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INFORMATION MODEL BASED ON PARAMETERS OF A COMBINED SOIL PREPARATION UNTIL FOR PLANTING

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Abstract: *The article describes in detail the development of a combined pre-sowing machine as a result of the literature analysis of the scientific research conducted on pre-sowing tillage machines and its use and working process. In addition, the article provides scientifically based information about the factors affecting the leveler-softener and previous work on their improvement. The current state of tillage before planting in Uzbekistan and the size of the tilled fields are studied and tabulated. In order to optimize the parameters of the developed machine and minimize costs, as well as to increase its efficiency, it is devoted to the creation of an informational model of the leveler-softener, which is considered as a research object of the machine, and to justify its parameters. On the basis of the studied and analyzed data, the factors affecting it and their areas of change in order to achieve the target function are presented in the tables based on the data studied in detail from previous scientific works. On the basis of the conducted studies, the factors that have the greatest impact on energy efficiency were determined and it was concluded that the theoretical and experimental part of the scientific research work should be continued based on them.*

Keywords: *leveler, softener, research object, soil, brush-storm, factors.*

Annotatsiya*:Maqolada ekishdan oldin tuproqqa ishlov beruvchi mashinalar yuzasidan olib borilgan ilmiy tadqiqot ishlarini adabiyotlar bo'yicha taxlili natijasida ekishdan oldin ishlov beruvchi kombinatsiyalashgan mashina ishlab chiqilganligi va uning qo'lanilishi hamda ishlash jarayoni batavsil keltirilgan. Bundan tashqari, maqolada tekislagich-yumshatgichga ta'sir qiluvchi omillar va ularni takomillashtirish bo'yicha oldingi olib borilgan ishlar haqida ilmiy asoslangan ma'lumotlar keltirilgan. Tuproqa ekishdan oldin ishlov berishning O'zbekistondagi hozirgi holati va ishlov beriladigan dalalarning o'lchamlari o'rganilib jadval holatiga keltirilgan. Ishlab chiqilgan*

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mashinaning parametrlarini optimalshtirish va xarajatlarni minimalshtirish xamda samaradorligini oshirish maqsadida mashinasining tadqiqot obekti hisoblangan tekislagich-yumshatgichining infarmatsion modelini yaratish va parametrlarini asoslashga bag'ishlangan. O'rganilgan va taxlil qilingan ma'lumotlar asosida maqsad funksiyaga erishish uchun unga ta'sir qiluvchi omillar va ularning o'zgarish soxalari oldingi bajarilgan ilmiy ishlardan batavfsil o'rganilgan ma'lumotlar asosida jadvallargama'lumotlar keltirilgan. Olib borilgan o'rganishlar asosida energiya tejomkorligiga eng katta ta'sir qiluvchi faktorlar aniqlandi va ilmiy tadqiqot ishini nazariy va eksperimen qismini shular asosida davom qildirish kerakligi haqida xulosa qilindi.

Kalit so'zlar: *tekislagich, yumshatgich, tadqiqot obekti, tuproq, mola-borana, faktorlar*

Аннотация: *В статье подробно описана разработка комбинированной предпосевной машины на основе анализа литературы, научных исследований, проводимых по предпосевным почвообрабатывающим машинам, ее применению и рабочему процессу. Кроме того, в статье приведены научно обоснованные сведения о факторах, влияющих на корректировщики-пластификаторы, и предшествующих работах по их совершенствованию. Изучено и сведено в таблицы современное состояние обработки почвы перед посевом в Узбекистане и размеры распаханных полей. С целью оптимизации параметров разрабатываемой машины и минимизации затрат, а также повышения ее эффективности посвящено созданию информационной модели правильной машины-умягчителя, которая рассматривается как объект исследования машины, и обосновать его параметры. На основе изученных и проанализированных данных факторы, влияющие на нее, и области их изменения для достижения целевой функции представлены в таблицах на основе подробно изученных данных из предыдущих научных работ. На основе проведенных исследований определены факторы, оказывающие наибольшее влияние на энергоэффективность, и сделан вывод о необходимости продолжения теоретической и экспериментальной части научно-исследовательской работы на их основе.*

Ключевые слова: *планировщик, умягчитесь, объект исследования, грунт, жернов, факторы.*

Introduction

Today, the introduction of modern resource-saving, high-productivity techniques and technologies in the agricultural sector of our country remains one of the most urgent issues. "Currently, the cultivated area in the world before planting in the soil is 1.6 billion. hectare" [1], it is necessary to pay special attention to the creation and development of energy-resource-efficient aggregates with high work quality and productivity, used in the cultivation of land before planting.

