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# **Methods and Technologies of Soil Treatment for Sowing Melon Crops**

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**ABSTRACT:** Different technologies of soil preparation for sowing gourds are considered. The advantages and disadvantages of each of the considered technologies are shown. In preparing the soil for sowing cucurbits it is necessary to perform a number of technological operations of basic and pre-sowing tillage, as well as open irrigation furrows. The production process is associated with high energy costs. Significant time consumption for operations lead to loss of moisture in the soil in the hot Central Asian climate. To eliminate these shortcomings, we propose a new technology of preparing the soil for sowing using a combined tillage machine, which performs all the necessary operations in one pass. Plowing the soil with the help of a front plough for smooth plowing with simultaneous formation of irrigation furrows and seedbed preparation by means of needle or knife discs, behind which a slatting roller is located. This rational technology of soil preparation for sowing cucurbitaceous crops is the most acceptable.

**KEYWORDS:** tillage, plowing, harrowing, leveling, irrigation furrow.

## **I. INTRODUCTION**

Uzbekistan annually produces more than 19 million tons of fruit and vegetable products, of which about 700 thousand tons are exported. Currently, more than 160 thousand farms operate in the Republic, which provide domestic and foreign markets with quality fruits, vegetables and melons [1,2]. The total volume of storage facilities in the Republic is 975 thousand tons of products, including modern cold rooms for 502 thousand tons. This contributes to the uninterrupted supply of the main types of agricultural products to the population and the expansion of its export. The transport infrastructure is dynamically developing, at the same time the work on the provision of interconnected logistics networks is being carried out, foreign trade relations are expanding, providing the growth of the sector's export potential [3, 4].

One of the conditions for effective melon cultivation is high-quality soil preparation for sowing. For its qualitative performance it is necessary to take into account the peculiarities of the applied technologies and natural-production conditions of the region.

The aim of the study is to substantiate the rational technology of soil preparation for sowing melon crops for the conditions of Uzbekistan.

## **II. MATERIAL AND METHODS**

In the cultivation of melon crops in a certain sequence of operations is carried out. Deep plowing or cheizeleaving are used as the main tillage. Then perform operations pre-sowing tillage, to bring it to seed conditions: harrowing and leveling. In addition, it is necessary to carry out the opening of irrigation furrows. All these operations can be carried out in different sequence, with special agronomic requirements, according to different technologies. Each of them has its own advantages and disadvantages. It is necessary to analyze the possible technologies of soil preparation for sowing of cucurbits and propose the most rational for the conditions of a particular region [5, 6].

**A. The first technology** of soil preparation and sowing of melon crops provides the basic tillage. After that the operations of pre-sowing tillage: harrowing and leveling are carried out. Then strip-till two-line sowing of melon crops by STV-4 or SKNG-6A seeding machines. After emergence of plants, the operation of opening irrigation furrows is carried out (Fig. 1).

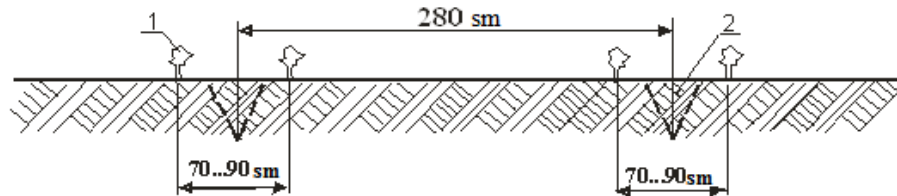


Fig. 1. The first technology of soil preparation and sowing of gourds:

1 - rows of plants; 2 - irrigation furrows

Irrigation furrows are opened by cultivators KRH-3,6, KRH-2,8, KRH-4,2 or by double-row stubble cultivators for taped crops at distance between plant rows of 70..90 cm [7].

The disadvantage of this technology is the long duration of operations, which leads to loss of moisture in the soil, its reconsolidation under the repeated impact of machine-tractor units, high energy costs and labor costs for the work. In addition, there is a high probability of damage to plants in the rows and their falling into the soil when opening irrigation furrows.

**B. The second technology** of soil preparation and sowing of gourds consists in carrying out similar, to the first technology, operations on soil preparation. After that the opening of irrigation furrows is made. Then tape two-line sowing (Fig. 2).

