals with the main function to remove excess water, but which later on were to provide and supply water to lacustrine accumulations and to the former paddy fields, vegetable gardens or for irrigation purposes (Blidaru et al., 1962; Vancea, 1969; Măhăra, 1977; Pop, 2005). This area plains were taken up, especially in the second half of the twentieth century, in a vast dam and drainage building project after which most of them entered the agricultural circuit. However, „in some areas remaining with moisture excess, even after drainage works were carried out, a series of ponds were set up, among them standing out those of Cefa (about 700 ha), Inand, Homorog and Tămașda (last in the Crisului Negru Plain), with intensive carp culture” (Pop, 2005). It should be mentioned that currently there are no rice fields, their place being taken between 1950-1960 by some of the ponds in question (Mărțihaz / Mădărăs) or there are other categories of use of these lands.

http://istgeorelint.uoradea.ro/Reviste/Anale/anal.htm
In this paper we intend to look at the evolution of basins designed for fish farming in the lower plains of Salonta, following data from cartographic documents but also some textual sources, because at a certain point, looking at several information sources, we noticed they did not match, and on some maps that are currently in circulation (publicly or operated by local county governments) there are inaccuracies. The accumulation that drew our attention and over which hangs a hint of general bewilderment is „Inand” and which in the A.B.A. Cris (Oradea) (by Oradea Crisuri Waters Administration) current documents appears to be non-permanent, but some thematic maps in use, show it as a water surface. The other reservoirs designed for fish farming (Cefa, Mădăras, Mărţihaz, Homorog) are presented with variable surfaces from one source to another. Table 1 shows the data heterogeneity, but we have also found that there is some confusion about hydronyms that generated the current ambiguous situation. After consulting a series of documents and maps, a number of inaccuracies were found. Thus, on the territory of Cefa commune, there appears a pond (pond, lake) „Inand” with a large surface and permanent water surface, although there is no such an accumulation in that location and the documents of ABA Cris - Oradea shows a non-permanent water surface that covers an area of more than 200 ha farmland.

Another inconsistent element appears on the territory of Mădăras commune, where a pond with a fairly large area, positioned to the south of Radvan forest, has different names, Mădăras or Mărţihaz or Rădvani (?), or maybe, at some point, the name „Inand” might have also referred to this pond (although the areas which appear in the literature are different from smaller to larger). There are also still a lot of pools on these maps, taken from topographic maps, that have no longer water.

Based on the premise that the map is not any conventional image, but a means of transmitting dimensions and various information and must convince the user that they are accurate, we are trying to clarify the situation and, as far as possible, to convince the authors of those maps to make the necessary corrections.

Table 1. Surfaces of lacustrine basins (ha) used for intensive fish farming in the area Cefa-Mădăras, from different sources

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Cefa Complex</td>
<td>1905-1945 expansion</td>
<td>598</td>
<td>670</td>
<td>670</td>
<td>735,8</td>
<td>598</td>
<td>521,9</td>
</tr>
<tr>
<td>Inand</td>
<td>1981</td>
<td>-</td>
<td>164</td>
<td>200</td>
<td>Non-permanent accumulation (257 ha)</td>
<td>164</td>
<td>Farmland</td>
</tr>
<tr>
<td>Mărţihaž</td>
<td>Interval 1950-1960 ?</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>215,0</td>
<td>-</td>
<td>Cogged up, farmland</td>
</tr>
<tr>
<td>Mădăras</td>
<td>Interval 1950-1960 ?</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>104,75</td>
<td>30</td>
<td>19,17</td>
</tr>
<tr>
<td>Homorog</td>
<td>1960</td>
<td>95</td>
<td>105</td>
<td>105</td>
<td>95/105</td>
<td>19,17</td>
<td></td>
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</table>

**MATERIAL AND METHODS**

The work methodology was based on the use of existing cartographic documents we had access to, topographic maps (1962, reprinted in 1996), a 1:10 000 scale topographic plan, thematic maps in circulation, data from ABA-Cris (Oradea) and the communes Cefa and Mădăras GUPs (2000 and 2007) and ended with the study of the orthophotomap (2009, 2010). In parallel, we also

\[1 \text{ By ABA Crișuri-Oradea} \]
looked at written information provided by textual references (Galatz, 1896; Blidaru et al. 1962; Vancea, 1969; Pop, 1968; Măhăra, 1977; Găștescu, 1971; Posea, 1977; Caraiman, 1995; Crișan, 2007), but we have talked with the fish farming engineers and with inhabitants of the two villages.

