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EFFICIENCY OF DRIP IRRIGATION COMPARED TO CONVENTIO-NAL IRRIGATION TECHNOLOGY IN THE «DULTI OTA» FARM IN MINGBULAK DISTRICT OF NAMANGAN REGION

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Annotation:
The article presents information on the results achieved when using the drip irrigation method of crops in the Dulti Ota farm, Mingbulok district, Namangan region.

Keywords: Drip irrigation, water transportation, inter-irrigation interval, horticultural crops, peripheral water flow.

Introduction

Irrigation is one of the main elements in the success of growing crops and their efficiency, therefore it requires special attention and study. Improper irrigation, even with high-quality water, can damage both the plant and the soil. Irrigation systems should use irrigation methods and techniques that would ensure the most economical and rational use of limited water resources with minimal production losses. Irrational use of water resources is one of the main reasons hindering the sustainable development of irrigated agriculture in Uzbekistan. One of the ways to solve the problem may be the use of a drip irrigation system.

Drip irrigation was first developed and implemented on an industrial scale, as an independent type of irrigation in Israel, in the early 60s. The positive results obtained in a short time contributed to the rapid spread of drip irrigation in many countries of the world. Drip irrigation is based on the supply of water in small doses to the root zone of plants. At the same time, the amount and frequency of water supply is regulated in accordance with the needs of plants. Water comes to all plants evenly and in the same amount. And exactly as much as the plant needs, without unnecessary flooding of the soil and water loss. In addition, huge water losses due to evaporation during the transportation of water through irrigation channels to plants in the fields are reduced.

The modern drip irrigation system is used in the cultivation of many agricultural and horticultural crops and has a number of advantages in Uzbekistan, for example:

- significant water savings - since only the root zone of plants is moistened, evaporation losses are significantly reduced, there are no losses from peripheral water runoff. During drip irrigation, the aisles, the so-called "ditches", remain dry throughout, compared to traditional irrigation, when water is usually supplied to the ditches.
- significant savings in energy, labor costs, fuel and lubricants and other materials - usually water from channels to the field for irrigation is supplied by pumps. With drip

irrigation, a smaller volume of water is required, which means less pump operation, less electricity or other types of energy (diesel, for example) is spent to operate the pump. Also, a significant saving of labor costs for irrigation is achieved (by 1.3-3 times). Fuel is saved – up to 60 liters per 1 hectare of cotton per season.

- saving of mineral fertilizers by 30-40% – with normal watering, 850 kg of nitrogen fertilizer, 150 kg of phosphorus, 100 kg of potassium chloride are consumed per 1 hectare of cotton field. With drip irrigation, 250 kg of nitrogen, 150 kg of phosphorus, 50 kg of potassium are consumed per 1 hectare. At the same time, the assimilation of mineral fertilizers is 90-95%, and with traditional irrigation only 30-35%. Dissolved fertilizers are applied directly to the root zone along with water during irrigation. There is a rapid and intensive absorption of nutrients. This is the most effective way to apply fertilizers in arid climatic conditions.
- higher yield and product quality – with drip irrigation, earlier ripening of the crop is observed. Due to the precise penetration of moisture to the root system of plants and greater efficiency of fertilizer assimilation, an increase in yield by 30-70% is guaranteed compared to traditional irrigation.
- absence of secondary salinization – drip irrigation does not require the construction of drainage, groundwater and salt do not rise; the soil structure is preserved. Such irrigation makes it possible to grow plants on moderately saline soils, use slightly salted water for irrigation. With drip irrigation, intensive salt leaching occurs near the droppers. The accumulation of salts at the edges does not have too strong an impact on the development of plants. Water and nutrients are absorbed by part of the root system from the leached zones of the soil.
- the possibility of irrigation of highly intersected areas of the earth's surface with different water permeability of soils - drip irrigation system – a system of tubes or tapes, located at the base of plants, i.e., on the beds themselves. Drip irrigation makes it possible to apply irrigation on slopes or areas with complex topography, without the construction of special ledges or soil transfer. The use of drip irrigation on the slopes does not create any threats of their erosion. In addition, drip irrigation is very beneficial for adyr (адырных) lands, in which dips, voids can be created during normal watering, and water can go not to watering the plant, but deep into the ground.
- convenience of operations in the aisle - with traditional irrigation, the aisle is filled with water, which makes the movement of equipment and people on them difficult. With drip irrigation, the irrigation ditches remain free of moisture, which allows for tillage, spraying and harvesting at any time, regardless of irrigation, because the soil in the aisle remains dry throughout the season.
- fewer weeds - in comparison with other irrigation methods, since water is supplied only to the root system of the plant and does not irrigate the entire land around. The root system develops better than with any other irrigation method. The bulk of the roots are

