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Research Article

IMPORTANCE OF EROSION IN INFLUENCING SOIL FERTILITY IN CROP IRRIGATION

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ABSTRACT

At present, research and development activities aimed at developing new scientific and technical solutions for the effective use of land resources, the organization of optimal use of agricultural land in areas affected by erosion and at risk of erosion in land development projects are being carried out. In this direction, among other things, reducing the harmful effects of the environment in areas with the risk of water and wind erosion, improving the methods of effective use of each plot of land, taking into account the natural and economic conditions and the requirements for the protection of land from erosion, geosystem complexes that allow to prevent erosion in land formation. development, efficient use of land, protection of soils from erosion, creation of technologies that allow to increase the productivity of land is considered urgent. In this regard, special attention is paid to studies aimed at improving the efficiency of work in determining the composition of land types attached to land users and methods aimed at their optimization. Based on this, the main task of today's region is the wide use of modern economical technologies and the possibilities of their application to production, analysis of problem solving, and elimination of excess costs.

KEYWORDS

Effective use of land resources, environment, wind speed, salinity level, technology.

INTRODUCTION

Organization of effective land use in globally eroded areas requires implementation of new methods of land development projects. In this regard, in developed foreign countries, special attention is paid to the

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implementation of land preparation works, taking into account the methods of effective use of land resources and protection of eroded lands. In this regard, effective use of land resources, introduction of advanced modern methods of designing irrigation plots in eroded lands is considered important. Effective use of existing land resources, development of new scientific and technical solutions for organizing optimal use of agricultural land in areas subject to erosion and at risk of erosion in land development projects are being carried out. In this direction, among other things, reducing the harmful effects of the environment in areas with the risk of water and wind erosion, improving the methods of effective use of each plot of land, taking into account the natural and economic conditions and the requirements for the protection of land from erosion, geosystem complexes that allow to prevent erosion in land formation. development, efficient use of land, protection of soils from erosion, creation of technologies that allow to increase the productivity of land is considered urgent. In this regard, special attention is paid to studies aimed at improving the efficiency of work in determining the composition of land types attached to land users and methods aimed at their optimization.

In our republic, comprehensive measures are being taken to improve land preparation works in the areas affected by erosion, and certain results are being achieved. In the Strategy of Actions for the further development of the Republic of Uzbekistan in 2017-2021, including "...modernization and rapid development of agriculture, consistent development of agricultural production, further strengthening of food safety, expansion of production of environmentally friendly products, agricultural sector important tasks for significantly increasing the export potential... In the implementation of these tasks, it is important to carry out scientific research on improving the methods of preventing the development of erosion processes in agricultural lands by introducing intensive methods, first of all, modern agro-technologies that save water resources into the field of agricultural production. The main task of the land development project is to organize the territory of agricultural enterprises against erosion. As a result of it, an organizational-territorial basis is created for the implementation of soil protection. In the project, taking into account the flow lines and the directions of harmful winds, it is intended to place forest strips, soil protection measures.

Table 1

The distance between the strips of surrounding trees according to the wind speed and the mechanical composition of the soil, m (data from Q. Mirzajonov)

Wind speed	According to the mechanical composition of the soil			Number of rows
	Sand and sand	Light to medium tone	Heavy clay, mud	
Weak (< 5м/с)	450-500	450-500	450-500	2
Average (5-15 м/с)	200	250-300	350-400	3
Strong (> 15 м/с)	100-150	200	250-300	4

Ihota trees are selected depending on the degree of salinity and waterlogging of the soil. White acacia, juniper, alder, mulberry, and willow, poplar, oak, and maple trees can be planted on saline lands, and on lands prone to swamps, Ihota forests mature in 8-10 years and protect the soil and crops from the wind. Agro-ameliorative measures are used to protect soil and crops from wind damage before the trees mature, and thereafter to increase soil fertility and make efficient use of eroded land (Table 1).

Protecting hedge trees not only protect crops from wind, but also have a positive effect on air temperature and air humidity in the protected area. As a result of the positive effect of protective hedge trees on air temperature and air humidity, a favorable microclimate is created, which also has a positive effect on crop productivity.

A land development project has been developed to improve the methods of land development projects in areas affected by erosion and at risk of erosion. The issues of placement of land types and crop rotation arrays, taking into account the level of erosion risk of the area, and the use of water-saving technologies in the design of irrigation plots are based.

