ABSTRACT

Human communities have developed, since ancient times, first in well-drained natural regions, in the area of streams and rivers. As the population grew, more and more land was needed to produce food, and people soon realized that the best soils for farming were in river valleys and coastal plains. Since the Middle Ages, through the construction of dams, the regularization of rivers, the digging of canals and ditches for the evacuation of excess water from rainfall and water leaks have allowed the recovery of many agricultural lands.

Underground drainage has developed mainly in areas with temperate climates: Europe, Russia, North America. Today, it is also used in semi-arid and arid areas as an integral part of irrigation in agriculture.

Thus, Seikan I. A. (1968) points out that drainage allows the execution of land preparation works and sowing in the optimal period 2-3 weeks before, compared to undrained land.

Thus, the present doctoral thesis aimed to provide specialists and farmers with information on the ways of rehabilitation of irrigation and drainage-drainage arrangements, rational exploitation and their extension in the studied area.

According to the requirements, the paper consists of two parts, namely the current state of knowledge and the part of personal contributions. The first part summarizes the evolution of the concerns for regulating the water regime at the surface and on the soil profile so as to ensure favorable conditions for the development of the root system and the growth of plants as a whole, so that regardless of the evolution of the rainy regime. healthy, profitable. After a review of the specifics of the hydrotechnical arrangements of irrigation and drainage-drainage in several areas of the globe, the situation specific to our country is presented.

It is thus shown that the irrigation arrangements developed mainly between 1970 and 1990, the developed area reaching 3.2 million hectares at the end of the interval.

Unfortunately, the socio-economic conditions that followed produced a decline in this field of activity, the area actually irrigated being reduced to 11% of

the agricultural land fund with annual variations determined by the amount and dynamics of the precipitation regime.

Low hydraulic efficiency and high cost of electricity are the main drawbacks for most systems such as those with high pressure pipes for sprinkler watering. As a result, irrigation infrastructure can no longer be used for almost 75% of the total. Those who have maintained their physical condition are unfortunately inefficient in terms of water and energy consumption, which is why farmers cannot use them in a practical way.

That is why it is necessary to rehabilitate these facilities and, moreover, to extend them.

Excess moisture in the soil can be periodically permanent, it is determined by internal and external factors. Heavy rainfall, river floods, high groundwater levels and depressive relief are all external factors that contribute to soil properties (poor drainage due to fine texture or the presence of clayey, heavy or compacted horizons).

Excess moisture causes reduced soil aeration, slowing down oxidation processes and insufficient mineralization of organic waste.

The first dam works in the Big Island of Brăila were executed in the area of Frecăței, Băndoiu and Strâmba localities.

The dam of the whole Island was built in 1964, through a circular dam, designed with a 10% insurance quota, with a length of 152 km and an average height of 4 m. The protected area is 71,994 ha, and the dam area damage of about 4,700 ha.

The embankments deposited in the body of the dam amounted to 10 million m3, which means 63 m^3 / ml of dam and 152 m^3 / ha dammed. In cross section, the dam has a canopy width of 5.5 m, and slopes of 1/4 on the outside 1/3 on the inside.

The high waters of 1970, 2006 and 2010 forced the canopy quota to be raised to 1%.

The evacuation of excess water due to precipitation and infiltration from the Danube and irrigation systems, led to the design of drainage works in the seventh decade of the last century which consisted of the construction of 7 independent systems serving areas of 5,000 to 15,000 ha. The total length of the canal network of about 1,500 km was built by moving earthworks volumes of 20 million m^3.

To control the groundwater level in the depression areas, drainage networks with absorbent tubes and collectors were built. The discharge of the captured water was carried out by means of 17 pumping stations, with flow rates between 0.6 and 1.4 m^3 / s.

The documentary study consists in consulting, analyzing and interpreting the contents of 173 bibliographic titles. Based on this study, the extent to which human communities have managed to solve the problem of hydro-amelioration interventions was highlighted.

