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Innovative Technology and Technical means for Preparing a Field for Machine Harvesting of Raw Cotton

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Abstract

The article presents the results of research on the development of technology for growing cotton on a ridge with targeted and uniform moistening of the root system of plants, which together contributed to the creation of optimal conditions for machine harvesting of raw cotton by ensuring early maturation (for 2-3 weeks), smooth movement of the machine and high yield.

One of the main requirements when preparing a cotton field for machine harvesting is its alignment, which ensures smooth movement of the machine and a stable stable position of the harvesting machines relative to the treated cotton bushes. To use the developed technology and the sowing unit in farms using drip irrigation systems with the laying of flexible perforated irrigation tapes in the upper part of the ridge along its entire length, comb formation and sowing of cotton seeds are performed simultaneously, which allows leveling the initial sowing on the ridge of the alignment of rows to prepare the field for machine harvesting.

Introduction

In the conditions of Central Asia, in irrigation agriculture with the existing agrotechnics of cotton cultivation and sowing on a smooth field, as a result of early spring and pre-sowing treatments, the top layer of soil is strongly sprayed and a dense soil crust is formed when heavy precipitation falls. During row-to-row processing before and after watering, when the cortical layer is destroyed, the profile of the rows is disrupted, which leads to uneven movement of the machine.

To do this, it is necessary to create an agrophone of cotton under machine harvesting, hence the development of an agrophone management system. Based on the theoretical foundations of soil treatment, a new technology for cultivating cotton on ridges has been developed to create an optimal density of the arable layer and maintain it during the growing season.

The loose addition of the ridge provides high water permeability and, even with rainfall of a stormwater nature, moisture quickly penetrates into the lower layers of the soil, and its excess flows into the bottom of the furrow and infiltrates into the root system. Therefore, the accumulation of moisture in the beds is excluded, which leads to pollination of the soil, destruction of the structure and formation of a soil crust. The soil crust on crops along the ridges has a lower weight and thickness, and its density is two to three times less than on crops on a smooth field, as a result of which it does not prevent the emergence of cotton seedlings.

In conditions of irrigated agriculture in spring, due to low air temperatures and often precipitation, soil warming is always insufficient, as a result of which the germination of cotton seeds is significantly delayed. Therefore, agricultural techniques that contribute to at least some improvement soil temperatures in the spring are very appropriate and deserve attention.

Hence, during the period of obtaining cotton seedlings on the ridges, they have two important advantages before sowing on a smooth field: 1) the formation of a strong soil crust is excluded, 2) a higher soil temperature is provided and 3) leveling of the irregularities of the profiles of the rows.

In the process of making ridges, the soil is removed from the place of the future furrow and superimposed on the place of the ridge. As a result, there is a significant increase in the capacity of the arable layer due to the upper cultivated arable land.

The drip irrigation system with the laying of flexible perforated irrigation tapes on ridges along its entire length is performed simultaneously with the sowing of cotton seeds, which eliminates the manual layout of irrigation hoses, eliminates time-consuming manual operation during feeding and further watering. The use of drip irrigation guarantees higher yields, as well as provides savings in labor, water and energy resources, provides one of the main requirements when preparing a cotton field for machine harvesting - its alignment.

Methods of analysis and problem statement

The technology of cotton cultivation on ridges and ridges with 90 cm between rows is fully mechanized on the basis of existing agricultural machinery of cotton modification. The traction forces of tractors ensure the construction of ridges and ridges. Available seeders and cultivators can be used for sowing and care with some modifications. Harvesting is carried out by conventional cotton harvesters.

Increasing the yield of cotton and harvesting it at the optimal time is associated with ensuring early, friendly and healthy shoots. However, in recent years, cotton growers in Uzbekistan face great difficulties during the sowing season due to adverse weather conditions (heavy rains, frosts on the soil, etc.). Because of this, cotton has to be replanted on some areas, which leads to a decrease in its yield, delayed harvesting and higher production costs. In this regard, the cotton growers of the Republic of Uzbekistan faced the task of changing the technology of cotton cultivation, which would allow for high-quality sowing at an early date, complete harvesting in October and thereby make it possible to carry out all the necessary field work in full for next year's harvest, before the onset of rainy days.