Determining types of agricultural land and organizing crop rotation is one of the main parts of the project of land formation on the farm, which is inextricably linked with the organization of production in the agricultural enterprise. The main task of determining the composition of land types and organizing crop rotation in the farm is to adapt land areas for the production of the maximum amount of high-quality products required by the market with the minimum necessary costs from each hectare of land used and create favorable regional conditions for production.

The project of land formation in areas with erosion risk in Kashkadarya region was created for U. Yusupov massive farms in Nishon district based on the methodologywe recommend (Table 2).

In 2021, 50 farms, including 40 cotton-grain farms, 2 grain-vegetable farms, 3 horticulture farms, and 5 livestock farms, operated in the massif area. One of the main tasks of internal land formation in an agricultural enterprise is the organization of land types and crop rotation.

The main purpose of the organization of land types and crop rotation is to increase the intensity of land use and increase its efficiency, taking into account the economic interests of land owners and land users. In this case, it is necessary to strictly comply with environmental requirements, because otherwise the fertility of soils will decrease, erosion and degradation processes will develop in them.

Silk production is one of the auxiliary and profitable branches of agricultural enterprises in the direction of cotton production. The importance of sericulture is not limited to the production of cocoons. Mulberry trees planted along roads and ditches protect the fields from wind and dust and create a basis for increased crop productivity. They bring additional income without requiring the allocation of special land areas for themselves.

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Table 2

The land fund of the massif named after U. Yusupov

T/r	Land types	Area, ha		
		Total	Relative to the total area, %	Q/agricultural land, %
1	2	3	4	5
1.	Arable land: Sh.j: irrigated	3055.62	74.75	91.21
2.	Arboretums, total: gardens vineyards traps	70.61 25.81 7.8 37.0	1.72 0,63 0,19 0,90	2,10 0,77 0,23 1,10
3	Gray land	108.1	2.64	3.23
4	Meadows	116.06	2.84	3.48
	Total agricultural land	**3350.39**	**81.96**	**100**
5	Total farm land: Sh.j: field plot	174.1 2.9	4.26	
6	Ihota groves	15.1	0.38	
7	Ditches and ditches	369.3	9.03	
8	Roads	70.9	1.73	
9	Buildings and areas	100.8	2.47	
10	Non-agricultural land	7.1	0.17	
	Total massif lands	**4087.69**	**100.0**	

The size of cocoon cultivation is determined depending on the market demand and the possibilities of the massif. The calculations showed that the available 37.0 hectares of land in the area of the massif are sufficient for growing the planned cocoon product.

For this reason, it was recommended to leave 25.81 hectares of garden and 7.8 hectares of vineyards in contours 60, 80, 171, 178, 181a with low productivity and deep underground water (2-3m) in the area of the massif, but to replace the varieties with high-income intensive varieties. Fruit trees and vegetable crops could not be planted

In the 241st circuit, it is recommended to establish a fishing pond. In addition, the construction of workshops for the processing of products grown in the area where horticulture-viticulture, vegetable, potato and potato crops are grown is also planned. In order to protect the land from soil erosion, the project also planned to plant an additional 16.2 ha of trees on the existing 15.1 ha area. Placement of land types begins

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with the placement of trees. First of all, gardens, vineyards and orchards are placed. The good development of fruit trees and vines largely depends on the correct allocation of land, the correct selection and placement of varieties and species, the quality of seedlings, their correct planting and subsequent care.

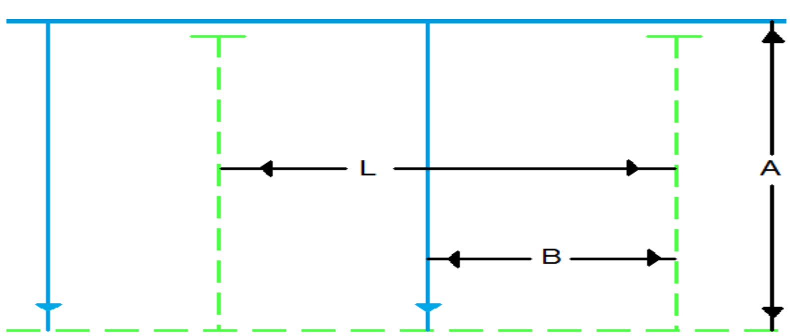
The area of arable land (Pkf) is calculated by subtracting the area of unused land types (Pfe) from the area of land that will be used in the future.

$$P_{кф} = P_{ум} - P_{фе} \qquad (1)$$

64 farms, including 34 cotton-grain farms, 4 grain-vegetable farms, 3 horticulture farms, 22 livestock farms, and 1 poultry farm were placed in the land development project (Fig. 1).