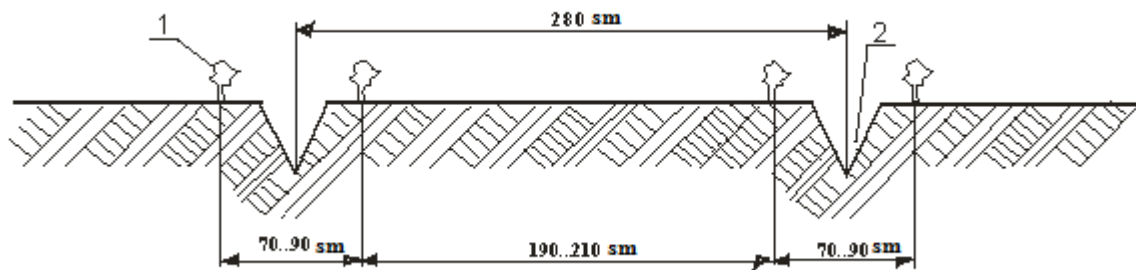


Fig. 2. The second technology of soil preparation and sowing of gourds:

1 - rows of plants; 2 - irrigation furrows

In this technology it is possible to combine two technological operations, opening irrigation furrows and sowing of gourds. For this purpose, working bodies of cultivator-plant feeder or cultivator-harrower are installed in front between the seed drill coulters [8].

This technology is more effective than the first one, however, a slight reduction in time of work does not eliminate loss of moisture, and thus slow development of plants. Labor and energy costs remain quite high. At the same time, it should be noted that this technology is widely enough used.

**C. The third technology** of soil preparation and sowing of gourds proposed by N. Rakhmatullakhodjaev presents a fairly complex set of different technological operations. After the basic and pre-sowing tillage similar to the first two technologies, sowing is carried out. This technological operation is carried out with the simultaneous opening of temporary irrigation furrows, on both sides of two-line sowing of gourds, with the distance between the furrows of 110 cm. At the same time the soil dumping during opening of irrigation furrows is made to one side, outside of the formed two-line strip of sown plant seeds (Fig. 3). After emergence of sprouts, irrigation along the furrows formed during sowing, during the first inter-row cultivation the temporary irrigation furrows are closed and new permanent ones are opened - between the rows of plants in the ribbons. Closing of temporary furrows is made by blades, installed on cultivators for inter-row cultivation at a certain angle of attack in relation to the direction of the machine movement. When closing

temporary irrigation furrows, mineral fertilizers can be applied in them in the form of top dressing. Closing of temporary irrigation furrows after their direct use, also promotes preservation of moisture in a root zone of plants [9].

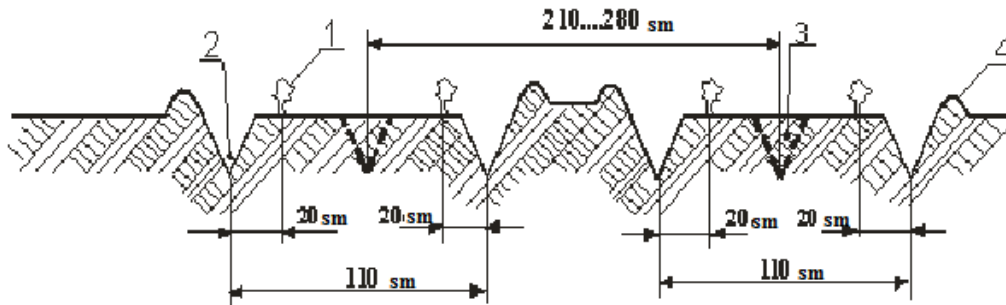


Fig. 3. The third technology of soil preparation and sowing of gourds:

1 - rows of plants; 2 - temporary irrigation furrows; 3 - permanent irrigation furrows; 4 - one-sided soil dumping

The technology under consideration, allows solving a number of technological aspects in the cultivation of melon crops, however, it is quite difficult to implement, has high labor and energy costs, does not reduce the time of work.

The fourth technology of soil preparation and sowing of cucurbits proposed by Azerbaijani scientists is aimed at using minimum amount of water during irrigation. The main and pre-sowing tillage is carried out similarly to the above mentioned technologies. Opening of irrigation furrows with simultaneous sowing of cucurbits is carried out in such a way that seeds are sown on shelves formed in the walls of irrigation furrows (Fig. 4). In this case, the width of inter-row space is 90 cm [10].