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concentrated in the dropper zone, the root system becomes spongier, with an abundance of active root hairs. The intensity of water and nutrient consumption increases;

At the same time, it is impossible not to mention some disadvantages of drip irrigation:

• not suitable as antifreeze irrigation

• not acceptable for auxiliary technical watering

• problematic for irrigation of young trees (plantings) in arid areas with sandy soils and strong winds

• the effectiveness of the system depends on its design and operation large initial investments that require an accurate assessment of the risks of payback.

Drip irrigation in comparison with conventional irrigation technology in the "Dulti ota" farm in the Mingbulak district of Namangan region will be carried out in the following order:

Head water intake unit (pumping station). The pumping station and water intake are designed to take water from a source (an open reservoir, a well, a channel, etc.) and create working pressure in the system.

- filtration plant. the filtration station is the most important element of the drip irrigation system. when taking water from an open source, it contains a large number of impurities of various origins (algae, sand, silt, microorganisms, etc.). due to its design and large filtering surface, the gravel filter blocks and prevents the further advancement of impurities present in the water.

- feeding node. the feeding unit is designed to supply fertilizers dissolved in water together with irrigation and consists of a fertilizer head, an injector, a container for dissolving fertilizers and a disk filter. the fertilizer application device also allows you to apply systemic pesticides for plant protection with irrigation water.

- main pipeline. a system of main distribution pipelines made of polymer materials delivers filtered water to an irrigation site of a certain size and shape.

- drip lines. drip lines are polymer tubes of small diameter (16-17 mm) with emitters (droppers) built into them. depending on the selected culture and planting scheme, drip lines with different distances between emitters (0.2 m, 0.3 m, 0.4 m, etc.), different discharge rates per dropper (from 1.3 to 4 liters per hour) and different service life (from 1 year to 7 years or more) can be used. in some cases, external droppers are used, which are compensated and not compensated with different discharge rates (from 2 to 6 liters per hour).

In practice, in Namangan region, farmer "Dulti ota" successfully tested a drip irrigation system on his cotton field (1 ha), consisting of:

• 3 settling tanks of different capacities;

• one feeding tank (tank);

• one small container with dissolved mineral fertilizers;

• two pumps and a filter for cleaning the finished mixture;

• main (100 mm) and distribution (63 mm) pipelines

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• drip lines (16 mm).

This system supplied water to the field according to the following scheme. In the first, main pipe (outlet) with a diameter of 100 mm, enriched water is supplied from the tank (feeder tank), at a pressure of 8 atmospheres, using a pump. Further, from the outlet 100 mm (trunk) pipe, a distribution pipe with a diameter of 63 mm departs, which, therefore, passes into a 16 mm irrigation pipeline. With the transition to smaller diameter pipes and an increase in the length of the pipeline, the pressure will drop to 2 atmospheres. Special holes are made in the pipes, and emitters (droppers) are attached to them through which water will be delivered slowly, but "at the address" to the root system of each plant.