Figure 1. Land development project of U.Yusupov massif in Nishon district, Kashkadarya region

Design of fields and irrigation plots After placing land types and crop rotation areas in the area of the massif, each crop rotation massif area is created and irrigation (working) plots, fields, field roads, hedge trees are placed in it.



where: A- the length of the irrigation section, m; V-width of irrigation plot, m; Distance between L-drainages, m.

Figure 2. The scheme of combining the collector-drainage network with the irrigation network in saline lands

Determining the rational size of the irrigation plots by area is influenced by: the mechanical composition of the soil and salinity level, the location of the collector - drainage and irrigation network, as well as the costs of leveling the surface of the irrigated land. When using open drains in saline lands, the scientifically based distance between the drains is one of the most important elements that determine the area of the irrigation plot (Fig. 2).

In saline lands, drains should be located between two adjacent irrigation ditches, either permanently or temporarily. This scheme of combining the drainage network with the irrigation network is widely used in the development of land development projects.

The length of the irrigation section can be determined by the following formula.

$$A = \frac{N_{\text{б}}^{\text{с}}}{N_{\text{б}}}.L, \qquad (2)$$

where: L- the length of the furrow, m

Allowable water consumption and furrow length on different slopes for some soils have been established by scientists through experiments.(Table 2)

The size of the land area of the irrigation plot is determined according to the following formula.

$$P = \frac{A \cdot B}{10000}. \qquad (3)$$

The results of studies on determining the optimal size of irrigation plots in lands subject to irrigation erosion are presented in Table 3.

Table 3.

Recommended elements of irrigation technology for Kashkadarya region

Soil mechanical composition, water permeability	Shows*	Slope of irrigation furrows			
		0,01	0,007	0,002	0,0005
Sand and light sand, very permeable	R	0,50	0,75	1,50	1,00
	L	100	150	200	150
	T	4,7	4,7	3,1	3,3
Light weight, high	R	0,40	0,75	1,00	0,75

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permeability	L	150	200	300	250
	T	9,2	6,3	6,7	6,7
Medium sand, medium permeability	R	0,25	0,50	0,75	0,50
	L	175	250	300	300
	T	15,0	11,7	8,35	10,0
Heavy soil, low water permeability	R	0,20	0,25	0,30	0,50
	L	200	300	400	350
	T	23,4	26,7	28,4	15,0
Clay, weakly conductive	R	0,10	0,15	0,20	0,25
	L	150	200	300	400
	T	35,0	30,0	33,3	35,0

*Compiled based on the information of M.D. Chelyukanov, G.A. Bezborodov, Kh.T.Tashev. x).

R- water consumption in the furrow, water flow rate, l / s.; L- the length of the furrow, m;

T- the duration of irrigation in simultaneously irrigated furrows, s.

Table 4.

Recommended optimal areas of the irrigation plot

Soil mechanical composition, water permeability	Water consumption of plot water dispensers, l/s	Plot areas, ha			
		0,01	**0,007**	**0,002**	**0,005**
1	2	3	4	5	6
Sand and light sand are highly conductive	200	18,0	18,0	18,0	18,0
	250	21,0	22,5	24,0	22,5
	300	24,0	27,0	30,0	27,0
Light strong sand, high permeability	200	18,0	18,0	18,0	22,5
	250	22,5	24,0	27,0	30,0
	300	27,0	30,0	27,0	30,0
Medium sand, medium permeability	200	21,0	15,0	18,0	27,0
	250	26,2	22,5	27,0	27,0
	300	31,5	30,0	27,0	36,0
Heavy soil, low water permeability	200	18,0	18,0	12,0	21,0
	250	24,0	27,0	24,0	21,0
	300	30,0	27,0	24,0	31,5

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Experts say that the decrease in the productivity of agricultural crops, and in some cases the failure is related to the problem of water shortage. In order to mitigate this situation and prevent irrigation erosion, it is necessary to introduce economical technologies in the irrigation system, to prevent unnecessary wastage of water.

