Innovative technology for increasing the fertility of saline soils

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INTRODUCTION

The Turkestan region is the most densely populated in Kazakhstan, with a population density of over 17 people / km2. At the end of nine months of 2020, the gross regional product per capita in the Turkestan region amounted to 729.2 thousand tenge - this is the minimum value among all regions of the country, below the national average by 70.2% [1]. The level of unemployment and poverty is one of the most unfavorable in the Republic. Thus, the share of the population with incomes below the subsistence minimum is within the critical 11.2% - almost 2 times more than the average for the Republic of Kazakhstan (5.7%) [2].Most of the population is engaged in agriculture, and in the irrigated areas of the Turkestan region, due to salinization, soils on 42,912 hectares have an unsatisfactory meliorative state, due to the rise in the level of groundwater on 80005 hectares, and due to both factors on 24909 hectares. In this regard, the purpose of our research was to solve the problems of irrigated saline soils of the Turkestan region by applying innovative technology to increase soil fertility and corn productivity, taking into account the level of potential and effective soil fertility to ensure food security in the region.

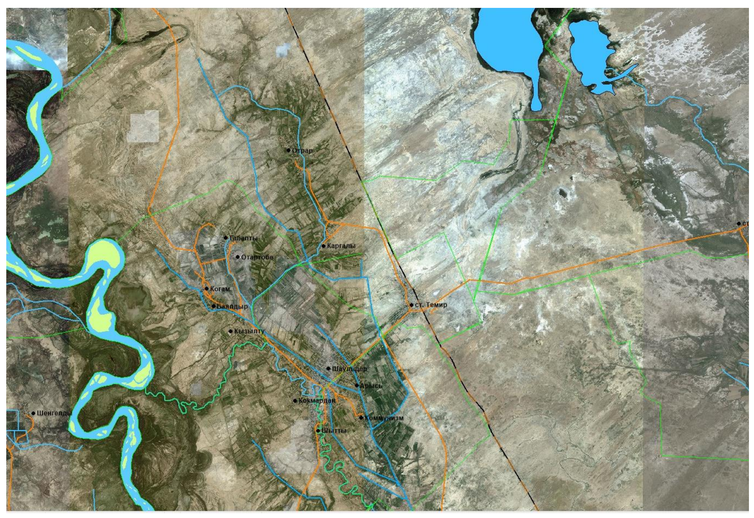

Fig 1.

METHODOLOGY

Field and laboratory generally accepted methods of soil and agrochemical research, geoinformation mapping technologies, remote (space) soil research were used; Work on the compilation of a map of the content of humus and nutrients in soils was carried out by carrying out a traditional ground soil survey of the territory of the study object according to [3]. Guidelines for conducting ... [4]. (1979) and Methodological Guide ... [5]. To determine the coordinates of the points of soil sampling, the GPS global positioning system “Garmin 62s” was used in tandem with the “ASUS” netbook; Soil sampling sites were mapped directly during field work using the Map Info professional software. The obtained analytical data were subjected to variational-statistical processing [6]. and calculated the average "background" content of humus, basic nutrients, pH and toxic salts. Thematic maps were compiled in the GIS environment using the MapInfo professional computer program.

RESULTS

The results of assessing the soils of peasant farms by the degree of salinity and the content of nutrients on an area of 1507 hectares were obtained. The soil database contains the results for 4897 soil horizons. On the territory of 3 pilot farms, a production test of the biological method of soil desalinization was carried out. A microbiological preparation has been developed that increases the biological activity of saline soils. On an area of 1507 hectares, a technology was introduced to increase the fertility of saline soils and the yield of agricultural crops in 70 peasant farms with an increase in the yield of corn for grain from 33.8 to 34.1% on weakly and moderately saline soils, and on highly saline soils - 14, 5 %. The analysis of the effectiveness of the developed technology is carried out, indicating the cost estimate per 1 hectare, the payback of costs due to increased productivity, indicating the payback period.

