

Rehabilitation of Drainage Multipurpose Arrangement and Soil Erosion Control Greoni-Ticvani, Caras-Severin County

. Man Teodor Eugen¹, Mutascu Ghita²,

Abstract: Multipurpose arrangement of drainage and soil erosion control Greoni - Ticvani, Caras-Severin County executed during 1988-1989, after 30 years of work still needs rehabilitation. This paper presents the design situation before and after rehabilitation. Based on observations in the field (see photos) have been established and proposed rehabilitation works carried out in 2008 and presented photographs of section 2, works financed by the state budget.

Keywords:

1. INTRODUCTION AND GENERAL ISSUES

Arrangement was designed in 1985 by I.E.E.L.I.F. Timiș beneficiary is I.E.E.L.I.F. Caras-Severin, and project title was: "Caras Arrangement left bank - Greoni-Ticvani area".

Multipurpose arrangement of drainage and soil erosion control was carried out during 1988-1989 and is located on cadastral territory of "Vărădia", "Grădinari", "Ticvaniu Mare" and Oravița city, Caras-Severin county, and in terms of basin area arranged surface is part of the Caras Basin - left bank. Arranged area with land improvement works is 3734 ha, of which 3234 ha drainage and 500 ha soil erosion control, with 138 451 meters of channels on which are located 88 pipes culvert, 65 drops of stone of 3 under-crossings the dike with metallic dampers.

In over 30 years of operation, the measures and maintenance and repair works have been limited, made many damages occur by failing to ensure proper disposal of waters, and protection against soil erosion has considerably decreased. It imposed in 2008 to intervene with the rehabilitation works that will be presented in this paper.

2. ARRANGEMENT SITUATION BEFORE REHABILITATION

Arranged area includes:

- arrangement and regulation works of natural valleys, through calibration section beds for ensuring the conditions for collection and transportation of excess water from the hills and plains;

- drainage works through open channels for water evacuation of ponding and excess moisture from soil and soil surface on lands located in the meadow area and high plains;

- works to combat soil erosion in hilly area, consisting of a network of traffic arrangement, slopes arrangement, leak adjustment on the slopes.

The negative effects caused by excessive moisture were removed by hydromeliorative and soil report for ameliorative purposes works, being removed water ponding and excess moisture by the drainage works with open channels, loosening, scarification and application of amendments to improve the salt lands.

The application of drainage works, part of the water quartered in soil pores it eliminates, air enters in its place, and improving soil aeration is the main effect of eliminating excess moisture, causing a number of processes it favorable for the evolution of soil and its fertility, namely:

- improving the thermal regime - earlier spring warm soils, work are easier, work being better quality;

- increasing the mineralization of organic matter, renew the nutritional background through the formation of humus;

- improving the structure, soil porosity and permeability and increasing water retention capacity of soil.

These processes took place over a period of 6-8 years depending, largely, land-use technology.

Visible effect of improving soil quality is manifested by the disappearance of weeds specific at land with excess moisture (horsetail, bulrush, reed, cane, etc.), as well as specific diseases (powdery mildew disease, smut, etc.), but the physical condition of some arrangement components shows significant damage.

Implementation of rehabilitation works in 2008 was beneficial to ensuring the arrangement functioning closer to the designed parameters.

¹ Faculty of Hydrotechnical Engineering Timisoara, „Politehnica” University of Timisoara, CHIF Department, George Enescu Street, No. 1/A, 300022, Timisoara, Romania, E-mail: eguentman@gmail.com

3. SCHEME OF ARRANGEMENT INCLUDES:

- anti-erosion arrangement of lands, collection and directed evacuation of excess water through outlets and interception channels to the emissaries of the area, and the introduction of farming system on the contour lines;
- arrangement and regulation “Lisava”, “Oravita”, “Rachitova”, “Rachitova 1”, “Fragilor” and “Potoc” valleys;
- drainage of the areas of meadow near the river Caras, the areas affected by excess moisture, through a network of open channels, formed by tertiary channels (TC) with evacuation in secondary collecting channels (SCC) and secondary channels (SC) and these in turn, with evacuation in the main channels,

CP1, CP2, CP3, CP4, CP20, CP22, CP41 and the main collecting channels CCP3.

