



## **LASER LEVELING OF SOIL IN THE PRE-SEASON PERIOD FOR LEVELING SOIL RELIEF IN «THE TST AGRO CLUSTER «NIZHNECHIRCHIK» DISTRICT TASHKENT REGION»**

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| <b>Article history:</b>   | <b>Abstract:</b>   |
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| <b>Received:</b> August 4 <sup>th</sup> 2023<br><b>Accepted:</b> September 4 <sup>th</sup> 2023<br><b>Published:</b> October 4 <sup>th</sup> 2023 | This article presents methods for leveling the soil before the pre-sowing period using laser leveling in the Nizhnechirchik district of the Tashkent region. |
| <b>Keywords:</b> leveling, laser, cluster, digital shooting, laser planning, hydraulic valve.   |  |

**INTRODUCTION.** As is known, in Uzbekistan, the cultivation of agricultural crops is based on irrigated agriculture, and 90-95 percent of the crop is grown on such sites. Care and cultivation of crops is carried out by applying several agrotechnical events, one of them is the leveling of land. The main purpose of the leveling of land in agriculture is to eliminate some irregularities that prevent irrigation and mechanized agrotechnical events while maintaining the slope of the field area.

Reducing groundwater level and soil health deterioration are the main problems at present. Thus, due attention should be paid to the management of irrigation water for adequate growth of agriculture. Concerted efforts must be made to educate farmers on effective use of irrigation water at the farm level. As a rule, farms specializing in rice cultivation believed that their fields were aligned and do not need further planning. But the map of digital field shooting shows that most fields are not properly aligned and require further accurate alignment of the Earth.

Improving the water efficiency and farm productivity at the field level is one of the best options to solve the problem of reducing groundwater level.

Laser-land planning - one of these important technologies for effective water use, as it reduces irrigation time and increases productivity not only water, but also other water-free agricultural resources.

Results in technologically advanced countries have shown that this saves water by 25-30% and time by 30%, as well as increases production and productivity by 10-15%. It was also noticed that with laser leveling of the land, 2-3% of the effective sown area in the case of flat fields and especially on ridge crops become available for cultivation of crops, since the number of embankments and irrigation channels is significantly reduced.

Laser alignment is a laser-guided precision alignment technique used to achieve very precise alignment with the desired slope in an agricultural field.

When leveling, a laser transmitter is used, which constantly emits a beam rotating 360°. This beam is received by a laser receiver (receiving unit) mounted on the mast of the scraper unit. The received signal is converted into an adjustment of the level of the excavation and embankment, and the corresponding changes in the level of the scraper are carried out automatically using a two-way hydraulic distributor. Laser alignment is maintained automatically by performing cutting and filling operations.

Then a map is compiled indicating which areas are high, require cutting the soil, and low require backfilling.

The complete equipment of the laser ground planner includes a laser emitter, a laser receiver, a two-way hydraulic valve, a planning rod, a tripod, a tractor control unit and a ground planner.

The advantage of laser leveling:

- *Increases the efficiency of water application.*
- *Saving irrigation water (20-30%), hence saving energy (Diesel/electricity).*
- *Better germination due to the uniform application of fertilizers and other means as a result of an increase in yield by 5-10%.*
- *Increases the effectiveness of weed control.*
- *The smaller area under embankments/channels increases to 8-10% of the area under the crop.*
- *Reduces the need for labor for irrigation.*

Currently, our farmers and farmers are well aware that the flat surface of the field area is one of the factors contributing to the efficient use of land, uniform moistening of the field, improvement of the reclamation condition of the soil, obtaining a rich harvest and increasing economic efficiency. In addition, it helps to simplify mechanized work, save energy consumption and increase labor productivity. When leveling the land, the elevations of the relief of the area are moved into the recesses. Leveling work is carried out with the help

of a tractor and a special leveling mechanism (with a long or short base), the elevations of the field are cut off and poured into the recesses.