RESULTS AND DISCUSSION

Brief presentation based on textual bibliography

In 1962 a team of hydrologists published a monograph of the hydrological improvement works in Romania, but for the Crisurilor Plain only the works on dams and canals were presented (Blidaru et al., 1962). Between 1968 -1977, a few geographers from Oradea, joined by P. Găștescu and Gr. Posea, published papers that contain different drawings for the area in question.

Thus:
- in 1968, Gr. P. Pop and Viorica Rusu wrote an article that presented an outline of the positions of fish ponds which shows unequivocally the existence of four fish accumulation (figure 1): Cefa Mădărăș taking, Homorog;
- 1971, P. Găștescu, presenting the ponds in Salonta Plain, shows an outline similar to that of Gr. P. Pop, with four "artificial lakes" Cefa Mădărăș, Inand, Homorog (figure 1);
- in 1972, Ig. Berindei and Gr. P. Pop, presenting the Bihor County hydrography, dedicate several lines to this area which presents again four lakes (Cefa, Mădărăș, Inand, Homorog);
- later, in 1977, Gh. Măhăra, when presenting the hydrography of the Crisurilor Plain has another drawing, on which only three lakes appear (figure 3): L. Cefa L. Inand, L. Homorog;
- there are also references to this complex made by Gr. Posea (1977), but only textually, without any drawings: "Cefa lake complex (670 ha) with 16 lakes, complex Inand (200 ha), lakes from Mădărăș (30 ha), Homorog (105 ha)."

Figure 1. Location of fisheries in Crisurilor Plain in 1967
(Source: Gr. P.Pop, Viorica Rusu, 1968)

Figure 2. Artificial Lakes in Crișurilor Plain
(Source: P. Găștescu, 1971)
We have found no other references in technical literature, to these fish farming water accruals, until 1995 when Gh. Caraiman published a monographic work on intensive fish farming in the Crișurilor Plain. Here, there is a drawing showing the "location of fish farms in the Crișurilor Plain, belonging to the Știință Piscicolă Cefa" where, just to make things even more complicated, three such ponds are located: Cefa Homorog and ... Rădvani (!) (figure 4).

The information on the internet, present the same lacustrine basins and areas taken from the authors mentioned above. In 2007, I. Crișan published a historical work dedicated to Cefa, where he briefly reviewed the natural environment, but refers only to Cefa Fishery Complex.

**Presentation of the cartographic material**

It is generally known that Crișurilor Plain was covered by numerous marshes, some with very large areas. A Franciscan map (1863), highlights the hydrographic situation of the land at that time. The area of interest is studded by numerous swamps, strongly meandering courses of the main brooks, but there were also representations of some early hydrological works (sectors of dams along currently overflowing rivers, especially for the protection of the cores of the villages). These territories, like the whole Crișului Plain, experienced catastrophic flooding over villages and inhabitants in the years: 1864, 1869, 1871, 1873, 1874, 1875 (Gallacz, 1896).