Scientific approaches have been particularly productive, with research institutes and stations and the work being done - now largely obsolete - proving the interest of researchers in the country in arranging irrigation work, drainage drainage and combating soil erosion.

After establishing the research problem and the bibliographic documentation, the investigation protocol was elaborated according to the particularities of the analytical studies.

Scientific research in the field of agriculture means that in addition to studies in the experimental fields, other types of research should be used, based on the case study, for example.

Chapter 2 is dedicated to the characterization of the natural setting of the Great Island of Brăila. It is shown that the increase of the temperature on the background of the decrease of precipitations determines in the studied area an uncompensated annual deficit over 222 l / m^2.

In this situation, difficulties are created in the work of the soil and germination is prevented.

Chapter 3 contains references to the purpose, objectives of the study, research material and method. It is specified that the purpose of the work is to inventory the irrigation and drainage-drainage arrangements in the Big Island of Brăila and to analyze the possibilities of their rehabilitation to ensure the favorable environment for modern, high-yield agriculture, in the conditions where it is possible to adjust the water regime to the surface of the ground and to the soil profile,

In order to achieve this goal, action was taken to solve the following objectives:

1. Establishing technical solutions for the rehabilitation and improvement of the functionality of irrigation facilities;

2. Identifying the technical variants for the rehabilitation and improvement of the functionality of the drainage-drainage arrangements;

3. Estimation of the technical efficiency of the hydro-ameliorative facilities rehabilitated in the light of the economic results obtained at the main plants cultivated in the area;

4. Proposals to increase the efficiency of hydro-amelioration intervention in the conditions of preventing soil degradation.

In order to know the latest achievements in the field of study, 173 bibliographic sources were consulted with authors from both the country and abroad.

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Scientific research in the field of agriculture means that in addition to studies in the experimental fields, other types of research should be used, based on the case study, for example. It has a different character to the interpretation of the manipulation of experimental variables, often based on retrospectives. Therefore, the analytical study consisted of field observations and analysis of data obtained from specialized state institutions (ANIF, APIA, Brăila County Agricultural Chamber, local mayors, etc.).

The data obtained during the study from the specialized state institutions and the data resulting from the field observations constituted a database which was then processed and interpreted according to the research objectives.

In this regard, the method of observation and analysis of measured values was used throughout the period of scientific investigations.

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Chapter 4, the variants of remedying this state of affairs by presenting the works from the irrigable perimeters are presented, the irrigation arrangements from the reference area and the works carried out in the plot no. 37 for the rehabilitation of the network of canals, pipelines, and pumping stations and for the modernization of automation and control facilities.

After reviewing the current components of the environment in Balta Brăilei, the components of the analyzed irrigation plot are presented in detail. The irrigation plot consists of seven semi-stationary pumping units, consisting of horizontal centrifugal pumps type NDS driven by 75 Kw and 100 Kw electric motors, which pumped water from the AC supply channel into underground pipes located bilaterally.

Rehabilitation works of pressure stations.

In plot 37, 7 pumping stations were built on the site of the former pumping stations.

The changes made to the initial solution were imposed by the technical-functional characteristics of modern irrigation equipment that differ from the old ones by higher values of flow and pressure.

The modernization works were carried out on the sites of the initial constructions. We opted for the version with pumping stations with concrete tank.

Buried underground cement pipes with diameters between 125 and 300 mm, have a length of over 31 thousand km and distribute irrigation water over an area of 1920 ha. In practice, these are 14 antennas located equidistant at 650 m, which are mounted 455 hydrants Dn100 mm.

The design considered the use of sprinkler systems equipped with a number of 17 ASJ-1M sprinklers. In the conditions in which no maintenance works were carried out, the pipeline network deteriorated and the hydrants, most of them, were destroyed.

The proposed repair and modernization works were designed to ensure the operation of the irrigation network by repairing or replacing the existing pipe sections and new hydrants were procured, their position being signaled to prevent their breakage by agricultural equipment.