The cotton field is characterized by a number of parameters, including the width of the aisles, the straightness of the rows, the value of deviations in the width of the aisles from the permissible size, the deviation of plants from the axis of the row, the number of plants per 1 hectare of cotton sowing area, the uniformity of the arrangement of plants along the length of the row, the size of cotton bushes in height and width, the microprofile of the bottom of the furrow and the tops of the beds, physical and mechanical properties of the soil.

Cotton in the CIS is cultivated with row spacing of 0.6 and 0.9 m, and the row spacing is a variable value depending on many factors, and ranges, respectively, within 0.53...0.78 m and 0.78...1.02 m with mathematical expectations of 0.63 and 0.91 with standard deviations of 0.044 and 0.036 m [1, 8].

The irregularities of the cotton field backgrounds vary in length and width. Their sizes depend on the soil structure, irrigation methods, terrain, the design of the propulsion system, the mass of machines used in the cultivation of cotton, and are random in nature. The distribution of the ordinates of the height of the surface profile of the beds obeys the normal law. The standard deviation of the irregularities along the row is 0.022 m, and across - 0.094 m. The height of the ridge ranges from 0.055 m to 0.185 m. The difference in the levels of irrigation furrows is in the range of 0.077...0.121 m. The arithmetic mean value of the difference in the levels of irrigation furrows is 0.038±0.0034 m. In about 90 % of cases, the difference in the levels of irrigation furrows is in the range of - 0.034...+0.103 m. As a result, when cotton harvesters move along irrigation furrows, their harvesting machines occupy different positions relative to stationary cotton bushes. As a result, some of the boxes with raw cotton in the lower zone of the bushes remain untreated, some fall to the ground, which sharply reduces the completeness of the harvest [1, 8].

Row spacing profiles of 0.9 m are characterized by the presence of false ridges, i.e. the highest sections of the profile are located not in the middle of it, but at a distance of 0.075 m on both sides of the axis of the row. The height of the false ridge is 0.008...0.088 m and 0.002...0.013 m, respectively, before and after the machine passes. The height of the main ridge of the field profile also decreases after passing the machine. The height difference of the average profiles for row spacing of 0.6 m and 0.9 m is 0.025 and 0.037 m, respectively.

The cotton bushes are not arranged in a row along the centerline, but are somewhat mixed on both sides. By the time of harvesting of raw cotton, the number of plants with mixing from the axis of the row by 0.03...0.07 m reaches 36...39%. There are cases of deviations up to 0.16 m or more.

With the increase in working speeds, row and width of the machines, the preparation of the cotton field for mechanized harvesting becomes crucial. However, the influence of certain parameters of the agrophone on the performance of cotton harvesters has not been sufficiently studied. This applies to the patterns of movement of the cotton harvester in the irrigation furrow, the crumpling of the soil under the wheels, the different heights and non-straightness of the beds, the rigidity of the cotton bushes, the distribution of the harvest of raw cotton on the bush during the first and second collections.

It can be seen from the above that the characteristics of the agrophone of the cotton field vary widely and significantly affect the operation of row-to-row processing and cotton harvesting machines.

The cotton field agrophone is also influenced by row-to-row processing of cotton and furrow irrigation of them.

Examining the artificial damage to the roots during row-to-row processing and its negative effect on the growth, development and vital activity of cotton, it was found that the damage causes profound changes in physiological processes, respectively affecting the formation and accumulation of roots, growth and development of cotton.

These changes are stronger the more the root system is damaged. The negative effects of root damage are particularly pronounced during the reproductive period of plant development. In the early stages of development and with sufficient water supply, the restoration of damaged roots occurs more intensively than in the later stages of vegetation.

With less significant damage, the flow of water and nutrients from the pasok from the system to the aboveground organs is noticeably reduced, and with deeper damage, the supply of xylem juice stops.

The restoration of the normal absorption activity of the cotton root system is noted on the seventh to tenth day or more, depending on the degree of damage. However, the negative impact of damage on the growth and development of cotton is not fully compensated. Under the influence of root damage, the fall of fruit organs increases and the yield of raw cotton decreases by 10-15% compared to plants with an undisturbed root system.

