

Modernizing Greoni –Ticvani land reclamation system

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Abstract: In this paper are presented regularization works of Lisava, Oravița, Răchitova, Răchitova 1, Fragilor și Potoc Valley, reprofiling of drainage canals, completing the crossing of Greoni Ticvani land reclamation system. The draining surfaces Caras River floodplain is also are presented in the paper. The area under study is 1200 ha and includes drainage works and corresponding hydrotechnical constructions. Works that were performed had a positive effect on the environment, removing excess moisture from the soil and excess moisture from precipitations directing to drainage channels to natural emissaries

Keywords: modernization, reprofiling, water supply regulation works, drainage channels, hydrotechnical constructions.

1. INTRODUCTION

The area planted with land improvement works in Caras-Severin is 72571 ha, of which 28627 ha are with drainage systems and 43944 ha by preventing soil erosion.

The Greoni Ticvani drainage system was designed in 1985.

Complex construction of drainage and soil erosion Greoni-Ticvani was executed in the period 1987-1988 and is located on cadastral territory of the village Vărădia, Grădinari, Ticvanii Mare and on cadastral territory of Oravița city, Caras Severin County, and by hidrological point of view is on the left bank of Caras Hidrografic Basin.

The area of Greoni Ticvani land improvement is 3734 ha, from which 3234 is drainage works and 500 ha is preventing soil erosion works. These land improvement has 138451 meter of channels with 88 culverts, 65 stone falls and 3 undercrossing dam with metal clip.

Development scheme designed and includes:

- Establish land erosion, collection and disposal of excess water directed through outlets and channels interception by emissaries of the area and the agriculture on level curves;
- The improvement and regularization of Lisava, Oravița, Răchitova 1, Fragilor and Potoc valley;
- Draining surfaces Caras River floodplain, the areas affected by excess moisture, through a network of open channels, consisting of tertiary channels (CT) with exhaust secondary sewers (SCC) and secondary

channels (CS) and these with direct exhaust into the main channels, CP1, CP2, CP3, CP4, CP20, CP22, CP41 and main sewer CCP3

The main channels, totaling a length of 17070 meters discharged the water by gravity in the emissaries Caras River Valley, Potoc and Fragilor Valley through hydraulic structures (dams undercrossings metal clip), existing and newly executed, and the main sewer CCP3, with a length of 2638 meters, discharged water by gravity, through direct connection, on Potoc Valley.

The natural Lisava, Oravița, Răchitova, Răchitova 1, Fragilor and Potoc Valley, appointed and regularized, has a total length of 20750 ml, discharged waters in the main emissary, Caras River, through direct connection to it.

Regularization of Lisava and Oravița Valley on a length of 4 km by afferent hydrotechnical construction works (falls from gabions, stone falls, pipes culvert) led to obtaining equilibrium slope to that valley arrangement.

2. MATERIAL AND METHOD

By analyzing the hydrographs made on the main outlet points of Caras River it was observed that the gravitational discharges are possible with 2-3 days of restrictions. How long is flood on Caras River, the level being high, does not allow drainage, the metal clips from the crossing of the dam are closed because of high Caras river water pressure and it will be opened after the flood wave passage and decrease level of the river.

Water discharges from the perimeter of preventing soil erosion is by gravity, through direct connection of the channels with the arranged and settled valleys.

The area planted includes the following works:

- Regularization of natural valleys from the area, by calibration of river beds section, for ensuring the collection and transport of excess water from hilly and plain;
- Drainage works through open channel for drainage of ponding and drainage of excess moisture in the soil and the soil surface on land located in the floodplain and high plains;
- Works to combat soil erosion in hilly areas, arrangement consisting of a network of traffic,

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arrangement of land slope, flow regularization on the slopes;

The negative effects caused by excess moisture were removed by hydro and agropedoameliorative works, being removing surface humidity excess through the open channel drainage works, raising, scarifying and application of amendments to improve salted lands.

By applying drainage works, some of remaining water in soil pores is removed and in its place enters the air; soil aeration increase the main effect of the removal of excess moisture is, causing a lot of favorable processes to soil evolution and soil's fertility, like [1]:

- Improving the thermal regime- heated soils early spring, work easier, work is of better quality;
- Increase the mineralization degree of organic matter, renewing the nutritive fund by forming humus;
- Improving the structure, porosity and permeability of the soil and increase the water retention capacity of the soil.

These processes were conducted over a period of 6-8 years depending on the land use technology [6].

The visibly effect of soil's improving quality is manifested by the disappearance of specific weed areas with excess moisture (horsetail, bulrush, reed, cane, etc.) and to specific diseases (powdery mildew, smut etc.) [6].

Operation draining works includes collection, transport and disposal of flows from landscaped perimeters.

The period of operation is conducted throughout the year, but with a maximum intensity in spring season.

Maintenance of drainage works is the ensemble of activities and actions taken to maintain in working order of all the works of a landscaped perimeter.

In addition to maintaining the state of operation, maintenance should also lead to improving the design parameters.