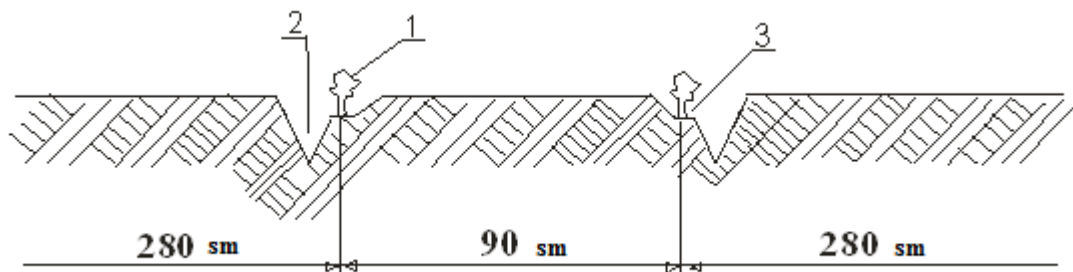
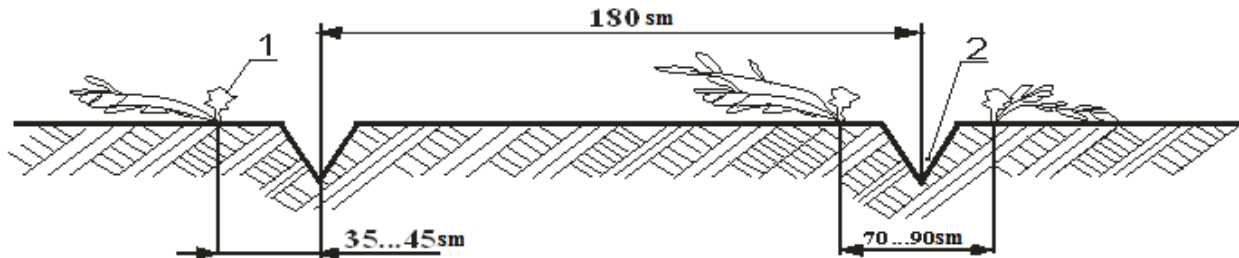


Fig. 4. The fourth technology of soil preparation and sowing of cucurbits: 1 - rows of plants; 2 - irrigation furrows; 3 - side shelf for sowing seeds, located in the walls of irrigation furrows

**D. Presented technology** allows saving water during irrigation, as the plants are located closer to the bed of irrigation canals. It should be noted that the implementation of this technology requires a high quality of technological processes. At the same time the terms of works are not reduced.

**E. The fifth technology** of soil preparation and sowing of gourds has a feature - the plants on the surface of the field are asymmetrically arranged. The basic and pre-sowing tillage is carried out similarly to the above mentioned technologies. Then the opening of irrigation furrows and sowing of melons is carried out simultaneously or sequentially. Coulters of the seeder have an asymmetrical arrangement when sowing. Two rows are sown with 70 ... 90 cm row spacing

on the sides of one irrigation furrow and one row at 180 cm distance to the second irrigation furrow (Fig.5) [11].



**Figure 5. The fifth technology of soil preparation and sowing of gourds:**

1 - rows of plants; 2 - irrigation furrows

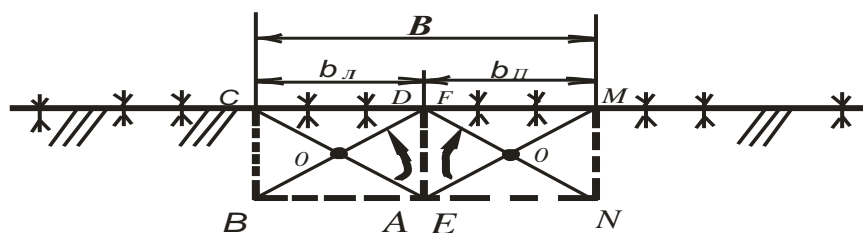
This arrangement of plants in the field makes it easier to carry out mechanical inter-row cultivation of plants. Here it is more difficult to ensure uniformity of irrigation of crops. In terms of advantages and disadvantages, this technology is close to the second technology discussed above.

### III.RESULTS AND DISCUSSION.

Analysis of technologies of soil preparation and sowing of melon crops revealed their general disadvantages: all technologies are multi-operational; time, labor and energy costs for their implementation are quite large with high moisture loss from the soil due to the hot climate of Uzbekistan. With multiple passes of aggregates on the field there is a problem of over-compaction of soil [12, 13].

To ensure quality performance of the complex of works under consideration it is proposed to use a combined tillage aggregate, capable of fully preparing the field for sowing in one pass [14, 15]. For this purpose, the unit must be able to perform a number of related operations: primary and pre-sowing tillage with simultaneous opening of irrigation furrows.

