Considerations on the Status of Rehabilitation Works for the Land Improvement Arrangements in Timis County, Romania

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Abstract. The paper presents the surface drainage arrangements in Timiş County, Romania, that have been recently rehabilitated or will be rehabilitated in the future. Due to the high length of the existing surface drainage arrangements in Timiş County, Romania and climate changes correlated with a lack of maintenance works over the past 30 years has become necessary to rehabilitate the pumping stations in order to eliminate the water excess from agricultural land and to protect the localities from flooding. According to the current legislation, with the support of the local farmers, The National Agency for Land Improvement has been carried out maintenance and reparation works on the land improvement infrastructure. The paper aims to present the current situation and proposed rehabilitation works in order to strategically improve the functional parameters of surface drainage pumping stations and surface drainage arrangements, as well as the perspective of further financing from The Romanian Government and European Union funding.

1. Introduction
Timiş Land Improvement Branch is the biggest unit in Romanian National Land Improvement Agency, with an agricultural area of 705.000 ha from which 479.701 ha, representing 68%, is arranged with land improvement works. Land improvement works represent draining works on a surface of 438.788 ha (91,5 %) and soil erosion control works on a surface of 40.913 ha (8,5 %). Irrigation works overlap with drainage area on a surface of 9.202 ha [1].

The drainage of excess humidity is carried out by pumping from on a surface of 332.042 ha (75.67%) and gravitational for 106.746 ha (24.33%).

Timiş County area is part of the Western Plain of Romania and it is considered an area prone to excess humidity and over certain limits even for flood, due to a set of unfavorable natural conditions, such as: poor drainage, large areas of agricultural land with heavy texture soils, high level of ground water, torrential flow of upstream water courses at certain times of the year, small watercourses, existence of excess wood vegetation [2].

Land improvement works located in the border area are of common interest with neighboring countries and represents part of the flood defense protocols and conventions.
Since 2012, flood defenses activities have been attributed to the Romanian National Water Administration, for which the fixed assets, the materials and the related inventory objects were transferred through the protocol between the agencies.

Activities carried out by Timiş Land Improvement Branch consist of:

- evacuation of excess water gravitational and by pumping;
- water supply and pumping for irrigation;
- works for soil erosion control on sloping land.

One of the last years priorities have been the rehabilitation of existing pumping stations and unclogging of channels.

2. Materials and Methods

The main arrangements in which works were carried out were: Aranca drainage arrangement, with Mureş pumping station, Checea-Jimbolia drainage arrangement, with Cenei pumping station, and Sânnicolau-Saravale drainage arrangement, with Cenad pumping station.

2.1. Aranca drainage arrangement

Aranca drainage arrangement was executed in 1965 and additional work has been carried out between 1974 and 1977. The gross surface of the arrangement is 55.582 ha, of which drainage capacity represents 52.548 ha. Aranca drainage arrangement is located in Timis county, near by Romanian-Hungarian border and Romanian-Serbian border. [3]

From the hydrographic point of view, the area is part of the Mureş - Aranca basin. Aranca drainage arrangement consists of 12 drainage units. Evacuation of excess humidity in the arrangement is made by pumping water into the Aranca Channel and the Mureş River.

There are 9 pumping station: Aranca with a flow rate of 13.52 m³/s, Cheglevici - right bank - with a flow rate of 1,8 m³/s, Cheglevici – left bank - with a flow rate of 1,81 m³/s, Colonia Bulgara with a flow rate of 4,68 m³/s, Mureş with a flow rate of 27,0 m³/s, Teremia with a flow rate of 0,9 m³/s, Țiganca with a flow rate of 10,91 m³/s, Valcani 1 with a flow rate of 1,5 m³/s, Valcani 2 with a flow rate of 1,95 m³/s.

Of the total pumping stations, 4 are fully functional and one is totally inoperable due to electrical and mechanical causes. Apart from Aranca pumping station, all pumping stations require repair works.

Mureş pumping station (Figure 1) is located on the left bank of the Mureş river at km 1+100. The pumping station is equipped with 9 Dunărea pumps (6xDV750 + 3xDV5-110) and is 60% functional. Mureş pumping station serves for pumping of an area of 49.861 ha and is subject to Romanian-Serbian Protocol and Romanian-Hungarian Protocol.
2.1.1. Rehabilitation solutions for the pumping station. Dunărea 750 pumps have been removed from production, and for their rehabilitation sub-assemblies can be used from a similar AV 702 pump with a support on the upper floor, which can be adapted to the old pump.

Advantages using the solution described above are that the nominal pump output is approximately 83-85%, general suspended structure eliminates the need to dry the suction chamber when removing the pump from the plant for planned revisions, and better conditions of work safety - both during the removal and the reinstallation of the Dunărea pumps.

2.1.2. Rehabilitation solutions for channels. The drainage channel network is partly used to transport irrigation water to local facilities, which are being expanded into this arrangement.

The total length of the channel network is 986.054 km and is currently functional but partly infested with aquatic, grassy and woody vegetation. Due to the lack of allocated funds, the works that have been carried out during the last 25 years in this arrangement were maintenance works - unclogging of the main channels, maintenance of hydrotechnical constructions, operating buildings and pumping stations (Table 1).

| Drainage arrangement | Objective | Maintenance work                     |
|----------------------|-----------|---------------------------------------|
| Aranca               | channels  | unclogging of the main channel Aranca-Mureş |
|                      | hydrotechnical constructions | weir on channels Ciarda Roşie and Cociohat
|                      |           | overflow weir on Aranca channel       |
2.2. Checea – Jimbolia drainage arrangement
Checea – Jimbolia drainage arrangement was executed in 1970. The gross surface of the arrangement is 54.451 ha, of which drainage capacity represents 52.560 ha. Checea – Jimbolia drainage arrangement is located in Timis county, near by Romanian-Serbian border. [4]

From the hydrographic point of view, the area is part of the Bega – Veche basin. Checea – Jimbolia drainage arrangement consists of 8 drainage units. Evacuation of excess humidity in the arrangement is made by pumping water into the Bega – Veche River.