In the period 1989-2014, in accordance with the rules of operation of the complex arrangement of draining Greoni-Ticvani were executed works of service, maintenance and repairs, consisting in:

- destruction of aquatic and woody vegetation from the channels, handmade and mechanic works with brushcutter and Stihl chainsaws, from ANIF, in an area of 1660 ha (Fig.1);
 - Strengthening the channels eroded slopes by perennial grasses, - works that was made manual by leveling, raking and seeding the slope of the channel and strengthen embankments with wattle fences in an area of 23 ha (Fig.2);
 - Maintenance of channels and hydraulic structures (bridges, falls, dams undercrossings with metal clip etc.) to ensure drainage section – works made manually, consisting of mud and silt cleaning the tubes and tubular culverts from the undercrossings pier, cleaning channels on small portions, damaged or clogged by heavy rains or other hazardous weather, realizing a volume of 1350 cubic meters (Fig.3);
 - Clogging the canals and valleys settled for mud deposits, made with draglines, excavators, bulldozers in 38.500 volume mc;
 - Repairs to the hydraulic constructions (culverts-6 PCs., falls to 5 PCs, under crossing pier, with metallic clip-2 PCs., Rapids-3 PCs.) (Fig. 4);
 - Unlock the channels and the hydrological construction from the channel - removing certain obstacles consisting of channels or hydrotechnical constructions, but maintaining the drainage section - 780 volume mc of unsilting;
 - Determining the volumes of works by topographical measurements for the next period, and also the supervision and reception of executed works with third parties for unsilting works;
 - Maintenance of pitching on the hydrotechnical construction of the canals in the area of 72 sq m;
- Maintaining operational headquarters Oravita, this belongs to the complex arrangement Greoni-Ticvani.



Figure1. Clean vegetation on the channels



Figure2 Consolidation in embankments with wattle fences



Figure3. Maintenance works on the counterweights metal clip and maintenance on bridges



Figure 4. Maintenance thresholds and culverts

3. CONCLUSIONS

During this period land reclamation works were performed well, largely succeeding, curbing and combating erosion and removing excess moisture from the surface, ensuring greater extent, optimal conditions for carrying out, on time, agricultural works and obtaining secure and stable production.

There were detected areas within the complex arrangement Ticvani Greoni in that, because the clay texture of the soils, the vertical water infiltration is not permitted, so the arable layer of the soil surface may suffer from temporary excess moisture. In that case is required works to remove excess moisture by thickening network of open channels and hydraulic structures on the network, located in the lowlands and existing natural floods, where usually accumulates excess water.

The proposed drainage channel network has adapted to the new configuration of land holders in accordance with Law no. 18/1991 - on the land fund.

Also were founded serious erosion on the slopes of the drainage canals due to high water flows transported, and the high speed of the water, taking into account the high slope of drainage canals in the plains and hilly, requiring complete the network of concrete falls with cracks, to break the speed and the attenuation slope drainage channel [3]

So, in the landscaped area was found the need to establish land improvement works to rehabilitate Greoni-Ticvani complex arrangement consisting of:

- Expanding the network of drainage channels by creating open channels needed to evacuate excess water from agricultural lands located on lowland areas, on the existing floods route in the area, agreed with land owners;
- Hydraulic structures on the newly established network of channels, but also on the existing drainage channels, affected by erosion;
- Regularization filling on Oravița and Lișava Valley, which are the main water runoff emissaries from the area rehabilitation;
- Reshaping channel CP41 and Răchitova 2 Valley.

The hydrotechnical networks of the rehabilitation are is:

- 4 main sewers: CCS41, CCS42, CCS43 and CS403 in length 10250m;
- 14 secondary channels: CT421, CT422, CT430, CS44, CT4034, CS4011, CS4010, CT4032, CT40321, CS405, CT40341, CT4037, CS410 and CT420, with a length of 7348 m;
- extension of the main channel CP41 with 500 m in length;
- Arrange further Lişava Valley on 2000 m length and with 630 m Oraviţa Valley required for taking water from the area landscaped with rehabilitation;

Hydraulic structures on the newly established network of the channels:

- 8 culverts DN800 on the channels CT421, CT422, CS44, CS40, CS4011, CS4010 and CS405;
- 3 culverts DN1000 on the channels CCS41 si CCS42;
- 3 culverts DN1200, two culverts on the channel CS403 and one culverts on the existing channel CP41, required to access tools within the agricultural parcels;
- 27 threshold falls with cracks, from concrete: 13 falls on the channels CCS42, CS403, CT4032, CS410, 14 falls on existing channels CP41, CS207 and CS430 (Răchitova Valley 2);
- 4 consolidation on the channels confluence CP41, CS410, CS207 and Lişava Valley;
- 4 gabion falls filled with stone, one on Oraviţa Valley and three on Lişava Valley;
- 2 undercrossings dam, DN1000, with metal clip on the channels CCS43 CCS42, on the Lişava evacuation Valley.

After rehabilitation the scheme includes:

- Establish land erosion, collection and disposal of excess water directed through outlets and channels interception by emissaries of the area and the introduction of agriculture on the level courves;

- Arrangement and regularization of Lişava, Oraviţa, Răchitova, Răchitova 1 Fragilor and Potoc Valleys;

- draining surfaces Caras River floodplain, the areas affected by surface water excess, through a network of open channels, consisting of tertiary channels (CT) with exhaust in the secondary sewers (CCS) and secondary channels (CS) and these in turn exhaust into the main channels, CP1, CP2, CP3, CP4, CP20, CP22, CP41 and main sewer CCP3.

The main channels, totaling a length of 17070 ml discharged the water by gravity, in the emissaries of the Caras River, Fragilor Valley and Potoc Valley, through an existing and newly executed hydraulic structures (dam's undercrossings with metal clip). The main sewer CCP3, with a length of 2638 ml, discharged the water by gravity, through a direct connection in the Potoc Valley;

The natural valleys like Lişava, Oraviţa, Răchitova, Răchitova 1 Fragilor and Potoc Valleys, arranged and adjusted total length of 20750 ml, discharged waters in the main emissary, Caras River, through direct connection to it.

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