In recent years, certain works have been carried out to reform the agriculture of our country, in particular, to improve the state management system in the field, to widely introduce market relations and strengthen their legal basis, to attract investments to the field, and to introduce resource-saving technologies and technical tools [2-4].

In world practice, combined energy and resource saving in soil cultivation, preventing soil compaction under the influence of the walking parts of machines, reducing the number of times they walk in the field, maintaining soil fertility, protecting the soil, preventing water and wind erosion, production costs and agriculture It is important to reduce the cost of food products.

Materials and methods

It is known that the main and pre-sowing processing of land are the most energy-intensive processes in agricultural production, 40-50 of the total energy used for growing and harvesting grain, cotton and other agricultural crops. percent is spent on their fulfillment [5]. Therefore, reducing the energy consumption during the main and pre-planting tillage of the land leads to a reduction in the cost of the product by saving a large amount of fuel and lubricants in agricultural production, reducing labor costs and other costs, A. Tokhtakuziev and H.A. Ravshanov mentioned in their works [6,7].

A. Tokhtakuziev and H.A. Ravshanov's scientific researches and researches have shown the main ways to ensure energy-resource efficiency in the cultivation of land before planting in the conditions of our Republic [6]. These directions are:

-optimization of working width and working speed of tillage machines;

- transition to technologies that reduce energy consumption in tillage;

- grinding of combined tillage machines;

- is to reduce the energy consumption for soil deformation and decomposition.

According to the analysis of the conducted scientific and technical and patent literature, it was determined that the factors of economy in tillage are energy and resource efficiency. Economical technologies should be aimed at preserving the fertile layer of the soil and moisture, fighting against water and wind erosion. In such technologies, each operation can be carried out by tilling the soil with or without turning the working bodies [7]. In some technologies, it can be done on the basis of using zero

or minimal tillage, keeping plant stems and root residues on the surface of the field [8,9]. Therefore, one of the important directions should be the use of specific (coordinated) agrotechnics or farming technologies that ensure high efficiency in tillage.

Currently, in our republic, in the implementation of the indicated agrotechnical measures for preparing the soil for planting, medium BZSS-1.0 and heavy BZTS-1.0 and BZTX-1.0 gear harrows, CHK-3.0, CHKU-4A chisel-cultivators, RVN-8.5 leveler-compacter, VP-8.0 pre-sowing leveler, MV-6.0 and MV-6.5 trowel-levelers are used [3,10,11]. To use this type of machines, it is necessary to use high-class tractors.

In addition to the above-mentioned levelers, many artificial levelers are used on farms. In most cases, they are made of wooden and concrete beams (slabs) and sleepers or two-way beams (Figures 1-a and b), and are connected to the tractor by means of chains, cables or wires.

a)

b)

Fig.1. Preparing the soil for planting. a - artificial trowel-leveler made of concrete brush; b - artificial trowel made of wood

This situation indicates that there is not enough combined type of work tools that work before planting turrock in the farms, or the ones that are available do not have the expected efficiency (work productivity and quality).

One of the studies devoted to the justification of the scheme and parameters of the machine system used in tilling the soil before planting belongs to K. Mukhamadsadikov [10,11], who studied the work process of the pre-planting leveler, its working bodies are installed in two rows (the first line is at an angle to the direction of movement, and the second line should be perpendicular to it (the direction of movement). According to theoretical and experimental studies conducted by S.K. Kochkarov on the basis of the parameters of the chisel softener leveler, which prepares the fields empty of wheat and repeated crops for planting, it is important to ensure the required quality of the specified technological process with low energy consumption. who emphasized that the issue is serious [12].

Currently, in the agro-industrial complex of our country, there are more than 160,000 farms with irrigated and semi-arid land areas of up to 40...500 hectares, of which more than 75,000 are multi-sectoral, their number as of 2009 increased by 45 percent in the last two years. In 2019, they produced more than 80 types of agricultural products and exported them to 66 countries. The distinctive feature of farms in Uzbekistan, as mentioned above, is their versatility, the size of their farms is small in outline - fields up to 6 hectares make up about 40% of the total land area, up to 10 hectares and fields make up about 60% (Table 1).