In this regard, the above consequences should be taken into account when developing the depth, quantity and timing of row-to-row processing of cotton.

The conducted experiments [3] do not confirm the prevailing opinion that the formation of a crust on the soil surface worsens its air regime. The results of their research show that the soil crust cannot serve as an obstacle to the entry of atmospheric air to the roots of plants.

Hence, row-to-row processing of cotton does not affect the air regime of the soil and, provided that the fields are cleared of weeds, plants are provided with water, and the upper soil layer is maintained in a loose state, it is possible not to carry out or completely avoid row-to-row treatments for a long time. The root system of cotton during the growing season does not need additional aeration – oxygen enrichment of the air by loosening the topsoil. Row-to-row treatment is necessary only for the destruction of weeds, the preservation of moisture in the soil (fighting the crust that dries up the soil), and sometimes to deepen the middle of the irrigation furrow and where it is necessary to increase the evaporation of moisture from waterlogged soils. In the absence of weeds and soil crust,

the number of row-to-row treatments should be reduced as much as possible. In the absence or lack of atmospheric oxygen supply through the soil surface, the root system can function normally due to oxygen from the air entering the roots through the aboveground part of cotton, as well as oxygen released during metabolism and regenerative processes in plants and soil.

The number of row-to-row treatments should be reduced as much as possible. This can be achieved by the widespread and correct use of herbicides, various kinds of mulch, and the combination of individual parts of agricultural machinery in one operation. In the future, more advanced agrotechnical measures may appear that would limit or completely eliminate row-to-row treatments, such as new cheap and easy-to-use mulching agents and techniques such as comb sowing. In a number of conditions, ridges can be created in the spring.

On crops in a smooth field, the highest content of humus, total nitrogen and phosphoric acid is observed in the upper layers of the soil within 30 cm, and decreases sharply deeper. When making ridges and ridges, the content of humus, total nitrogen and phosphorus, due to soil accumulation, is higher up to a depth of 40 cm. Consequently, the construction of ridges and ridges contributes to an increase in the capacity of the arable layer in comparison with sowing on a smooth field without increasing the depth of plowing [4].

An important condition for a high yield of raw cotton along the ridges is to ensure early and friendly shoots of cotton. It was found that sowing along ridges, in comparison with sowing on a smooth field due to the finely lumpy surface of arable land, the absence of soil crust, better soil warming, provides a significant run in cotton seedlings and ensuring the necessary density of standing plants. In years with a cold rainy spring, the appearance of cotton seedlings on ridges and ridges outstripped their appearance in comparison with crops in a smooth field by 4-6 days, and under favorable spring conditions by 3-4 days [4].

Sowing cotton along the ridges, due to these conditions, provides a higher yield of raw cotton. The increase in the yield of raw cotton on the ridges was 8.0 c/ha, and on the ridges 4-5 c/ha, compared with sowing on a smooth field [4], which allowed us to improve the technology of ridge sowing with the installation of an irrigation hose on the top of the ridge.

The problem statement is the creation of a controlled agricultural cotton field to prepare for machine harvesting with early seedlings, reducing row-to-row treatments, saving labor and costs, increasing yields and productivity of the harvesting machine.

The purpose of the work is to develop a resource–saving technology and technical means to prepare the field for machine harvesting, which is carried out using the development of technology and technical means for innovative ridge tillage of soil with simultaneous sowing of seeds of industrial crops and laying a drip irrigation hose on the ridge. This will allow for the initial sowing of seeds before harvesting and management of the agrofon, as a result of saving labor costs, irrigation water and, accordingly, mineral fertilizers and high-quality harvesting.

Research objectives

1. Analysis of soil protection systems for soil treatment.
2. Analysis of the development of cotton growing technology.
3. Analysis of factors negatively affecting the agrophone of the cotton field.
4. Development of the proposed technology scheme.
5. Development of the design of technical means for the proposed technology.
6. Analysis of the results and examples.

The goal is achieved by using proven technologies and methods for comb cultivation by creating a microclimate for the root system of the plant; using the possibility of regulating parameters inside the comb by the ratio between heat content + moisture content + soil fertilizer with targeted and uniform moistening both for absorbing seeds with fertilizer and the root system during the growing season; ensuring full disclosure of boxes for machine collection by desiccation with irrigation hoses.