Electrical installations are installations of strong currents, namely: electrical distribution and supply to specific consumers, lighting, as well as elements of protection against electric shock and surges.

Low-current installations consist of installations for measuring and transmitting various parameters, including control.

As none of the components of old electrical installations and equipment, including transformers, fuses and medium voltage disconnectors, are currently replaced, they have been replaced with new equipment by the local electricity supplier.

Thus, the supplier carried out the power supply works for each location, as well as the column up to the measuring equipment that will become the separation element of the installations.

Chapter 6 is dedicated to the presentation of the complex dam and drainage works carried out to highlight the potential of this territory removed from the flood waters.

To highlight the potential of this territory removed from the runoff, complex dam, drainage and irrigation works have been provided.

In the first stage, the embankment, the main drainage network (collector and drainage channels), deforestation, deforestation, leveling, systematization of settlements and roads were carried out, and in the second stage, irrigation was introduced, the drainage network was completed and drainage works have been carried out.

embankment works in the Great Island of Brăila protected some agricultural areas and human settlements (Frecăței, Băndoiu and Strâmba).

In 1957-1959, the I.A.S. The willow raised by 5% the dam that closed an agricultural area of 4,200 ha, drained with a network of canals totaling 41 km and irrigated on 3,070 ha, with water from the Măcin arm, pumped through two floating stations with a total flow of 1.7 m^3 / s.

The drainage arrangements executed during 1979-1985, on an area of 9,347 ha, were organized on 19 systems: 13 for field drainage, 4 for intercepting infiltrations from the river and 2 for taking over infiltrations from irrigation supply channels. Corrugated (rifled) tubes from P.V.C. 50, 80 and 110 mm in diameter and to a lesser extent ceramic tubes, geotextile filter materials (drainage, liatex, madrid), discharge holes from prefabricated concrete parts, P.V.C. and asbestos cement.

Among the technical parameters of the drainage works can be mentioned: specific drainage flow 0.6 l / s · ha, slopes of the absorbing drains 2 ‰, lengths of the drain lines 150-180 m, frequent distances between drains 25-40 m and their laying depth 1.10-1.70 m.

The belt drainage at the dam was executed on the surface of 2,170 ha and consisted of five drainage lines arranged at variable distances between the drainage lines of 20-50 m, the strip covered with belt drainage having a width of 175-265 m.

The drainage network has a total canal length of 1,500 km, representing a density of 0.2 km canal / ha.

In order to evacuate the waters coming from precipitations, infiltrations from the Danube and losses from the irrigation systems, in the period 1965-1970 seven independent systems were drained by executing, with surfaces between 5,000 and 15,000 ha. The total length of the canals is about 1,500 km, and the average depth is 2 m. The total volume excavated amounts to 20 million m^3.

The main drainage channels, located at distances of 350-1,000 m, have rectilinear routes, and the collecting channels follow the routes of the main natural privals: Filipoiu, Gemenele, Maicanu, Boul s.a.

After 1976, a part of the network of lower order collecting channels was abolished in order to mechanically move the watering wings on about 45,000 ha. It should be noted that the lack of these elements of leakage regulation was highlighted in the excess periods, the new tertiary channels being located on the same locations as the demolished canals.

For more rigorous control of groundwater in the lowlands, for the interception of seepage in the area of the dam to high water and those in the irrigation canals, tubular drainage works have been introduced in local systems, the water being collected through canals or collector drains. In order to take over the water from the drainage arrangements, 18 pumping stations were provided, with flow rates between 0.6 and 1.4 m^3 / s.

Currently, the drainage works serve a gross landscaped area of 69,241 ha (net 65,571 ha). The water is evacuated through 30 pumping stations, in the Danube, from the entire surface of the arrangement (6 reversible pumping stations: Filipoiu, Gemenele, Maicanu Dig, Titcov Dig, Salcia Dig and Bălaia Dig and 24 drainage pumping stations).

