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PHOSPHOGYPTIC COMPOSITIONS TO IMPROVE MELIORATIVE SOIL PROPERTIES

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ABSTRACT

The article presents the possibilities of using geographic information systems in assessing the performance of the region's economy. Electronic maps created on the basis of the "Resource Potential of Semi-Saline and Saline Soils" database help to investigate and describe the spatial differentiation of the region's economy, the nature and relationship of business entities, and to identify environmental management features. Some indicators that characterize the main trends in the agriculture of Tuva are reflected. The application of the capabilities of geographic information technologies ensures the comprehensiveness and visibility of the presentation of information. The article deals with the use of phosphogypsum for effective dressing in various soil and climatic zones for cereals, vegetables, industrial and other crops, to increase the yield of cotton and the technological quality of its fiber. That the use of phosphogypsum as a chemical ameliorant improves the chemical, physical and water - physical properties of the soil.

Keywords: Bukhara, Khorezm region and Republic of Karakalpakistan, indicators of agricultural Economics, geographic information systems, phosphogypsum, chemical ameliorant chemical reclamation.

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INTRODUCTION

Economic geography as a science of territorial division of labour, location of production, on the conditions and characteristics of the development of production in different countries and regions of different geographical approach to the study of the phenomena of economic life. Feature of economic geography is an extremely wide range of observed economic phenomena. The main methods of economic–geographic research: analysis of statistical materials, cartographic, direct observation of economic-geographical phenomena and others. The analysis of statistical data allows to open in reality a logical objective connection and interdependence of the phenomena, to trace the course of economic processes and tendencies of their development. Mapping method makes it possible to represent in visual form the geographical localization of any economic-geographical phenomena, their spatial relations and interconnections [1,2,3]. The development of computer technology contributed to the creation of various software products for solving typical economic-geographical problems. In particular, the main of these methods such as mapping, and mathematical modeling implemented in geoinformational systems (GIS), which contributes to their widespread use. The purpose of the application of the tools of geographic information systems to create and analyze maps reflecting the state of agriculture of Bukhara, Khorezm and the Republic of Karakalpakistan.

Physiological processes occurring in plants (metabolism, photosynthesis, movement of water, the process of development) directly linked to regulation and order fuel fertilizers. Mineralization occurs by the penetration of ions according to the law of osmosis in the soil, through the roots of plants, as well as participation in the metabolism and movement in the stem of plants. Ions moving in the radial direction, absorbed in a vessel the xylem conducting through organo — mineral compounds, with the transpiration of water held in the stem and leaves of the plants. As it is known that the mineralization of cotton and other crops composed of 13 elements, including nitrogen, phosphorus, potassium, calcium, magnesium, and a relatively large amount of sulfur, etc [4].

The amount of mineral elements in the stem of the plant depends on their quantity in the soil Genesis and soil development. The greatest number of mineral substances in cotton are located on the leaves, and the lowest in fiber. When feeding back into basic elements like nitrogen, phosphorus and potassium was observed, respectively, in seeds, pods and fibers and calcium, magnesium and sulphur in leaves of cotton. Based on data obtained in laboratory and field conditions in different soil and climatic conditions, recommendations and implemented for production. But

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despite this, applied the norm of mineral fertilizers in agriculture of plants like the cotton plant in the conditions of market economy does not meet the requirements. It should be noted that, especially in conditions of deep groundwater, where much of the irrigation water when watering, including with her and fertilizers go below the specified soil layer. Therefore, the markedly reduced efficiency in the use of supplied mineral fertilizers.

The use of interpolymer complexes (IPC) in agriculture and water industry is of great importance, since polycomplexes have a major advantage over any known polymers due to their high fixing abilities. Both technological and economic benefits of their use for solving a number of agrophysical problems and land reclamation issues appear [5,6,7].