The combination of soil protection systems for soil treatment makes it possible to develop innovative technology and technical means to prepare the field for machine harvesting.

Sowing is the most important technological operation in the cultivation of crops. The quality of its implementation directly affects the yield. In turn, the quality of sowing depends on the technical serviceability of the sowing machines and on how perfect their design is.

The thermal engineering calculation of the heat and mass transfer of the soil layers of the root system of the plant in the ridges allows the justification of the parameters of the shape of the ridge and the location of irrigation hoses on the top of the bed.

Favorable water-physical properties and nutritional regime on the ridge contribute to a race in the development of cotton and the accumulation of more pods than in crops on a smooth field.

The technology of sowing cotton on ridges by combining sowing with cutting furrows on the ridge and laying an irrigation hose can significantly reduce the amount of tractor work in the process of caring for plants.

It is very important to establish reasonable parameters - the depth and width of the ridges, the conditions of pre-sowing and post-sowing treatment, irrigation schemes and norms; to develop on their basis agrotechnical requirements for the designed machines and implements.

Currently, the following method of soil preparation and sowing is also used to obtain early seedlings of cotton. A day or two before the start of sowing, straight furrows with a depth of 18-20 cm are cut through the field carefully prepared during pre–sowing treatment every 90 cm (for a wide–row sowing method). After one or two days after cutting the furrows, when soil moisture is more evenly distributed over the height of the furrow, sowing is carried out on the ridge of the latter. In order to remove the topmost insufficiently moistened soil layer, knives are installed in front of the seeder coulters. In this case, the seeds fall into loose moist soil, which ensures that friendly shoots are obtained using natural moisture.

In areas where there is little precipitation and seedlings are obtained by carrying out spare watering, they are carried out along pre-cut straight furrows. After the soil has ripened, harrowing is carried out in the longitudinal direction. Harrowing cuts up the soil somewhat, destroys the weeds that have appeared, removes the dried soil layer. As a result, the best conditions for sowing are created – the seeds are embedded in moist and loose soil on the crest of the furrows. Good results could be obtained by combining the described sowing method with simultaneous mulching of seed rows with petroleum products and other mulching materials, for example, crushed dry manure.

Materials and methods of research

In recent years, with changing weather conditions, it has been possible to harvest raw cotton with more than 90% of the boxes opening. At the same time, the MX-1,8 cotton harvester removes up to 90% of cotton in one pass, and horizontally spindle – more than 90%. In the last 2015-2019 years, research was conducted at the landfill of the State Center for Testing and Certification of Agricultural Technology and Equipment of the Republic of Uzbekistan on the management of the agrophone of cotton cultivation using irrigation with flexible perforated hoses in beds [4].

Knowing the advantages of comb sowing, when using the results of research on the development of technology for comb cultivation of cotton with targeted and uniform moistening of the root system of the plant, it is possible to create an even more favorable microclimate of the root system of cotton and conditions for machine harvesting of raw cotton by ensuring early maturation (for 2-3 weeks) and high yield and technical means for their implementation [6] (fig.1).

When using a drip irrigation system [8], when sowing cotton seeds, perforated tapes are laid at the top of the ridges (Fig.1, c). To do this, brackets are installed on the comb-forming plate of the gun to attach coils with tapes. In the center of each row, a metal tube is installed on the comb-forming plate, through which the tape is fed to the top of the beds. The lower end of the tube is directed in the direction opposite to the direction of movement of the unit, and is installed 2-4 cm deeper, measured from the top of the beds. This arrangement of the tube provides complete cover with a layer of soil of the irrigation hose tape, which has the best effect on the distribution of moisture in the area of the cotton root system location. Similar technologies are used for other crops, such as potatoes.

Fig.1, b shows the location of the irrigation hose [8], while an onion-shaped shape 12 of the wet layer is formed inside the beds 11 and moisture does not seep sideways. From here, all moisture is consumed by the root system, which also has an onion shape. Irrigation hose 13 made of elastic plastic and equipped with outlets arranged in a row, characterized in that the outlets are circular openings, the walls of which have flanks. A method of laying an irrigation hose for irrigation of agricultural crops, including its laying on the soil, characterized in that the irrigation hose is laid on top of the beds for watering with outlets to the soil surface and covered with a layer of soil, and the angle of deviation of the axis of the outlet to the soil surface should not exceed 15 °.