For main tillage it is proposed to use ploughing tools of frontal plough for smooth plowing providing rotation of soil layer in its own furrow (Fig. 6). Two-cone plough has working width  $B$ . In this case, the plough bodies are installed along the axis of symmetry of the tool with the arrangement of field cuts to each other. Then turnover of layers ABCD (left in the course of the unit movement) and EFMN (right) is carried out in different directions from the axis of symmetry of the bodies, with a slight shift of their center of gravity away from the field trims.



**Fig. 6. Cross-section profile of soil strata before their turnover.**

Installation of shortened skimmers is made in such a way that they perform their function not completely, i.e. turnover of layer was not full. Then the soil layers are located so that there is formation of irrigation furrow on their junction (Fig. 7). Outside the plough working width, on both sides, cultivator tines can be installed for surface loosening of soil to the value  $a_1$  outside the zone of deep tillage.

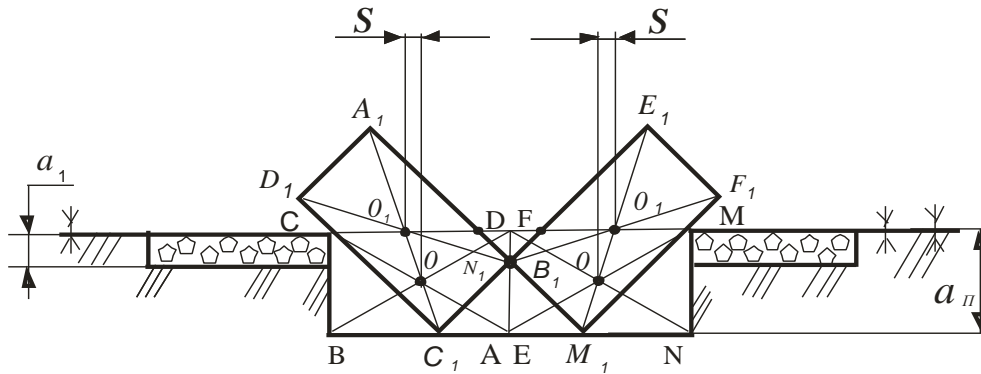


Fig. 7. Cross-section profile of soil strata after their turnover

After rotation of soil layers ABCD and EFMN, they occupy, respectively, positions  $A_1B_1C_1D_1$  and  $E_1F_1M_1N_1$ . As a result of soil layers turnover during plowing their centers of gravity  $O$  and  $O_1$  are displaced by the value  $S$  from the symmetry axis of the plow. Tillage is carried out to the depth  $a_I$ .

For performance of operations of pre-sowing tillage after plough bodies and ploughs of front plough is set ripper-leveling device. As such a working body can be used needle or knife discs, behind which the slat roller is located. As a result of such a combined tillage unit we have a fully prepared field for sowing cucurbitaceous crops with formed irrigation furrows (Fig. 8).

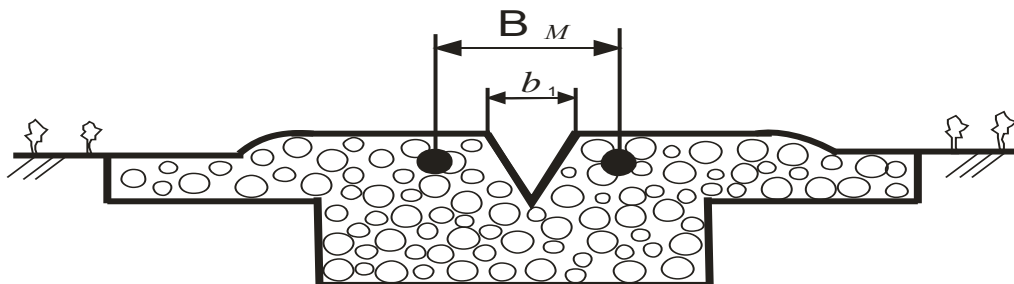


Fig. 8. Cross-sectional profile of the field prepared for sowing cucurbits after the passage of the combined tillage machine:  $B_M$  - width of inter-rows when sowing cucurbits;  $b_1$  - width of the irrigation furrow. Выводы

The proposed technology of soil preparation for sowing cucurbitaceous crops using a combined unit makes it possible to reduce the time of work, save moisture, reduce labor costs and fuel consumption. Also by reducing the number of machine passes over the field the level of soil compaction is reduced.

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