

ABSTRACT

Keywords: irrigation system under the earth, corn, economic efficiency.

Choosing the crop, preparing the soil, preparing the seedbed, adapting the irrigation method to the crop and soil, monitoring the crop throughout the growing season and adapting the irrigation rate according to climate changes, are some of the stages of obtaining an agricultural crop sufficient to ensure food for the population and to achieve a desired economic efficiency.

The doctoral thesis named "Research on the efficiency of irrigation arrangements within Triticum Săvinești, Neamț county" was developed with the aim of discovering the most suitable irrigation method for the maize crop, located in an area with high humidity and with temperatures that vary greatly in a very short time.

In the present conditions, when periods of drought of a year are more and more frequent, great difficulties are encountered in adapting an irrigation method to a particular crop. But by testing different irrigation methods, under different weather conditions a beneficial correlation/connection is obtained between a reliable irrigation system and increased crop productivity.

The reliability of an irrigation system is given by its correct realization, having the necessary components for a correct operation, carrying out all the repair and maintenance (maintenance) operations, for a long functionality and without too many costs.

The desired productivity of a crop can only be obtained if we follow the steps necessary for the development of the plant, more precisely, we give the plant exactly what it asks for in the quantities it wants. So first of all, when we choose a crop, from which we want a large profit, we must test the plant very well and satisfy all its needs, from all points of view (need for water during the vegetation periods, fertilizer, etc.).

For each arable land, geotechnical and pedological analyzes are carried out, in order to know the structure of the land and the substances existing in it, and subsequently

to be able to supplement the amount of substances, if necessary, with nutrients useful for the development of the plants to be cultivated.

In order to achieve the proposed objectives, we carried out a series of activities, including: establishing a work plan, creating the experimental field with a maize crop, fully applying all the technological procedures initially established, taking soil samples, followed by an analysis in situ and in the laboratory, regarding the physical condition of the soil, the determination of the production characteristics and the analysis of its dynamics, and last but not least the analysis of the results obtained and the substantiation of the implementation of the technological variant adapted to the conditions in the field.

The research was carried out in Neamț county, at the commercial company Triticum, more precisely in the town of Săvinești. The land on which the experiments were carried out is characterized by a slope of approximately 15% and is a cambic chernozem type soil, having a slightly acidic pH, with a value of 6.5, with a humus content with values between 3.5 and 4.2%, the supply of nitrogen is medium and the content of potassium and phosphorus have values suitable for the crop. The experiences were taken from the 61 hectares, taken at random.

The doctoral thesis is composed of two parts and comprises six chapters. In the first part, research is presented regarding the current state of knowledge up to now, regarding the topic under study.

The second part includes the natural setting in which the research was carried out, the material used and the research method, as well as the own results followed by conclusions and recommendations.

Chapter I, "The importance of irrigation facilities in the sustainable development of agriculture" - includes data on relevant achievements in the field of irrigation infrastructure, the current situation of irrigation facilities globally, the current state of the irrigation sector in Romania and the necessity and opportunity research.

Within this field of anthropic activity, we can distinguish both the hydro-technical works aimed at the design, execution, operation and maintenance of facilities for capturing, adducing and distributing water to plants, as well as the specific works of agricultural exploitation expressed, in particular, through the methods of controlled

moistening of the root layer in the soil, in accordance with the requirements of the crop plants. The two categories of works are interconnected in such a way that an irrigation arrangement (autonomous or in complex) can be exploited with maximum efficiency only through a suitable agricultural operation, i.e. through the rational application of irrigation and through the systematic performance of all agrophytotechnical and hydropedameliorative works appropriate to the new conditions offered by the respective arrangement.

Chapter II, "Characterization of the natural environment in Neamț County" - includes the current state of knowledge with reference to the geographical position of Neamț County, features of the relief, climatic characteristics, hydrographic, hydrological and hydrogeological characteristics, aspects regarding vegetation and fauna, followed by the geological study and pedological.

Currently, the planting of cereals (as well as other field crops) in the North-East of Romania represents a major risk, due to the particularly dry climate (the area is classified as the "drought pole" in Europe), with low periodic precipitation. Atmospheric droughts that turn into soil droughts and in some cases even hydrological droughts are a very frequent and irregular phenomenon in this area. The occurrence of drought reduces yield, both in terms of production quantity and quality. Effective prevention of the negative effects of drought is achieved by irrigating the maizecrop with adequate amounts of water in each growing season, corresponding to the optimal watering plan.

Chapter III, "Purpose, objectives and research method" - including the research methodology and the material used.

The aim of the research was to develop an optimal model that would highlight the necessary measures to improve the efficiency of irrigation systems and quantify the effects of maize irrigation on the significant increase in production, depending on the indices that characterize the moisture content during the critical periods of vegetation.

Regarding the technical-economic side with applicability in practice, the aim was to establish viable and effective solutions for improving the operating yields of irrigation facilities, by reducing water, energy and fertilizer consumption, with direct effects in increasing agricultural production and reducing production costs; was aimed at

developing appropriate measures to ensure the increase in the quality of agricultural production by reducing the consumption of chemical products (chemical fertilizers, pesticides, etc.) as a result of the application of efficient irrigation, the accurate knowledge of the soil content in nutrients and the control of limiting factors (pH , salinity, etc.).

Chapter IV, "Technical solutions for the efficiency of irrigation facilities in Neamț county" - which includes the current state of the environment and irrigation in Neamț county, considerations regarding current and prospective agriculture, the main technical characteristics and specific parameters of the research objective, the presentation of the schematic diagram of the irrigation system, the description of the main components, the operation and maintenance of the irrigation system, the presentation of the irrigated surface, the technological elements of the sown crops, the classification of the crop categories (in the period 2019-2022), the influence of irrigation on the microclimate, the influence of irrigation on the total water consumption of maize culture, the influence of irrigation on production, the material basis of the commercial company Triticum, the objectives of the company followed by the analysis of another irrigation method, with the aim of finding out which of these methods is more effective for maize culture.

In view of the research, I noted the existing problems in both methods studied, following some procedures, remedial measures were carried out, by replacement or repair, and the irrigation systems were brought back into operation, adapting them to the requirements of the culture.

Chapter V, "Economic efficiency of maize crops after the design of the drip irrigation system with buried pipes" - covers the economic efficiency of the maize crop irrigation after the system design.

In order to determine the water consumption for the maize crop using a drip irrigation system having buried pipes, several factors must be considered, such as the type of soil, the stage of plant development, the temperature and humidity of the air, and the amount of recent rainfall.

In general, it is recommended that maize receives between 25 and 50 mm of water per week. To measure the amount of water applied, an irrigation system with moisture

sensors can be used to help measure the amount of water applied in real time. It is also possible to monitor the condition of the soil, by adjusting the amount of water according to the needs of the crop. In the case of the drip irrigation method with buried pipes, we do not depend much on the climatic conditions, because the water administered to the plant is placed directly at the root system.

Investments in irrigation facilities have a favorable impact on the environment, during the drought, it creates a wetter microclimate in the irrigated area, combats aridification, reduces water losses, and together with this, the consumption of electricity and water resources is reduced. For 4 years (2019-2022) we followed and analyzed the maize crop in non-irrigated and irrigated conditions.

In our country there are considerable risks to climate change, the effects being clearly determined by changes in the temperature regime and precipitation.