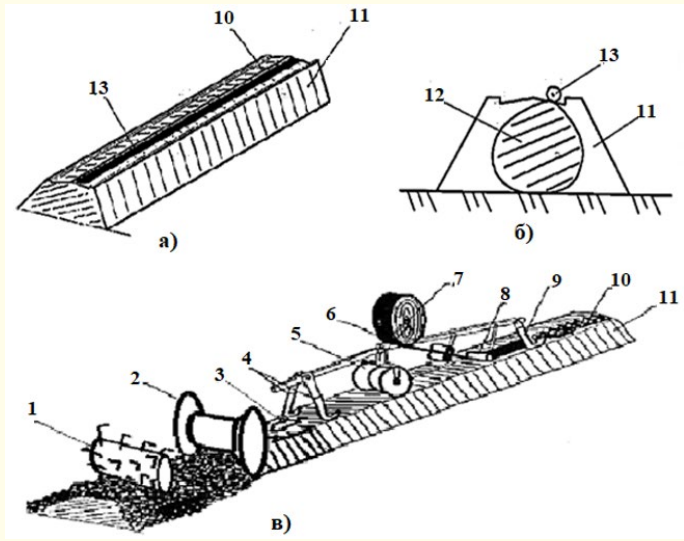

Figure 1: Technological layout of irrigation hoses on ridges: a) the type of location of the irrigation hose on the top of the ridge; b) the onion-shaped shape of the soil moisture inside the ridges; c) the type of location of the comb sealer, the coulter for sowing and the device for laying the irrigation hose on the top of the ridge; 1 - soil milling cutter; 2 - comb sealer; 3 - coulter; 4 - zagortachi; 5 - a rolling roller; 6 - a drum for laying a hose; 7 - an irrigation hose roller; 8 - a hose guide; 9 - zagortachi; for sealing the hose; 10 - the tip of the ridge; 11 - a prepared ridge; 12 - the onion-shaped shape of a moist soil layer.

The proposed technology uses strip tillage in conjunction with ridge tillage of the soil. In this case, the soil is not treated before sowing. At the same time, before sowing, the soil surface is treated with a soil cutter (active) at a depth of 10-12 cm. With the help of spherical disks, ridges with a height of 15-20 cm are formed. The formation and sealing of the ridges from above and on the sides is carried out using a roller, the shape of the surfaces along the longitudinal section of which has the shape of a trapezoid. Sowing is carried out in ridges 15-18 cm high with the coulters of the seeders. Herbicides are used to control weeds in combination with absorbent irrigation using a drip irrigation hose.

The problem is solved due to the fact that the combined seeder contains a former-compactor to create a finely lumpy soil layer with milling of the soil into a smooth field, simultaneous formation of a ridge of a given height, laying and sealing of a hose for targeted irrigation and additional compaction of the soil above it and devices for automatic coupling of different seeders species and the seeder itself. In this case, the milling part - forming the soil on the ridge and laying and sealing the hose for targeted irrigation can work simultaneously with the seeder or separately.

The essence of the method is that in the spring, instead of pre-sowing harrowing and leveling the field smooth, the soil is crushed with a milling cutter to a predetermined finely lumpy state with the destruction of weeds, the soil is thrown to the body of the shaper, a hose for targeted irrigation is laid over the formed ridge and the ridge is additionally compacted along the top and sides Sowing is carried out on the prepared ridge, and the seeder is attached to the former frame using a device for automatic coupling with hydraulic cylinders.

The essence of the combined seeder of the invention lies in the fact that the shaper-compactor with a hose layer for targeted irrigation is connected to the seeder through a coupling device with hydraulic cylinders for automatic coupling with hydraulic cylinders.

The essence of the combined seeder is illustrated by the diagram shown in Fig. 2, which shows the relative arrangement of the working bodies of the former-compactor and the seeder.