Table 1

Sizes of contours of cultivated agricultural land in the regions of the Republic of Uzbekistan[13]

Provinces	Number of contours	Average area of contours	Distribution of contours by size (hectare)											
			0-0.5	0.5-1	1.1-3	3.1-6	6.1-10	10.1-15	15.1-20	20.1-25	25.1-30	30.1-35	35.1-40	Over 40
Tashkent	3160	13.1	-	5.7	13.8	14.7	17.4	15.7	12	-	-	20.7	-	-
Sirdaryo	1735	25.8	-	1.4	2.7	6.6	9.9	10.4	14.5	12.6	14	8.4	4.8	14.7
Ferghana	3988	6.7	5.3	10.8	22.2	19.8	19.9	11.4	-	10.6	-	-	-	-
Namangan	781	10.5	-	2.3	10	22.8	25.5	18.7	10.2	-	10.5	-	-	-
Andijan	1497	8.0	3.5	5.8	24.3	24.5	16.6	10.8	6.4	-	-	8.1	-	-
Samarkand	835	13.5	-	4.4	10.7	16.1	21.6	17.2	11.4	7.4	-	5.9	-	4.3
Bukhara	409	5.0	-	6.1	36.9	32	12	10.8	2.2	-	-	-	-	-

Provinces	Number of contours	Average area of contours	Distribution of contours by size (hectare)											
			0-0.5	0.5-1	1.1-3	3.1-6	6.1-10	10.1-15	15.1-20	20.1-25	25.1-30	30.1-35	35.1-40	Over 40
Kashkadarya	1835	16.4	-	0.7	7.4	10.4	17	18.9	16.5	18.4	-	6.6	-	4.1
Surkhandarya	611	8.2	1.5	3.3	28.6	27.7	9.7	18	3.3	5.2	-	-	4.7	-
Khorezm	1101	8.6	-	1.5	18.1	26.2	22.9	18.1	-	13.2	-	-	-	-
Tottal:	17540	12.9	1.6	5.2	15.7	17.1	17.5	14.6	7.9	5.4	4.2	6.2	1.7	2.9

Based on the information given above, it is appropriate to use machinery and agricultural aggregates with a slightly smaller coverage width for tilling the soil before planting on farms. It shows the need to take into account the smallness of the field contours in the design and production of tillage machines and in the research work conducted on them. Nowadays, the machines that work before planting in the soil in farm chickens are machines with a coverage width of 4-12 m [13]. In order to treat the land at the required level, this system of machines passes through the same place two or three times, its maneuverability and productivity are low, it is material-energy-intensive, and its use requires additional manual effort. All this leads to labor costs and other costs for preparing the land for planting, including excessive consumption of fuel, excessive compaction of the soil and loss of moisture in it, and a decrease in productivity. In addition, it should be noted that the existing levelers are morally outdated, do not meet modern requirements such as minimal and economical land treatment with the help of complete mezanization and automation of auxiliary operations. Based on this, the purpose of the research conducted in this work is to improve the quality and productivity of land preparation for planting, fuel and other costs, based on the way of improving the technological work process and justifying the parameters of the working bodies and aggregates that process the soil before planting. is to reduce consumption.

Results and Discussions

Basing the parameters of the new combined leveler-softener unit [14], which works before planting in the soil, consists in developing a mathematical model of the research object (RO) based on the goals and tasks of the scientific research work.

The leveler-softener aggregate, which is the object of the study, is attached to the tractor by means of a puller 1 for use in the work process. In the case of transport, the harrows 8 or rollers 9 are carried on the frame and are connected to the tractor through an additional special traction mechanism 3 for pulling from the side of the frame. Moves together with 5. In the working position, the support wheels are raised up.

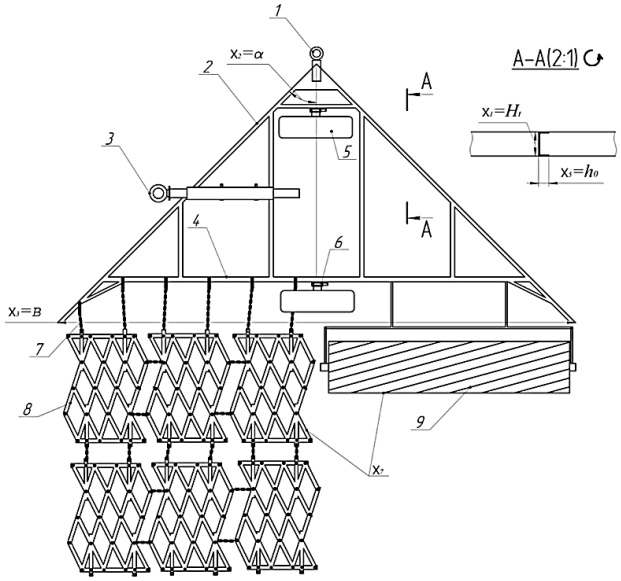

Fig.2. The scheme of the machine (leveler-softener) that works the soil in a combined way before planting. 1-tractor suspension device (in operation); 2-side sections; 3- tractor suspension device (in the state of transportation); 4-the last section; 5-wheel; 6-wheel column guide; 7-chain; 8-harrow; 9-roller.

