TECHNICAL AND FUNCTIONAL CHARACTERISTICS OF THE IRRIGATION SYSTEM FROM SC LIVADA MERE DE ITEŞTI SRL BACAU

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Abstract

High-performance agriculture is achievable based on investment: starting from a high-quality seed or propagating material, ensuring optimum conditions for growth and development to reach, in the end, a higher value for production. By providing the crops and plantations with the water need, a significant increase in productions obtained. To this purpose, it is necessary to invest in irrigation systems, because the annual rain fall is not sufficient or we do not benefit from it in the critical phenophases of the crops. In the fruit-growing farm SC Livada mere de Itesti SRL Bacau, the drip irrigation system, which is currently considered the best method for irrigating the orchards, is installed. Designed on an area of 17 acres cultivated with apple trees, of different varieties, the irrigation system consists of: front assembly, transport-distribution pipe, connecting pipes, and watering pipes provided with droppers. By accessing European funds, through the PNDR, it was possible to make are conversion investment of the fruit plantation, to equip it with a drip irrigation system, as well as to modernize the fleet of agricultural machines and equipment. The work aims to present an irrigation development model, a model successfully implemented, thanks to the funds.

Key words: drip irrigation system, fruit growing farm, European funds

Apple fruits, bringing a considerable contribution to the human body, through their rich content in active principles, are grown on large areas in our country. The apple tree, being a species with a high water consumption, there is the need to replenish the water intake by irrigation, in almost all areas of the country.

Drip irrigations recommended, regardless of the rootstock or pedoclimatic area of the crop (Kumar, 2017).

The suitable method for fruit plantations is the one by drip with water distribution hoses, connected to the first trellis, which evenly and continuously irrigates the soil strip along the row, on a width of 1-1.2 m. (MADR, 2014).

Among ***the advantages*** of the drip watering method, we recall:

- It is suitable to be applicable on all types of land, regardless of their texture or degree of unevenness;
- It can be achieved with low water consumption, low labour and electricity costs;
- With this method, irrigated plants benefit throughout the year from optimal humidity;
- Water droplets are immediately absorbed by the soil, so there is no risk of crust formation at the surface of the soil;- the water from irrigation, because it does not stagnate at the surface of the soil, is not a vector of cryptogamic diseases;
- Fertilizers or substances for phytosanitary treatments can be introduced into the irrigation water;
- Compared to other irrigation methods, such as those by sprinkler or surface drainage, the yields obtained are higher.

There are a number of ***disadvantages*** to this method of irrigation as well, among which we mention:

- The expenses for the investment in the whole assembly, as well as with the equipment are high;
- There may be difficulties in exploitation due to frequent shutter of the droppers;
- An uneven distribution of water along the watering pipes may occur.

Given that such an investment is more difficult to reach small producers, this work aims to present a model of drip irrigation arrangement, a model successfully implemented, due to the submission of a project in order to access European funds.

MATERIAL AND METHOD

Established in 2014, SC Livada mere de Iteşti SRL owns land with a total area of 17.50 acres located within the radius of two territorial administrative units: in Bereşti-Bistriţa Commune -

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17.00 acres and in Iteşti Commune - 0.50 acres, both in Bacău County.

The company owned at its foundation 15.74 acres of apple plantation, in the stage of decline, the planting period being 1982-1984, as well as an area of 1.76 acres of land in preparation. The degradation degree of the plantation was very high, presenting over 35% gaps. (Cantoriu P., Tudorache A., 2016).

For this reason, it was decided to submit a project in order to obtain European funds, through the National Rural Development Programme.

The opportunity of investing in the establishment of a new apple plantation, on the site of the old, degraded one, appeared with the financing by AFIR of the sub-measure 4.1.a – Investments in fruit-growing farms.

Geotechnical, pedological and agrochemical studies have been carried out, from which it resulted that the location of the plantation, from the point of view of soil and climate conditions, is very favourable for the apple culture, receiving the natural favourability mark of 2.73 and the potential favourability note of 3.43, thus justifying the opportunity of the investment.

All the eligibility criteria being met, the company received funding for carrying out projects for the conversion of the fruit plantation, the installation of the irrigation system and the modernization of the agricultural machinery and equipment park.

Part of the investment is the arrangement of a drip irrigation system.

With the help of calculation formulas, the technical and functional parameters of the entire equipment were determined.