The main channels, totaling a length of 17070 meters, drains waters, gravitational, in the emissaries of Caras River, “Fragilor” Valley and “Potoc” Valley, through hydraulic constructions (under-crossings the dikes with metallic clamshell), existing and newly made, and the main collecting channel CCP3, 2638 meters length, gravitational water drains through direct connection, in Potoc Valley.

Natural valleys “Lisava”, “Oravita”, “Rachitova”, “Rachitova 1”, “Fragilor” and “Potoc”, arranged and adjusted, total length of 20750 ml, water drains in the main emissary, Caras River, through direct connection to it. (Photo 1 and 2)



Photo 1 – Oravita Valley at the junction with Lisava Valley (2009)



Photo 2 - Lisava Valley downstream of the DN 57 (2008)

The hydrograph analysis made on Caras Raul in the main discharge points, result that the gravitational discharge restrictions are possible 2-3 days, that it takes Caras River flood, level being high, does not allow drainage, metallic dampers from under-crossings the dike are closed because of high water pressure of Caras River and are opened after the flood wave passes and lowers the river.

Drainage from the area of soil erosion is gravitational made; the direct connection of channels arranged and settled valleys.

During 1989 - 2007, hydro ameliorative of multipurpose drainage arrangement and soil erosion control Greoni-Ticvani have been operated and maintained according to the "operating rules" drafted

by the designer, providing functionality and achieve the technical parameters of the project and prevent premature damage and maintenance of various hydraulic elements designed parameters.

Works of operation and maintenance of multipurpose drainage arrangement and soil erosion control Greoni -Ticvani were executed by hydro agents of the ANIF R.A., U.A.Caras-Severin, consisting of:

- herbaceous, water and wood vegetation destruction on the channels - handmade works and mechanical works by Stihl Motor mowers and chainsaws;



Photo 3 – Main drainage channel CP41 threshold drop of concrete, works for the destruction of aquatic vegetation and grassy (2010)



Photo 4 -Main drainage channel CP41 threshold drop of concrete, works for the destruction of aquatic vegetation and grassy (2010)

strengthening slopes of channels eroded by perennial herb - handmade works by leveling, raking



Photo 5 – Culvert pipe DN1000 on CCS43 Consolidation of slopes with fences of wattle (2010)

and seeding slopes to channels;



Photo 6 – Main drainage channel CP41 (2010)

- maintenance of channels and hydraulic constructions (bridges, water drops, under-crossings the dikes with metallic dampers, etc.) - handmade works, consisting of cleaning mud in pipes and river

alluvial deposits at pipes culvert and under-crossing the dikes, the channel cleaning on small areas, damaged or clogged , after heavy rains or other dangerous weather phenomena;



Photo 7 – Under-crossing the dike with metallic dampers Channel CCS42 Lisava Valley Maintenance and repairs works to the metallic damper counterweight (2010)



Photo 8 - Maintenance works on pipes at drainage channel CCS43 (2010)

- release channels and hydro constructions - consisting of removing certain obstacles from

channels and hydraulic constructions in order to provide drainage section.



Photo 9 – Drainage channel CT4032 Cleaning works at the threshold drops (2009)



Photo 10 – Pipe culvert DN800 and threshold drop at drainage channel CS410 (2009)

4. PRESENTATION OF THE REHABILITATION WORKS

During this period of land reclamation works have been performed well, largely succeeding, curb and combat erosion, and removing excess moisture

from the soil surface, and ensures largely optimal conditions for carrying out, in time, agricultural works and to obtain safe and stable production.

Have been detected in multipurpose arrangement of Greoni-Ticvani that because clay texture of the land did not allow the vertical infiltration of water, so that the surface layer of arable soil may suffer from temporary excess moisture, requiring works to remove excess moisture by increasing frequency of the network of open channels and hydraulic constructions on the network, located in low areas and existing natural draws, which usually accumulates excess water.

Proposed drainage channel network has adapted to the new configuration of the land owners, in accordance with Law no. 18/1991 - on the land stock.

Also there have been sharp erosion on slopes of drainage channels due to high water flow transported, but also high speed of water, given the steep drainage channels in the hilly plains, requiring completion of the drops concrete network with weep hole, to break the slope and mitigate drainage rates channel.