![Figure 3. Waters of the Crișurilor Plain (Source: Gh. Măhăra, 1977)](source)

![Figure 4. Location of fish farms in Crișurilor Plain, belonging to I.P. Cefa (Source: Gh. Caraiman, 1995)](source)

Between 1884 - 1886 very detailed plotting plans were made for the whole territory under study. From these plans we can see that land surfaces occupied today by lacustrine areas, were then grazing fields, called Rădvani Puszta. The territorial administrative units at the time were differently shaped than they are at the present, which is why we considered useful for their reconstruction based on cartographic materials, to observe how they could influence the name of the units lacustrine that were to be established (figure 5). The master drawing plans for the two communes bring nothing new to the content of the old maps. In addition, a sheet of the map showing the western area of the communes was drawn in 1921 and two sheets, showing the eastern part of the area were carried out in 1953, so we gave up using them.
Figure 5. Reconstitution of territorial administrative boundaries of 1886 based on cadastral plans made during 1884-1886

Figure 6. Sample from the topographic map at scale 1: 25 000 (year 1996) with some of the ponds on it
Figure 7. Fragment of the territory of Cefa and Mădăras communes on the black and white topographic map at scale 1:25 000 (year 1962) on which the former rice paddies are marked...some of them converted to ponds.

Figure 8. Fragment of the territory of Cefa and Mădăras communes on the cadastral map at scale 1:50 000.

Figure 9. Fragment of the territory of Cefa and Mădăras communes on the topographic plan at scale 1:10 000.
The next cartographic document used is the scale 1:25 000 topographic map (1996) (figure 6). On this map, three longitudinally disposed lacustrine accumulations are highlighted, but none of them is named: the northern one is without any doubt Cefa, the southern one is Homorog and we can assume that the one in the middle is Mărțihaz. Another, small, accumulation is shown between Cefa and Mărțihaz, but close to the village Inand there is only a small blue spot (possibly a very small „pond”), which keeps the question on: why in the textual bibliography Inand pond appears with an area of about 200 ha?! (see table 1). And another question: where is the pond Mădărâs?

However, on the black and white topographic map of 1962, to the north of Mărțihaz (?) accumulation, there are large areas planted with rice (figure 7), the elderly villagers with whom we spoke, as well as a local fish farming engineer, told us that at some point just north of the current accumulation Mărțihaz (?), a paddy had been converted into a pond which was called Mădărâs (!) with an area of about 40 hectares and belonging to CAP (Collective Agricultural Cooperative) Mădărâs.

After learning this, we looked on the cadastral map of 1979 at scale 1: 50 000 (figure 8) and, it appears indeed marked, a small reservoir north of the median pond (Mărțihaz?) which had a smaller area at that time.

Further on, we took the topographic plan at scale 1: 10 000 (1971) (figure 9) and for the first time, there appears a fishpond called Mădărâs (!!!), but which is actually the median accumulation on the other maps, only here it has a name.

On the hydrographic map of Bihor County (1982), at scale 1: 200 000 we found another inconsistency: Cefa lake complex is called „Inand enclosure” but the median lake has a name this time (Mărțihaz enclosure) (figure 10).

**Figure 10.** Fragment of the territory of Cefa and Mădărâs communes

On the hydrographic map of Bihor County (year 1982)
Also in 1982, OCAOTA (Directorate General for Agriculture and Food Industry Bihor - Office of Cadastre and Land Management and crop rotation) produced plans at scale 1:10,000. These plans aimed at mapping the use of land (Land Cadastre). Here, we can see that what is called „Mărtihaz enclosure“ on the hydrographic map, on these plans are called Mădărăș fishery and for the first time, the name Rădvani appears (figure 11). The total area of lacustrine basin is 210 ha.

As we approached the present times, we looked at the GUPs of the two communes, at the integration into the administrative area (figure 12). On the territory of Cefa, the little accumulation in the vicinity of the village Inand can no longer be seen in the drawings and on the territory of Mădărăș commune (figure 13), the situation is unchanged, it is still not clear whether the fish farming pond southern to Rădvani forest is called Mărtihaz or has another name (Rădvani fishery is the name that also circulates). But because topographical background is given by the map of 1962, the former rice paddies can be seen. The last cartographic document we are using is the orthophoto mapping (the year 2009 for the northern half and 2010 for the southern one) (figure 14). Watching satellite imagery, things partly clarify: there is no pond close to the village Inand (yet, there is a small „pond", but irrelevant), the presence of crop land is clear.