Fig. 1 The process of laying drip irrigation lines in the field in Namangan

Fig. 2 Pumps in the system

Fig. 3 Installed drip irrigation system

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The cost of a drip irrigation system is quite high and directly depends on the projection of the field (length, width, geometric shape), so it is very important to properly plan all the work on the operation of the system. If the planning is carried out incorrectly, it will entail improper operation of the system, the costs will not pay off, since the profit will be low. Therefore, it is very important to extend the service life of drip equipment as much as possible. Proper operation during the season, timely maintenance and repair work can significantly extend the life of the system. However, one of the main elements is the proper preparation of the entire system for storage in winter. At the end of the irrigation season, dismantling and laying of all elements for storage is carried out. When using an annual drip tube, it is dismantled and removed from the field with further disposal. If a long-term tube has been used, it must be rinsed to remove all micro and macro particles accumulated during the period of operation. A very important point is the removal of water from all elements of drip irrigation. If water enters, it is possible to defrost and damage parts of the irrigation at low temperatures. The durability of the system depends on the thorough preparation of the entire drip irrigation system for proper storage in winter.

Analysis of the costs and benefits of implementing a drip irrigation system compared to the traditional irrigation method. All calculations are given for 10 hectares

Indicators	Unit. measur.	Cotton, 10 hectares	Wheat, 10 hectares	Garden (apples), 10 hectares	Note
Investment	**sum**	**88 360 000**	**91 560 000**	**50 360 000**	The cost of the drip irrigation system includes the cost of purchasing a film to cover the tank for supplying water to the drip irrigation system
General benefits	**sum/year**	**26 890 709**	**21 450 729**	**30 104 813**	Compared to traditional irrigation
Saving water resources	m^3/year	117 600	66 000	114 550	Water resource savings are calculated based on differences in irrigation technology (frequency of irrigation)
Saving electricity	sum/year	4 999 680	3 175 200	3 206 784	Due to a significant reduction in watering time and pump operation, electricity consumption for the season is significantly reduced
Diesel fuel economy	sum/year	1 087 500	37 500	37 500	Diesel fuel is saved by reducing the number of agrotechnical measures. The price is 2500 sums per liter on average
Savings on agrotechnical measures (cultivation, fertilization, etc.)	sum/year	850 000	50 000	50 000	

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Saving on mineral fertilizers	sum/year	1 143 000	377 500	0	The assimilation of mineral fertilizers is 90-95%, while with conventional irrigation - 30-35%
Saving on labor resources	sum/year	2 000 000	2 000 000	2 000 000	
The benefits of productivity growth	sum/year	16 000 000	15 000 000	24 000 000	The yield increases by about 40%, but depends on the score of the land.
Exemption from payment of land tax	sum/year	810 529	810 529	810 529	The land bonus score is taken on average equal to 60 (6th class of land, correction factor 6.78), and the amount of the basic land tax of the 1st class of land is 11954.7 soums for the Uychinsky district of Namangan region.
Payback period	**years**	**3,3**	**4,3**	**1,7**	

Conclusion

The widespread introduction of drip irrigation requires huge investments. However, it allows you to significantly save on the use of resources. For a hypothetical assessment of the effect of the widespread introduction of a drip irrigation system at the regional level, we took Namangan region as an example. The calculations are quite simple and clear: extrapolation of the above results (Table) was made for the total sown area of cotton and wheat in the region, which amount to more than 86 thousand hectares of cotton and about 9 thousand hectares of wheat. As anchor units for evaluating the effectiveness of the drip irrigation system, we took resource savings per 1 hectare of cotton and wheat – the key agricultural crops in our country. It should be noted that this is a rather rough and approximate estimate when the results of one experiment are projected onto an entire area. However, due to the lack of other published experiments in Uzbekistan that would clearly demonstrate the effectiveness of drip irrigation (with all indicators), we focus on the results of the experiment in Namangan region, which allows us to visually assess the possible benefits of drip irrigation.

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