So to remove the problems appeared in the arranged area, has been found the need for execution of land improvement works for rehabilitate multipurpose arrangement Greoni -Ticvani, consisting of:

- upgrade the drainage channels network by establishing open channels, necessary for the discharge of excess water from agricultural lands located in the depression areas, on draws route existing in the area, agreed with landowners;
- hydro constructions on newly established network of channels, and existing drainage channels, affected by erosion;
- completion of regularization Lisava and Oravita valleys, who are the main emissaries of water flow in the area from arranged area with rehabilitation works;
- reshaping the channel CP41 and Rachitova Valley 2.

The minimum works have been included in the rehabilitation of the 2008 action included:

- 4 main drains: CCS41, CCS42, CCS43 and CS403, with a length of 10 250 m;



Photo 11 – Drainage channel CCS43 during execution (2008)



Photo 12 – Drainage channels CCS42 during execution (2008)

- 14 secondary channels: CT421, CT422, CT430, CS44, CT4034, CS4011, CS4010, CT4032, CT40321,

- CS405, CT40341, CT4037, CS410 and CT420, with a length of 7348 m;



Photo 13 – Secondary drainage channel CT425 (2008)



Photo 14 – Secondary drainage channel CT40321 (2008)

- extension of main channel CP41 with 500 m;
- adjustment the Lisava Valley to 2000 m and Oravita Valley with 630 m, necessary for taking water from the arranged area with rehabilitation works;
- hydro constructions on newly established network of channels:
 - o 8 pipes culvert DN800 on channels CT421,

- CT422, CS44, CS40, CS4011, CS4010 and CS405;
 - o 3 pipes culvert DN1000 on channels CCS42 and CCS41;
 - o 3 bridges DN1200, two bridges on the channel CS403 and a bridge on existing channel CP41, needed for equipment access to agricultural plots;



Photo 15 – Pipe DN1200 (of caissons) and drop of concrete and rough stone on drainage channel CS403 (2008)



Photo 16 – Pipe DN1200 on drainage channel CP41 (2010)

- 27 threshold drops with weep holes of concrete: 13 drops on channels CCS42, CS403,

- CT4032, CS410, 14 drops on existing channels CP41, CS207 and CS430 (Rachitova Valley 2);



Photo 17 – Threshold drops, pipe DN1000 and consolidation at the junction with Lisava Valley of drainage channel CP41 (2010)



Photo 18 – Threshold drop of concrete on drainage channel CS403 (2010)

- 4 Consolidation at the confluence of channels

- CP41, CS410, CS207 and Lisava Valley;



Photo 19 – Channel CP41 Consolidation with rough stone at the junction with channel CS410 (2010)

- 4 drops of gabions, filled with stone, one on



Photo 20 – Lisava Valley Consolidation with rough stone at the junction with cu Oravita Valley (2010) Oravita Valley and three Lisava Valley;



Photo 21 – Drop from gabions with rough stone on Lisava Valley at km 5+800 (2010)

- 2 dike under-crossing, DN1000, metallic



Photo 22 – Drop from gabions with rough stone on Lisava Valley at km 5+300 (2008)

dampers on channels CCS42 and CCS43 to escape in Lisava Valley.



Photo 23 – Lisava Valley Under-crossing the dike with metallic damper on channel CCS42 (2008)



Photo 24 – Lisava Valley Under-crossing the dike with metallic damper on channel CCS43 (2008)

5. CONCLUSIONS

After rehabilitation of drainage multipurpose arrangement and CES Greoni-Ticvani, works executed in 2008 and financed from the state budget, of investment, we managed to stop the total erosion occurring on slopes of the drainage channels at their confluence with the emissaries, as well as evacuation of excess water from land, in the principal emissaries and then in Caras River. Both the drainage works, as well as those of soil erosion control, earthwork contain large amounts of excavations, leveling, transport which requires machinery and production equipments performance and increased productivity for these categories of works, which currently are not in the ANIF endowment. Vegetation control works were executed mostly manual, which is unacceptable in the current technologies available worldwide, so in this case are required equipments and performance machineries.

References

- [1] *Project. No.862* "Arrangement Caras left bank - Greoni-Ticvani area" under Contract no. 862/1985 Details and Execution Estimate by object - written and drawn pieces;
- [2] *Rules of Operation* for the "Arrangement Caras left bank - Greoni-Ticvani area"
- [3] *Project No. 862* Based on Addendum. 1 of 2006. Details and Execution Estimates, General designer S.C. SAIF-TIM S.A. Timisoara
- [4] *Operating Course* 1983
- [5] *Operating Course* 1992