Figure 11. Fragment of map, scale 1:10 000 made by OCAOTA in 1982
Then, in terms of the median accumulation (Mărțihaz?), we have found that, for now, it has no water, and the accumulation Homorog is in place. Also, the many small ponds that appear on
topographical maps and have been taken (by virtue of inertia?) later on various thematic maps, over time they went eutrophic and clogged or were drained, entering the agricultural circuit.

CONCLUSIONS
Following the several pages and cartographic images presented, we can draw the following conclusions:
- by some local and county government offices there are thematic maps with location and toponymy problems for the area of Cefa and Mădăras communes, and from here, in various ways, reached wider circulation;
- literature still persists in ambiguity regarding the hydronyms “Inand”, “Mădăras”, “Mărtihaz”, “Rădvani”, which creates trouble locating them and perhaps led to the wrong elaboration of the thematic maps mentioned above;
- topographic maps at different scales and GUPs of the two communes bring no further clarifications regarding the hydronyms mentioned;

Figura 14. Identification of actual water basins on the area of Cefa and Mădăras communes, using orthophotomap
- we were able to identify Mădărăș pond on the plan at scale 1: 10,000 (year 1971) which reads „Mădărăș fishery”, as well as drawings made in 1982 by OCOTA, but its position shows that it’s also about the median accumulation;

- we couldn’t find any Inand accumulation on any map. Possibly, the median accumulation could have been called „Inand” at some time... it’s absolutely, because this accumulation is one time referred to as having a large area (167 or 200 ha), and another time as having a small area (30 ha) (see table 1). The only certainty is that this accumulation is close to the village with the same name (Inand) where there is only a non-permanent accumulation with the role of mitigating floods;

- moreover, even if Table 1 mentions five fishponds, on all cartographic images only three can be identified, certain as name are only Cefa and Homorog. We believe that all other hydronyms (Inand, Mădărăș, Mărtițhaz, Rădvani) refers to the median accumulation;

Figure 15. Elements of hydrography in Cefa and Mădărăș communes
(Legend: roads, railroads, forest, non-permanent accumulation, mapped lakes, water surface, rivers, village core, administrative limits)
- the orthophotomap highlights the fact that, when photographing the land, terrain, only Cefa and Homorog complexes had water;
- the surfaces of these lacustrine basins have varied over time, we believe because of the following reasons:
  - initially, Cefa complex had a smaller area (see Table 1), and afterwards it grew by taking in other lands with humidity excess, ..., the first ponds (about year 1905, there is no documentary certainty) were designed to the limit of LIBARDI agricultural farm with an area of 150 ha, located to the west of the current fishery ...The area that would later take in the expanded farm, at the time, was planted with irrigated meadow" (Caraiman, 1995).
- currently the fish farming have greatly diminished their water area due to technical reasons (for rotation - case of Cefa complex) or economic reasons, translated by unprofitable operation, in which the body of water started to push back (to clogging) by invading hard vegetation represented, especially, by reed and bulrush, such as Mârățhaz pond. Therefore, although we were on the field several times, talked to locals, officials from the two communities and with representatives of ABA Cris - Oradea as well as after studying older or newer bibliography, we have come to the strange (!) conclusion that the real situation is hardly known.

At the end, we present a draft map (figure 15) that shows the current situation of these ponds, as we see it. We choose the name „Mârățhaz” for the median lacustrine basin, because it is located closer to the village with the same name than Mâdărás village, although the literature does not really make use of this hydronym (except the „water cadastre”). The name „Râdvani” occurs sporadically in the literature and we believe it is desirable to eliminate (gradually) other parallel names, to avoid confusion. We are totally against the hydronym „Inand”, because on the territory of Cefa commune and in the proximity of Inand village there is no accumulation, and to transfer the designation to another commune is, at least, out of place.

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