In order to bring the CA8 supply channel up to level, work was carried out to unclog and restore the wall from monolithic concrete slabs poured on a reinforced site with STM 6 mm mesh with 100x100 mm mesh starting upstream, in the following sequence: unclogging and deforestation of the channel of deposits and vegetation, according to the projected profile; manual finishing of slopes to bring the canal to the level; scattering of deposits on the banks of the canal that will represent the germination bed; clearing broken tiles and transporting rubble by dump truck; rearranging displaced tiles and filling in missing tiles; wall lining with 0.8 mm HDPE geomembrane type foil; pouring B200 concrete slabs in fields of 2 sqm, divided into joints of 2.5 cm and thickness of 6 cm; wall grouting with cement mortar to a depth of 4 cm.

For the rehabilitation of the bridges, action was taken to restore the water transport capacity by clearing the area in the crossings.

For the rehabilitation of the AVIO - AVIS dams, the following categories of works were provided: dismantling and reassembly of the dam after repair; execution of anticorrosive painters on metal constructions; road transport of materials; dam installation.

Chapter 6, entitled “Technical solutions for the rehabilitation and improvement of the functionality of drainage-drainage facilities in the Big Island of Brăila” is dedicated to the presentation of the complex dam and drainage-drainage works carried out to highlight the potential of this territory removed from overflow waters.

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Chapter 6 analyzes the economic efficiency of wheat and corn crops after the rehabilitation of hydro-improvement facilities.

The economic efficiency of wheat cultivation was carried out for the varieties Miranda, Glosa and Joker in the years 2018-2019 cultivated in irrigated and non-irrigated system.

In order to determine the economic efficiency of agricultural products, the main determining elements were taken into account: costs, prices, profit and profit rate. In order to reflect as accurately as possible the necessary efforts, as well as the obtained effects, we will study the practice of conventional agriculture in irrigated and non-irrigated system.

During the experiments, the influence of wheat variety factors and cultivation conditions (irrigated or non-irrigated) on wheat production was monitored.

This paper presents some of the results on the economic efficiency of the irrigated and non-irrigated wheat crop regime.

For each experimented variant, technological sheets were drawn up in each of the two experimental years.

On average for the two experimental years (2018-2019), the yields obtained, in irrigated and non-irrigated system, are between: 7211.5 kg / ha and 5475.5 kg / ha for the Glosa variety, 7840.5 kg / ha and 5389 kg / ha for the Miranda variety and for the Joker variety 7616 kg / ha and 6121kg / ha.

Analyzing the results obtained between 2019 and 2020, it is found that the highest profit for wheat was obtained for the Joker variety in non-irrigated regime (562.5 lei / ha) and respectively for the Miranda variety, in irrigated regime, which was 689.48 lei / ha.

For maize, the maximum profit was accustomed to the FAO 570 hybrid both in non-irrigated regime (511, 57 lei / ha) and in irrigated culture (3622.26 lei / ha).

The thesis concludes with the conclusions and recommendations derived from the observations and research carried out for the operation and maintenance of irrigation and drainage-drainage arrangements for obtaining profitable crops in terms of preserving the fertility of the soil.

Thus, for the efficient operation of the irrigation and drainage arrangements, it is recommended to permanent the exploitation personnel.

In order to save irrigation water and reduce production costs, it is recommended to include watering in the dynamics of the rainfall regime.

As it has been found that after damming there is a tendency for the accumulation of soluble salts on the soil profile, it is necessary to periodically monitor the evolution of this phenomenon in order to prevent, through appropriate measures, applied in time, the negative effects.

One of the important factors that determine the evolution of the salinization process being the groundwater, in the exploitation of the dammed enclosure it is necessary to create a network of hydrogeological wells, to follow both the variation of the level and the quality of these waters. These observations will be the basis for the further development of the drainage-drainage network.