There are 5 pumping station: Cenei I and II with a flow rate of 18,62 m³/s, Bobda I with a flow rate of 2,88 m³/s, Jimbolia with a flow rate of 2,22 m³/s, Grabiți with a flow rate of 2,0 m³/s, Comloș with a flow rate of 1,14 m³/s.

Cenei pumping station (Figure 2) is the main pumping station and consists of 2 units (Cenei I and Cenei II) and is equipped with 3 DH750 pumps, 1 Brates 500 pump, 3 DV 5-47 pumps, and 3 DV 2-10 pumps. Cenei pumping station serves for pumping of an area of 46.651 ha.

![Figure 2. Cenei pumping station](image)

2.2.1. Rehabilitation solutions for the pumping station. The pumps have been removed from production, and for their rehabilitation sub-assemblies can be used from other similar pumps. For future rehabilitation, it is recommended that the pumping station to be retechnologized with newer generation pumps.

2.2.2. Rehabilitation solutions for channels. The total length of the channel network is 828.507 m and is currently functional but partly infested with aquatic, grassy and woody vegetation. Due to the lack of allocated funds, the works that have been carried out during the last 25 years in this arrangement were maintenance works - unclogging of the main channels, maintenance of hydrotechnical constructions, operating buildings and pumping stations (Table 2).
Table 2. proposed work to be carried out within the Checea-Jimbolia drainage arrangement

| Drainage arrangement | Objective | Maintenance work |
|----------------------|-----------|------------------|
| Checea-Jimbolia      | unclogging of channels CPE, CS2, CS3, CS4, CS6, CS8 and CS8a | weir on channels CS6, CS7, CS8, CS8a, CS9 |

2.3. Sânnicolau-Saravale drainage arrangement

Sânnicolau-Saravale drainage arrangement was executed in 1958 and additional work has been carried out in 1986. The gross surface of the arrangement is 19.998 ha. Sânnicolau-Saravale drainage arrangement is located in Timis county, near by Romanian-Hungarian border. [5]

From the hydrographic point of view, the area is part of the Tisa-Mureș basin. Sânnicolau-Saravale drainage arrangement consists of 4 drainage units. Evacuation of excess humidity in the arrangement is made by pumping water and gravitational into the Mureș River.

There are 3 pumping station: Cenad reversible with a flow rate of 3,0 m³/s, Cenad amplification with a flow rate of 8,8 m³/s, Sânnicolau with a flow rate of 6,0 m³/s.

Cenad reversible pumping station (Figure 3) is the main pumping station and is equipped with 2 VSK-8R pumos. Cenad reversible pumping station serves for pumping of an area of 3.438 ha for drainage works and 638 ha for irrigation works, with a potential for irrigation of 12.738 ha.
2.3.1. **Rehabilitation solutions for the pumping station.** The pumps are technologically overcome and require replacement. For future rehabilitation, it is recommended that the pumping station to be retechnologized with newer generation pumps which can provide water demands for irrigation arrangements.

2.3.2. **Rehabilitation solutions for channels.** The total length of the channel network is 402,000 m and is currently functional but partly infested with aquatic, grassy and woody vegetation. Due to the lack of allocated funds, the works that have been carried out during the last 25 years in this arrangement were maintenance works - unclogging of the main channels, maintenance of hydrotechnical constructions, operating buildings and pumping stations (Table 3).

| Drainage arrangement | Objective     | Maintenance work                  |
|----------------------|---------------|-----------------------------------|
| Sânnicolau-Saravale  | channels      | unclogging of channels Silvia, Mureșan and Aranca |

**Table 3.** proposed work to be carried out within the Sânnicolau-Saravale drainage arrangement

3. **Results and discussions**

As can be seen in the data presented in this study (Figure 4), rapid and efficient intervention is needed in rehabilitation and retechnologization of primary importance component in the analyzed drainage arrangements.

![Figure 4](image)

**Figure 4.** Data presented in this study

Rehabilitation works are aimed at the proper functioning of the arrangements, for excess humidity evacuation from agricultural land, the decrease of the energy consumption, the increase of the pumping stations efficiency in the drainage facilities and for sustainable and efficient exploitation. [6]

In recent years, due to the drought, agricultural production has been greatly reduced, which has led local authorities and large agricultural holdings in the area to request farmland irrigation. Through the proposed investment, spending on stable agricultural produce will be made more efficient using modern technologies.
4. Conclusions
Due to the priority maintenance, the drainage facilities are functional but require further repairs and intervention. At the same time, poor maintenance of the secondary channel network and due to the poor application of the working technology on the agricultural lands, deficiencies can be observed in the drainage arrangements.

In order to obtain increased agricultural productions on farmland, it is necessary to rehabilitate all the constructions within the drainage facilities, therefore, a collaboration between the state institutions and the landowners is necessary to identify the problems of functionality and ways of intervention, including funds needed for investments.

After a period of time, recently, the financing of maintenance and repair works in the drainage facilities had been re-started. However, further steps are needed to identify funding sources and establish the necessary budgets.

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