RESULTS AND DISCUSSIONS

The implementation of the project involved the following steps:

- Land clearing;
- Preparation of the land for planting;
- Planting trees;
- Installation of the plantation fencing system;
- Installation of the anti-hail support and protection system;
- Installation of irrigation and fertilization system;
- Construction of the concrete platform
- Construction of the storage and distribution tank with the dimensions length = 40 m, width = 40 m, and a volume of 7008 cubic meters.
- Equipment.

The water used is metered and complies with the hydrographical base management plan under the Water Framework Directive 2000/60/EC in Romania.

Drip irrigation is a method of local irrigation, the water is constantly distributed, depending on the requirements of the plant, in very small quantity, in the proximity of the roots. This way, the water consumption is minimized, and this resource is used with maximum efficiency.

The components of the irrigation development are:

1. The storage and distribution tank (*figure1)* is made by performing a waterproofed excavation with EPDM membrane.

The tank is located in the vicinity of the plantation, to reduce water losses through pipes. The existing space allowed the construction of the tank of 40 m length and 40 m width, and a volume of 7008 cubic meters.

The bottom of the tank has a slope of 2% oriented in the opposite direction of the water flow, which leads to the storage of sediments in the area of water entry.

For security reasons, the tank is fenced with galvanized wire braided mesh, fixed on reinforced concrete pillars. The length of the fencing is 165 linear meters.

2. The tank is supplied from a ***well*** drilled at a depth of 180 m, with a diameter of 200 mm, in the South-East part of the plantation, equipped with a submersible pump that operates seasonally, to fill the tank, with a program of 8 hours / day.

3. The tank ***supply pipe*** is made of high density polyethylene with an internal diameter of 90 mm.

4. ***The transportation-distribution pipe,*** made of high-quality polyethylene, has an internal diameter of 110 mm. It connects the tank to the front assembly. Its length is 7 m. Pipes with a diameter of 355 mm start from the front assembly and fence the entire plantation. Valves, through which water is directed to the connecting pipes, are mounted on them.

5. ***The connecting pipes*** are made of polyethylene and have a variable internal diameter, depending on the location area, from 90 mm to 25 mm. The closest valves have a larger inner diameter. Lengths are variable, depending on the perimeter served.

6. ***The watering pipes,*** also made of polyethylene, have an internal diameter of 16 mm. (*figure 4*). The lengths vary, depending on the length of the row of trees, between 50.6 m and 144.37 m.

7. ***Droppers*** equip watering pipes. Their internal diameter is 5 mm, and these are made of polyethylene. There are two droppers on each tree.

8. ***The front assembly*** *(figure 2*) is located in a container. It includes: main control head, water

meter, pressure regulator (*figure 3 a, b*), fertilizer tanks, antenna connection and filter battery.

9. ***The fittings and reinforcements*** are made of rigid PVC, used for joints and branches.

According to the parameters of the plant, the watering needs are provided, as well as the watering requirements, calculated and shown in *Table1*.

Figure 1 **Storage and distribution tank**

Figure 2 **Front assembly**

a) 

b) 

Figure 3 **Taps and flow regulator**

Figure 4 **Watering pipes**

Table 1

The need and the requirement of water

Water need	Water requirement
Qs med. = 189,61 mc/day = 2,19 l/s	Qs = Kp x Ks x Qs average day
Qs max= 246,49 mc/day = 2,85 l/s	Kp (coefficient of water loss in the network) = 1,02
Qs min. = 73,95 mc/day = 0,85 l/s	Ks (coefficient of water loss in the system) = 1,01
Max. hour Qs = 15.40 mc/h = 4.28 l/s	Average Qs = 195,33 mc/day = 2,26 l/s
	Max. Qs = 253,93 mc/day = 2,94 l/s
	Min. Qs = 76,18 mc/day = 0,88 l/s
	Max. hour Qs = 15.86 mc/h = 4.40 l/s

CONCLUSIONS

S.C. LIVADA MERE DE ITEȘTI SRL practices a modern irrigation method, which ensures an uniform localized watering, on all plants. Water losses are minimal, and the quality of the technique is much superior to other techniques used in fruit plantations.

The equipment of the drip irrigation assembly are placed in such a way that the water losses in the network and in the system are as small as possible.

The storage and distribution tank is in the immediate vicinity of the container that houses the front assembly.

The connecting pipes have different internal diameters to ensure an even flow rate to the entire surface served.

The automation of the flows greatly facilitates the work of the employees, and the entire installation, due to its technical-functional characteristics, is easy to operate.

Benefiting from a good underground water network, the apple orchard, being located in the Siret meadow, makes very good use of the existing natural resources by the drip irrigation method.

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