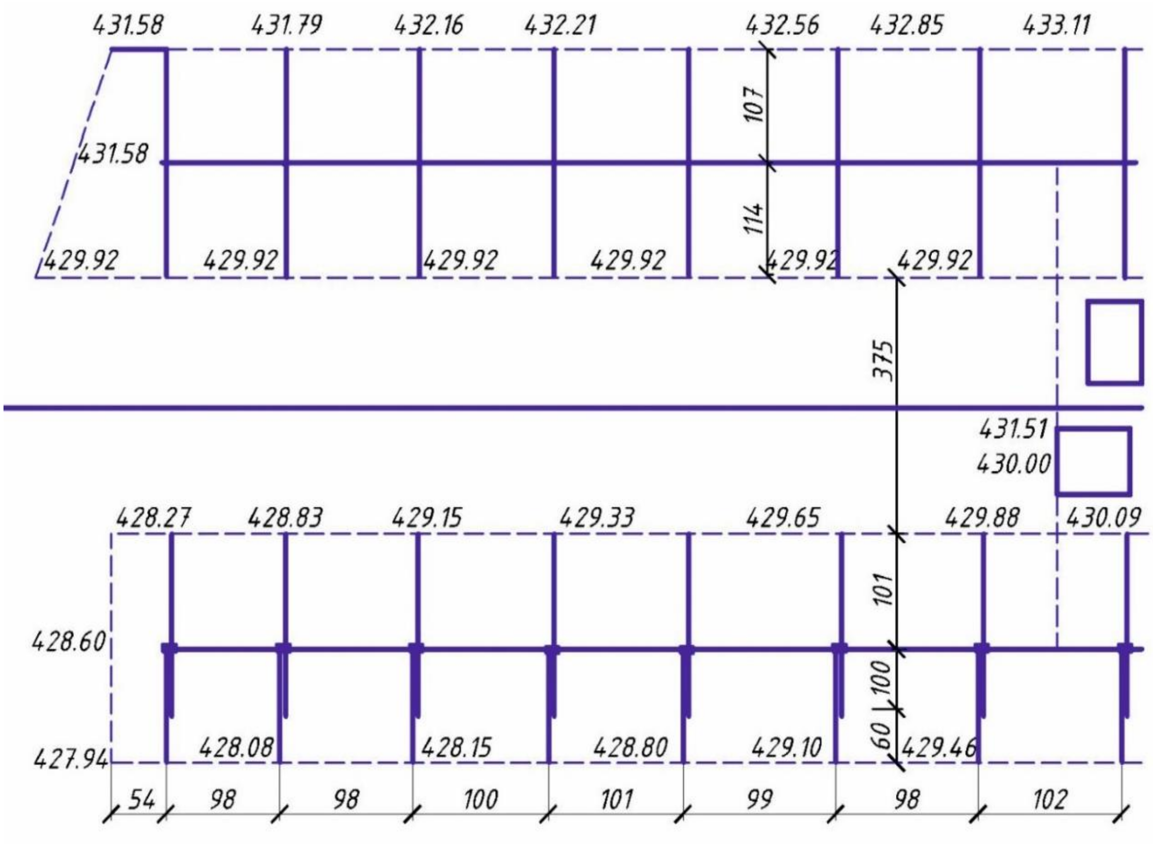

Figure 3. Design of drip irrigation plots

Table 5

Comparison table for assessing the location of fields and irrigation plots (in the example of the farm named after Z.Farmonov)

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№	Indicators	per year of land formation	according to the project
1	**2**	**3**	**4**
1	Land use factor (LFC)	95.37	98.32
2	Crop rotation area, ha	90.9	93.75
3	Area under roads, ha	0.9	0.3
4	Net area of arable land, ha	90.0	93.45
5	Number of irrigation plots	4	4
6	The average area of the irrigation plot, ha	22.73	23.44
7	The distance between the longest sections, m	1050	1050
8	Average processing distance, m.	740	860
9	Slope in working direction, %	13.3	9.1
10	The total area of circulation lanes, ha	15.2	8.21

Drip irrigation is aimed at saving water resources and stopping irrigation erosion. In this case, the specificity of the irrigation regime allows it to be used even on land with a relatively high slope. Most importantly, because the water is delivered to the plant through hoses, the field soil does not harden, as a result, there is no need for inter-row cultivation. At the end of the season, the field that has not hardened the soil is plowed with good quality and easily. Since the fertilizer is given together with water, there is no need to use equipment for fertilizing (Fig. 3). As a result, labor and fuel-lubricants are saved. The manual labor of watermen in the field is drastically reduced. In the course of conducting scientific research, a water-saving drip irrigation project was developed on the area of 42.0 ha in the area of the farm named after Z.Farmonov. The obtained results are presented in Table 4.

The composition and areas of agricultural land types used in land development projects were improved taking into account the natural, economic, social and ecological conditions of the massif, and there was an opportunity to increase the yield of agricultural crops by 2-3 centners per hectare. As a result of the use of "water-saving" technologies, water consumption per hectare decreased by 30-40%, production costs by 20-25%. Efficiency increased by 22%.

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