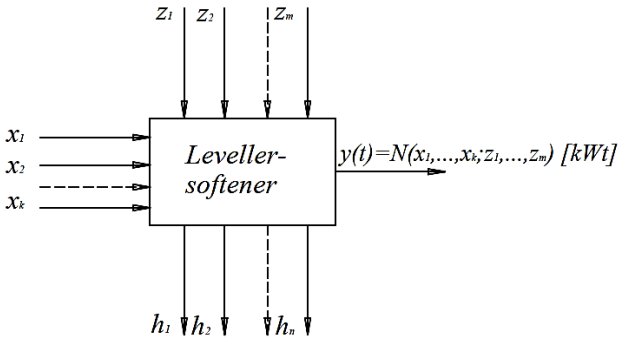

Fig.3. Informational model of combined aggregates that work before planting in the soil, based on the study of previous research (apriope data)

On the basis of the mentioned findings, an informational model of a leveler-softener was developed (Fig.3) to study the scheme and parameters of the processing unit before planting in the soil. The main parameter of the model is the objective function, since one of the most energy-demanding processes in

agriculture is tillage, the energy required for using the aggregate is $y(t)=N(x_1,...,x_k;z_1, ...,z_m)$ was set as the objective function to reduce consumption.

The input parameters of the information model were divided into two groups: 1-group - x_1 ,..., x_n - controlled input factors (see Figure 2), 2-group - z_1 ,..., z_m - uncontrollable input factors. Research on the results of the tests specified in the state and departmental normative technical documents for aggregate work quality indicators, and on obtaining a priori data from other sources (magnitudes $h_1,...,h_n$) was carried out. The parameters of the information model, information on their areas of change determined on the basis of a priori data are presented in Table 2.

Table 2

Information and sources of parameters of the information model of combined aggregates that work before planting in the soil

№	Parameter type and name	Field of change	Origin
1	***x_k – managed access factors:***:		
	x_1 – leveler height, m;	0,136 ... 0,36	[10,11]
	x_2 – grinding (attack) angle, grad;	30°... 50°*	[10-12]
	x_3 – aggregate coverage, m;	4-12	[10-12]
	x_4– operating speed, m/s;	6 ... 12*	[10-12]
	x_5– the length of the working surface of the compactor, m	0,06...0,4	[10,12]
	x_6– structural weight, kg	36,7 ... 1530	[13]
	x_7– type of softener		[10,11]
2	***z_m – unmanaged entry factors:***		
	z_1 – the height of the ridges on the field surface, sm	<5	[5]
	z_2 – the amount of large pieces, %	15 … 20	[5]
	z_3 – amount of plant residues after tillage, %	95	[5,13]
	z_4 – soil moisture, %	12-18	[5,13]
	z_5 – soil density, g/cm^3	1,1 ... 1,25	[10,11]
3	***h_n – regulated sizes:***		
	h_1– unevenness of the field surface (at a distance of 5 m), sm	±2	[10]
	h_2– soil moisture (in the 0-10 cm soil layer),%	16-18	[10]
	h_3– the amount of fractions (in the 0-10 cm soil layer),% – less than 25 mm – greater than 50 mm –greater than 100 mm	 80 5 -	[10,11]
	h_4– soil density (in the 0-10 cm soil layer), g/cm^3	1,1 ... 1,2	[5,10,11,13]
	h_5– rate of weed loss, %	95	[5]

**It should be clarified according to the results of additional studies.*

It is necessary to conduct additional theoretical and experimental studies to determine the degree of influence of the input parameters of the model (x_k, z_m) on the objective function y(t) and to select the most effective ones. In particular, it is necessary to justify the parameters of the unit based on the quantitative criteria of minimizing energy consumption and increasing work output, and determining the level of influence of these parameters. To perform this task in field conditions, the scheme of the tiller unit before planting in the soil presented in Figure 3 below was taken as a basis. The objective function to reduce the drag resistance of the rectifier-softener in the circuit is represented by y(t).

Conclusion

Systematization of future scientific research work on the basis of the scheme and parameters of the leveler-softener that works before planting in the soil with the help of the developed leveler-softener information model and its based parameters, their change limits and other data, among the controlled input factors selecting the most important ones and using them to continue the work in research work, rational planning and ultimately increase the effectiveness of research, save time and costs.

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