

ABSTRACT

Irrigation provides the necessary water for cultivated plants growing, under insufficient precipitation conditions. Numerous irrigation arrangements were established after 1965 but technological requirements of that period implied serving very large areas, by high energy consumption and large water losses exploitation systems.

Under the conditions of practicing sustainable agriculture, there is a need of enhancing the value of irrigation systems from our country by retechnology and modernization. Alining current technological requirements, through a reduced electric energy consumption and eliminating water losses on the network, are priority requirements in order to upgrade the irrigation system in Romania.

The work entitled *Reserches on effeciency of irrigation arrangements in The OUAI“ Aqua” Soloneț North Bivolari, Iași County*, addresses a current topic, analyzing economic efficiency of rehabilitation works of a pressurization station and a section of secondary irrigation infrastructure.

Approaching a theme of establishing irrigation efficiency under the conditions of rehabilitation and modernization the irrigation arrangements is a necessity, as these require very high costs, the necessary funds being provided both from national sources and E.U. funds for projects and programs for rehabilitation and development of irrigation systems.

In chapter I, entitled *The current state of knowledge in the field of facilities for irrigation*, there were analyzed different methods of watering and types of facilities used for irrigation, highlighting the advantages and disadvantages of each method. At the same time a bibliographic study was made, regarding the studies and researches on the evolution of irrigation arrangements both on international and national level.

Chapter II, entitled *Characterization of the natural environment in the middle hydrographic basin of the Prut river*, describes from the relief and pedoclimatic conditions point of view, the area on which researches were carried out. Thermal and precipitation regime was analyzed for a period of 8 years (between 2014-2021).

In chapter III, entitled *General data on The OUAI “Aqua” Soloneț North Bivolari, Iași County* information is presented on organization setting, area served and its members. In the second part of the chapter the Pressurization SPP1b Station which serves the territory of organization is described. At the end of the chapter was presented general data about SCPanifcom SRL Iasi, as founding member of this organization, on which studies of economic efficiency for irrigation facilities were carried out.

Chapter IV describes *The purpose and objectives of the study*, as well as the analysed material and methods of study used. The purpose of the paper is to assess the economic efficiency of irrigation facilities within The OUAI "Aqua" Soloneț North Bivolari, Iași County, as a result of rehabilitation of irrigation system from the same OUAI. This economic assessment is represented, in the end, by the increase in production obtained on irrigated crops compared to those non-irrigated.

Through the theme of this doctoral thesis I aim to achieve the following objectives:

- Analysis of the irrigation system within The OUAI "Aqua" Soloneț North Bivolari, Iași County before rehabilitation;
- Technical-economic analysis of various scenarios for rehabilitation of irrigation system;
- Analysis of optimization irrigation process as a result of rehabilitation of the irrigation system, through observation the influence of upgrading the pumping station on some consumption indicators and on the operating efficiency;
- Analysis of economic efficiency of the rehabilitated irrigation system both through analysis of consumption indicators and analysis of operating efficiency of The SPP1 Pumping Station, as well as through economic analysis of the increase production resulting as a result of irrigation the crops of S.C. Panifcom S.R.L. Iași.

The analyzed material was represented by the rehabilitation and modernization works for the SPP1b Pumping and Pressurization Station within The OUAI "Aqua" Soloneț North Bivolari irrigation system, Iași County.

The biological material studied is represented by crops of corn, corn grown for silage, wheat and alfalfa-lucerne, which were analyzed from economic point of view under both forms of culture: in irrigation and non-irrigation system.

Research methods were different, for each stage of the study requiring general and/or specific documentation, field study and analysis of documents for The OUAI "Aqua" Soloneț North Bivolari and SC Panifcom SRL Iași. The main economic efficiency assessment indicators analyzed, for each culture and culture system were: direct costs, indirect costs, irrigation costs, depreciation, total costs, productions obtained, selling price, production increase expressed in quantity and value form (money).

Chapter V, entitled *Results regarding arrangements for irrigation within The OUAI "Aqua" Soloneț North Bivolari, Iași County*, addresses the technical solutions that were proposed and the final ones, in order to rehabilitate and improve functionality of the irrigation arrangements of the SPP1b Pumping and Pressurization Station, as well as secondary irrigation infrastructure. For the

beginning, the situation of irrigation arrangement before rehabilitation was presented, then the entire rehabilitation process of pressurization station, by components, as well as the secondary irrigation infrastructure was listed. This chapter also presents the calculation for water requirement for crops, the irrigation rate and water consumption for each crop. The last part of this chapter is reserved for the presentation of the operating behaviour of the irrigation system within The OUAI "Aqua" Soloneț North Bivolari, Iași County, as well as for annual repair and maintenance costs.

In chapter VI, *Results regarding irrigation arrangements efficiency within The OUAI "Aqua" Soloneț North Bivolari, Iași County*, the technical-economic analysis of the agricultural holding is presented. As part of this analysis cost-efficiency indicator of the investment project in irrigation development was detailed, by comparing the norms of electricity and water consumption in the two analyzed situations: before the rehabilitation and after retrofitting.

Then, the sprinkler irrigation equipment, property of SC Panifcom SRL is presented, both from the point of view of technical characteristics and operational performance. The economic analysis continues with presentation of cultivated areas by SC Panifcom SRL, both under irrigated and non-irrigated conditions, during analyzed period (years 2014-2021). The productions obtained by surface unit are correlated with the cropping system (irrigated and non-irrigated), as well as with the registered precipitation during the critical phenophases of the crops.

An evaluation of the overall economic performance follows, calculating the direct costs, the indirect ones, the irrigation costs for each crop and for each year crop. The assessment of economic efficiency of irrigated crops rests from the profit made on irrigated crop, i.e. the sum of the income from the sale production, deducting the total costs generated by each crop separately. The increase in production obtained as a result of irrigation was expressed as a percentage, quantitatively and in monetary form, for highlighting the efficiency of irrigation application to plant culture system.

At the end of the paper *Conclusions and Recommendations* resulting from this study were formulated.

The aspects considered to be personal contributions are:

- performing an analysis of the impact of institutional reforms on irrigated agriculture;
- the full application of the proposed technical-economic for the arrangements of irrigation within The OUAI "Aqua" Soloneț North Bivolari, Iași County;
- the development of the financial-economic analysis of the impact of irrigation for crops, implicitly the appearance of increased production and its quantification.