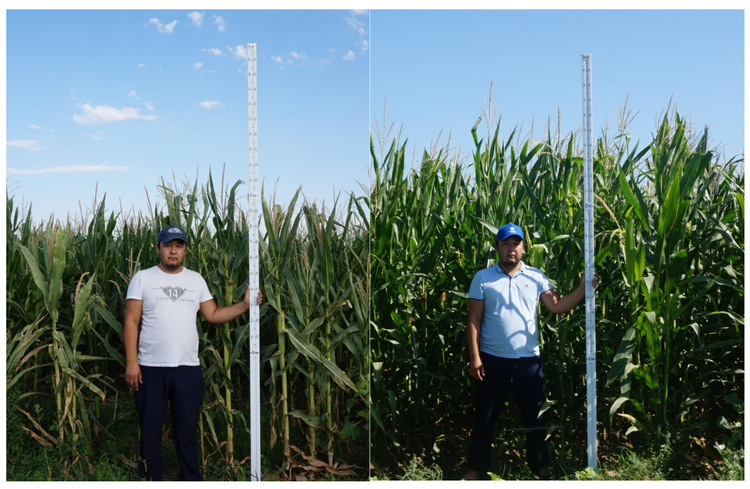

Fig 2.; Fig 3.; Fig 4.; Fig 5.

CONCLUSIONS

On an area of 1507 hectares in 70 farms, an innovative technology was introduced into production, which provided an increase in the yield of corn for grain by 33.8-34.1% on weakly and moderately saline soils, and on highly saline soils - 14.5%.

The economic efficiency of the introduction of technology in the cultivation of corn for grain in comparison with the existing technology varied from 180.5 thousand tenge / ha on non-saline soils to 34.2 thousand tenge / ha on highly saline soils. The cost recovery with the existing technology ranged from 1.21 to 1.86 tenge, with innovative technology it ranged from 1.34 to 2.52 tenge.

Influence of technology on the yield of corn for grain, c / ha

Soil salinity	Experience options		Increase in yield, c / ha	
	Current technology	Innovative technology	centner / ha	%
Non saline soils	76,3±0,38	108,5±3,09	31,8±3,10	42,1±3,98
Slightly saline soils	66,3±1,02	88,9±1,74	22,6±1,04	34,1±1,47
Medium saline soils	64,3±1,01	86,1±1,76	21,7±0,95	33,8±1,22
Highly saline soils	48,4±1,11	55,5±2,28	7,1±1,34	14,5±2,51

Cost-effectiveness of introducing innovative technology on corn cultivated on soils of varying degrees of salinity

Economic and business showings	Non saline soils		Slightly saline soils		Medium saline soils		Highly saline soils	
	Current technology	Innovative technology	Current technology	Innovative technology	Current technology	Innovative technology	Current technology	Innovative technology
Totalcost, th. tenge	245,5	258,2	243,8	254,8	243,5	254,4	240,8	249,1
Gross crop of grain, tonne	7,6	10,9	6,6	8,9	6,4	8,6	4,8	5,6
Grain cost, th.tenge/t	60,0	60,0	60,0	60,0	60,0	60,0	60,0	60,0
Total selling value, tenge/ha	457,8	651,0	397,8	533,4	385,8	516,6	290,4	333,0
Conditional net profit, tenge / ha	212,3	392,8	154,0	278,6	142,3	262,2	49,6	83,9
Cost of 1 kg of grain, tenge	32,2	23,8	36,8	28,7	37,9	29,5	49,7	44,9
Profitability, %	86,5	152,1	63,2	109,3	58,5	103,1	20,6	33,7
Costrecovery, tenge/tenge	1,86	2,52	1,63	2,09	1,58	2,03	1,21	1,34
Economic efficiency of innovative technology, th.tenge/ha	-	180,5	-	124,6	-	119,9	-	34,2

Table 1 and 2

ACKNOWLEDGEMENTS

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