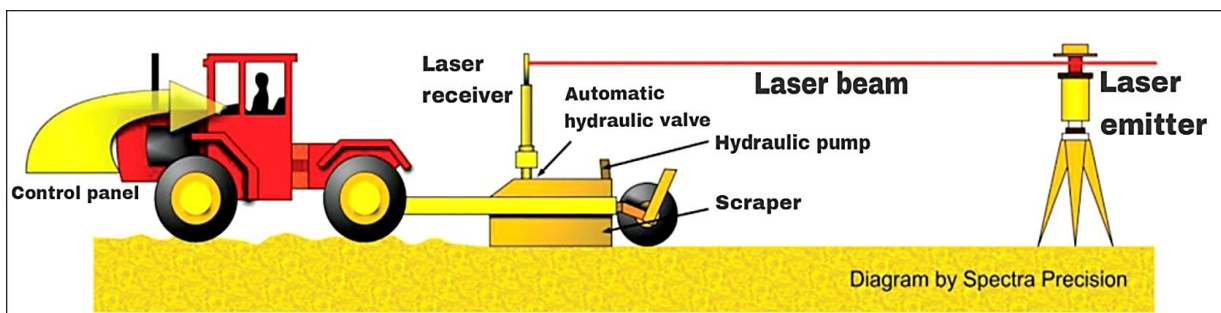
According to information obtained during conversations with farmers, with traditional leveling, the relief of each hectare of field area could differ by 10-15 cm. Naturally, with traditional alignment, it was not possible to align the ground more precisely. At first glance, with such an alignment, the relief of the field is not much different, or it seems very well aligned, in fact, excessive water consumption per hectare can amount to 1000-1500 m<sup>3</sup>. So, it is necessary to water those places of the field that are 10-15 cm higher. If you water 100 hectares of fields, due to the uneven terrain of the field, you can use up an extra 100,000 - 150,000 m<sup>3</sup>. In addition to this, as an example, it can be indicated that if the field is watered with a pump, an extra 1 sum for each cubic meter of water will be charged, 100,000-150,000 sum will need to be paid for extra watering.

Meanwhile, if we take into account the extra time or additional costs of dividing a field of 1 hectare into small 4-5 plots, this figure may be even higher.

Most importantly, excess water can have a serious impact on the land reclamation condition. For example, if the level of water mineralization is very low or is 0.5 g/l, the amount of salt coming with excess water per hectare of land is 500-750 kg. In addition, excess water increases the groundwater level, which also leads to an increase in soil salinity. This dramatically reduces crop yields.

Especially in recent years, when there is a shortage of water associated with global climate change, as well as a sharp increase in the population, in turn, a further increase in the daily need for agricultural products implies a more efficient and rational use of land in Uzbekistan.

**1-picture**



In this regard, one of the urgent tasks facing irrigated agriculture is the use of new innovative technologies that provide ultra-precise leveling of the field surface. This is the use of Laser leveling of the land in irrigated agriculture.

Laser leveling of the earth means leveling the earth to a level of difference of no more than 1-3 cm, using a special laser leveling device (1-figure).

In addition, the technology of laser leveling of land is widely used in housing construction, laying of trunk roads, leveling of agricultural land, construction of irrigation channels, drainage and collector systems. [1]

The Global Environment Facility Small Grants Program is a leader in the dissemination of this technology in the country's agriculture. With the help of this program, the technology is widely used in the practice of farms in the TST AGRO CLUSTER of the "Nizhnechirchik" district of the Tashkent region. The technology is also of great interest to farmers in other areas.

Based on the results of practical studies obtained on laser leveling of lands, this technology has several advantages.