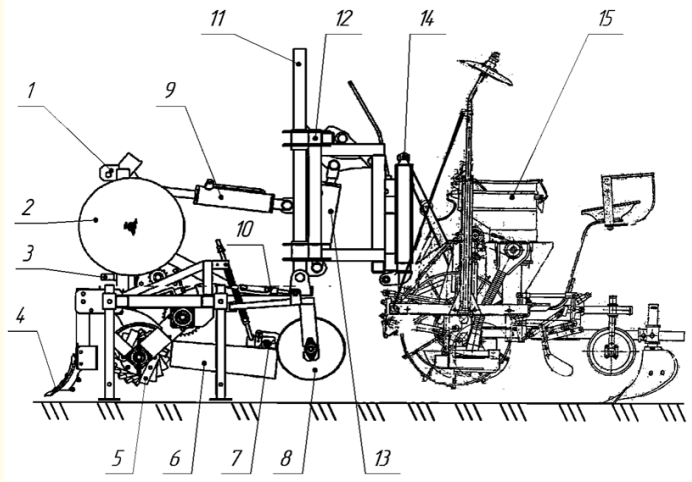

Figure 2: Combined unit for pre-sowing strip milling with simultaneous laying of drip irrigation hoses and the possibility of sowing: 1 - cutter frame; 2 - reel of drip irrigation hoses; 3 - cutter drive gear shaft; 4 - hiller ripper; 5 - knife drum of the cutter; 6 - apron of the comb of the educator; 7 - hose laying mechanism; 8 - compaction roller; 9 - hydraulic cylinder for folding the attachment bracket; 10 - lanyard for adjusting the compaction roller; 11 - automatic coupler bracket; 12 - automatic coupling carriage; 13 - hydraulic cylinder of the automatic coupler carriage; 14 - automatic coupler; 15 - seeder; 16-fields; 17- gearbox.

According to the diagram, a combined seeder for pre-sowing strip milling with simultaneous laying of targeted irrigation hoses and the possibility of sowing contains 1 sequentially arranged earrings for mounting on a tractor, a cutter frame for attaching working tools, 2 reel of targeted irrigation hoses, 3 cutter drive gear shaft, working tool 4 ripper hiller, 5 cutter blade drum, 6 ridge former apron, 7 hose laying mechanism, 8 additional compaction roller, 9 hydraulic cylinder for folding the attachment bracket, 10 compaction roller adjustment lanyard, 11 automatic coupler bracket, 12 automatic coupler carriage, 13 hydraulic cylinder of the automatic coupler carriage, 14 automatic coupler , 15 seeder, 16 fields, 17 gearbox.

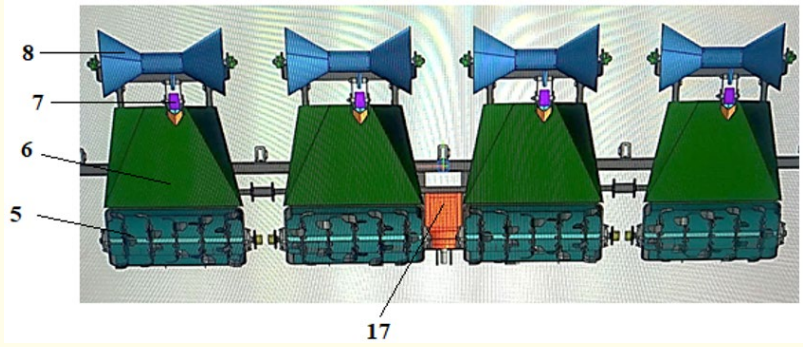

Figure 3: Shows a top view of the ridge former-compactor from the hose layer.

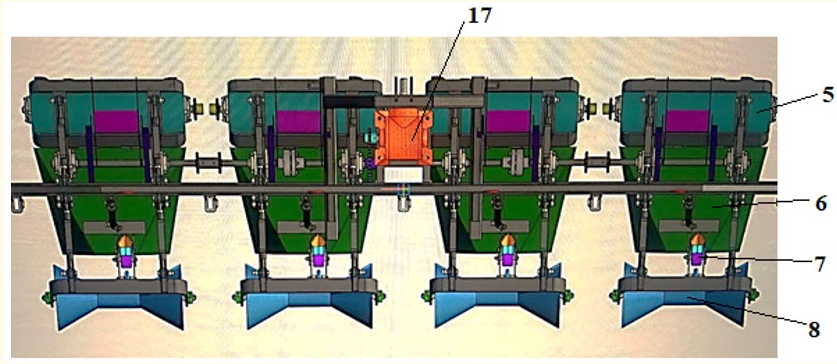

Figure 4: Shows a top view from the rear side of the ridge former-compactor from the hose layer.