Firstly, irrigation water savings of 20-25 percent are achieved. Secondly, the efficiency of water use increases. Thirdly, in agriculture, up to 5-7 kg of harvest can be obtained from 1 hectare of land. Fourth, due to the additional harvest received, economic efficiency increases by 15-20 percent. Meanwhile, with the help of irrigation water:

- excessive salinity is prevented;
- saving of time, labor and energy consumed for irrigation is achieved;
- smooth germination of agricultural crops is ensured on the squares;
- crops are evenly provided with nutrients and moisture;
- when using the technology, the number of weeds entering the fields with irrigation water is reduced;



- with the proper implementation of land cultivation measures, the areas can be re-leveled every 3-5 years.

In conclusion, we note that without exaggeration - "Laser leveling of the land is a guarantee of saving water, high yield and additional income" (Fig.2).[2]

### Leveling from the middle - is the main way

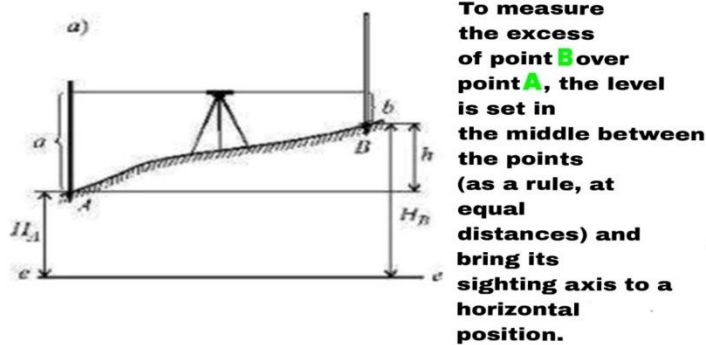


Figure 2<sup>1</sup>

Laser leveling of the soil in the pre-sowing period for leveling the soil relief in the TST AGRO CLUSTER of the "Nizhnechirchik" district of the Tashkent region will be done in the following order:

#### 1. Grading

Grading is a method of leveling the soil on a site using a large technique called a bulldozer. This heavy

machine moves the ground until the ground is leveled. Although grading can be expensive, it is also one of the most effective ways to level a large piece of land. If your site has significant slopes or uneven sections, grading may be required to achieve the desired results.

<sup>1</sup> <https://sgp.uz/ru/lazernoe-nivelirovanie-zemli—garantija-ekonomii-vody-vysokogo-urozhaja-i-dopolnitelnogo-dohoda/>



## **2. Adding soil**

Adding soil is a simple and affordable method for small and medium uneven areas. Start by using a cultivator or shovel to loosen the soil in problem areas. Then pour a layer of topsoil or garden soil and distribute it evenly with a rake. Finally, use a roller to seal the soil and create a flat surface. Keep in mind that you may need to repeat this process periodically as you settle.

## **3. Watering**

Watering is an effective and inexpensive method for small uneven areas on your site. On a hot summer day, just water the lawn before you start

leveling. Let it soak for an hour or two, and then use a light rake to level the soil on an un-leveled area. When the soil dries, you will see that the previously uneven area has already become smoother.

## **4. Terracing**

Terracing is a popular technique used on sloping areas such as hillsides. It involves the installation of one or more retaining walls across the slope to create a series of flat terraces. This method allows you to increase the usable area and prevent erosion.





### **5. Laser leveling**

Laser leveling is a modern, high-tech approach to leveling the earth. With the laser level, the ground is leveled to create a smooth, even surface. This method is suitable for large plots and is widely used in agriculture, landscape design and construction. Although this method is the most accurate way to level the ground, it also requires specialized equipment and trained specialists.[3]

### **6. French drains**

French drains are another useful option for areas with a slope and drainage problems. These trenches divert excess water, preventing it from eroding the soil and creating terrain irregularities. In addition, they can protect your home from flooding during heavy downpours<sup>2</sup>.

**CONCLUSION.** As you can see, there are several methods from which you can choose when it comes to leveling an uneven piece of land. Depending on the strength of the slope and the size of your site, you may need several methods. It is best to start by consulting with a professional land engineer or soil engineer who can give you advice tailored to your specific needs. With the right approach, you will be able to create a beautiful and smooth landscape that will increase the value of your property and give you pleasure.

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