A combined seeder for sowing cotton on ridges works as follows.

When moving the seeding unit, mounted on a tractor using a serger 1, across field 16, plowed in the fall, the ripper hiller 4 cuts a furrow with soil discharge to the knife drum of the milling cutter 5, the milling cutter crushes the soil and weeds and throws them to the body of the apron, which has the shape of a trapezoid, narrowing towards the exit , shaper 6 and forms the ridge, a mechanism for laying and laying the hose 7, fixed to the apron body, the hose is laid and laid in the soil of a given depth, an additional compaction roller 8, having a longitudinal section in the shape of a trapezoid, compacts on the top and sides of the ridge, seeder 15 mounted on the frame The former, using automatic coupler 14, sows in the center of the ridge. The hose for targeted watering from the reel 2 is supplied due to friction between the rollers of the hose laying mechanism. The compaction roller is adjusted using the talper 10. The clutch and lifting and lowering of the seeder is carried out by hydraulic cylinders 9 of the carriage 12 of the automatic coupler 14.

The proposed combined seeder can also be used both for preparing a ridge before sowing, and for simultaneous use with a seeder of various types.

Since the soil milling cutter is active and rotates in the direction of movement of the unit, with its help, part of the traction resistance is compensated. The number of revolutions of the milling cutter shaft is 300-350 rpm.

The weight of the combined seeder is 1250 kg, which is enough to seal the ridges from above. In this case, the seeding organ may be different.

Research results and discussion

Thus, the development of the proposed technology allows you to initially create comb shapes with sowing seeds and laying a watering hose on the ridge, which remains unchanged before harvesting. This ensures smooth movement of the machine. At the same time, this technology creates a condition for early friendly cotton shoots. Due to drip irrigation on the ridge, an onion-shaped form of soil moisture is formed inside it, and water does not seep through the sides. This prevents the crust formation of the soil surface and the growth of weeds.

Hence, the amount of cultivation decreases. With early spring precipitation, water accumulates at the bottom of the furrow between the ridges and infiltrates into the root system, and the grown weeds are raked with razor blades of the cultivator and stacked with hoppers on the ridge. Thus, the influence of the working bodies on the root system is prevented and the profile of the row spacing for the track of machines is leveled.

The destruction of weeds in the protective zone is carried out by herbicide together with seed feeding irrigation.

According to this technology, due to the prevention of crust formation on the protective zone of the plant, it makes it possible to carry out accurate sowing of seeds, which allowed for the thinning of sprouts.

For defoliation of cotton, desiccations on the necks of the root system with desiccants were used, which allowed the timely opening of the pods by 95%. At the same time, cotton leaves can be used as animal feed or siderates.

Experiments have established that the number of boxes on the control was 30 pieces, and with drip irrigation using this technology it was more than 60 pieces, all raw cotton on one box on the control was 5-6 grams, and the experimental one was 7-8 grams, while water saving was 70%.

The fertilizer was introduced together with irrigation water, while the droppers are not clogged with silt, since the proposed irrigation hose is made as a through hole without a compensator. In the drip irrigation system, the water pressure is 1 atmosphere, so the jet pressure is compensated by the soil. In the studies, the disadvantages of the ability to determine the consumption of fertilizer were noted.

The development of this study may make it possible to determine experimentally the size of the ridge for different types of soil. As well as studies of heat and mass transfer processes inside the ridge, which will allow leveling the shape of the track profile along all row lengths.

When absorbing seed irrigation, selective herbicides are added to irrigation water, thereby preventing the appearance of weeds on the protective zone.

Thus, the proposed technology of using innovative technologies for preparing the soil for sowing excludes spring pre-sowing tillage - harrowing and compaction of small. Since the soil milling cutter grinds the soil to a depth of 8-12 cm along with weeds, it mixes them and equalizes the moisture content of the soil mass. The disc working bodies form the ridge by mixing the moist soil layer and the upper dry ones. With the help of shapers, the ridge, which has a trapezoidal shape, is compacted from above, which creates a platform for the coulter of the seeder for sowing.

For sowing seeds of row crops, various brands of seeders with sets of technical means for forming combs and laying drip irrigation hoses can be used. Sowing of seeds is carried out in an accurate way at a distance of 7-10 cm between the nests, which makes it possible to prevent thinning of sprouts.

For sowing seeds in the places of the grooves of the rolling rollers, drip irrigation hoses are laid on the seeder and zagortachi seals it with a layer of soil 1-2 cm high, which allows water to be directed deep into the ridge. Experiments have shown that for a given size of the ridge, moisture seepage does not occur on the sides, the distance between the lines of the onion-shaped moisture contour and the surface of the sides of the ridge was 3-5 cm.

The results obtained are explained by the initial management of the agrophone field for the machine harvesting of raw cotton.

The features of the proposed method and the results obtained in comparison with the existing ones will be the evenness of seedlings in rows, since the comb shaper and the coulter are rigidly connected, which reduces the deviation of bushes along the axis of the rows and improves the entry of bushes into the working slot of the harvesting machine.

The inherent limitations of this study are that this technology is designed for sowing seeds of row crops.

The disadvantages of this study may include the fact that not all atmospheric factors affecting the development of cotton for various soil and climatic conditions were not taken into account during the experiments and they can be eliminated in the future with additional experiments.

The development of this study can take place mathematical simulations of heat and mass transfer processes inside the ridge, taking into account the consumption of irrigation water and the amount of fertilizers introduced, which can be verified by their effects on yield through experimental studies.

The sequence of the proposed technology:

- Autumn deep loosening with fertilization;
- Spring tillage and sowing according to this proposed technology;
- Absorbent drip irrigation with the introduction of selective herbicides;
- In the case of spring precipitation, row spacing cultivation is carried out with razor knives for cutting weeds at a depth of 2-3 cm and laying them with hoppers on the ridge, and cultivation with working organs for loosening the soil (naralniks, pointed paws, hoppers for the introduction of fertilizer) is not carried out;
- Vegetative drip irrigation is carried out in combination with the introduction of mineral and organic fertilizers;
- The chasing of bushes is carried out on time;
- To remove the leaves of cotton, desiccation is carried out with drying of its stem with desiccants in combination with drip irrigation;
- Preparation of turning lanes for machine cleaning;
- Machine cleaning with more than 90% of the boxes open.

Conclusion

1. In Central Asian risky irrigation agriculture, the preparation of the field for machine harvesting must be organized initially with the sowing of cotton seeds.
2. The characteristics of the agrophone of the cotton field vary widely and significantly affect the operation of row-to-row processing and cotton harvesting machines.
3. To implement agrophone management in risky farming conditions, it is necessary to develop technology and technical means in combination with innovative ridge tillage and strip tillage of the soil with simultaneous sowing of cotton seeds with laying a drip irrigation hose on the ridge to prepare the field for machine harvesting.
4. A design scheme of an innovative sowing machine has been developed with simultaneous sowing of seeds of industrial crops and with laying a drip irrigation hose on the ridge.

5. Targeted and uniform moistening of the root system of the plant inside the ridge consists in the fact that a thin tube is supplied directly to the trunk of the plant at the base, from which water enters the soil very slowly, drop by drop. Spreading out, the water forms a moistened contour, shaped like a humid bulb.
6. The development of technology and technical means for comb cultivation of cotton with targeted and uniform moistening of the root system of the plant is allowed to create a comb with dry and loose sides that reduce heat and moisture loss from the inner layers.
7. Based on the results of further research, it is possible to establish reasonable parameters – the depth and width of ridges and ridges, conditions for pre-sowing and post-sowing treatment, irrigation schemes and norms; to develop on their basis agrotechnical requirements for the designed machines and implements.
8. The sound technology and workflow of the seeder allowed an increase in yield by at least 25.6%, saving irrigation water by at least three times, reducing the number of cultivations by more than two times and reducing labor costs by more than 1.5 times.

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