METHODS

Currently, there are more than 80 million tons of phosphogypsum in the dumps of Ammofos-Maxam OJSC and its amount continues to increase annually (in terms of calcium dihydrate). The monitoring studies of the phosphogypsum dump located on the territory of the Almalyk Chemical Plant of Mineral Fertilizers of Ammofos-Maxam OJSC showed that stagnant phosphogypsum has the same chemical and phase composition. The chemical composition of phosphogypsum mainly contains oxides of calcium, sulfur and silicon with an admixture of oxides of iron, aluminum, magnesium, phosphorus, sodium and others. As can be seen from the table, the mass fraction of the main substance (CaSO4 · 2H2O) in terms of dry dihydrate is 97%, the mass fraction of hygroscopic moisture is 16.4%, the content of water-soluble fluoride compounds in terms of fluorine is 0.12%. No admixtures of toxic compounds of cadmium, arsenic, mercury, lead in phosphogypsum were found[8,9,10].

Results of chemical analysis of phosphogypsum samples of JSC "Ammophos-Maxam", Almalyk

The name of indicators	Phosphogypsum (stale), dump of Ammofos OJSC	
	density gr/sm^3 - 2,3	**density gr/sm^3 -2,4**
1. P2O5общ.	2,00	1,39
2. SO3	44,33	44,95
3. CaO	29,81	31,33

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4. Fe2O3	0,29	0,64
5. Fобщ.	0,42	0,39
6. SiO2	13,75	12,44
7. Al2O3,	0,31	0,58
8. Fe2 O_3	0,29	0,64
9. MgO	traces	0,5
Insoluble residue	9,09	7,78

According to the technical characteristics, stale phosphogypsum placed on the dump of the Ammofos-Maxam mineral fertilizer plant meets the requirements of TU 113-08-418-94 “Phosphogypsum for Agriculture” grade No. 2 and therefore can be used for chemical soil reclamation.

Specific effective activity of natural radionuclides was determined for samples of stagnant phosphogypsum (waste from OJSC Ammophos-Maxam), on the basis of which the sanitary-epidemiological conclusion was given that phosphogypsum samples correspond to SP No. 202 of 03.02.2012. “Sanitary and epidemiological requirements for ensuring radiation safety” and phosphogypsum can be used in economic activities without restrictions. For phosphogypsum samples, toxicological parameters were determined, which showed that the toxicity value of the aqueous phosphogypsum filtrate in the experiment on laboratory animals (white mice) corresponds to the 4th hazard class. The total toxicity index of the phosphogypsum sample is 7.53 units, which according to GOST 30774-2001 classifies this waste as hazard class 5 (non-hazardous)[13].

The total area of solonetzic soils in the Republic of Uzbekistan is more than 2 million hectares, of which about 50% of the irrigated lands of Bukhara, Khorezm and the Republic of Karakalpakistan were salinized, saline, and lost nutrient reserves. For this reason, crop yields on these lands decreased by almost 2 times.

To improve crop yields in saline and saline soils is needed to increase their permeability and wagodirect supplies of calcium, by making calcium-containing chemical ameliorants (IPK + gypsum, phosphogypsum). Making phosphogypsum composites that is calcium-containing compounds in sodic soil pursues the main goal - the ousting of the absorbing complex of the soil of sodium ions and their replacement with calcium ions. Such a replacement leads to an improvement so far, soil properties, increasing their fertility. When applied to sodic layer of gypsum or phosphogypsum the reaction can go via the following scheme:

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$$CaSO_4 \cdot 2H_2O + 2Na\text{-soil} \rightarrow Ca\text{-soil} + Na_2S0_4 + 2H_20$$

Mandatory agrochemical event after application of phosphogypsum is a spring watering of the site, which provides washout of metabolic products (cations of sodium, magnesium) and improve the physico-chemical properties of the soil [3].

Years of research and practice of agriculture found that meliorative effect of gypsum and phosphogypsum are equal. The economic effectiveness of these ameliorants is determined by the content of the active substance (CaS04·2H20), with a cost of meliorant, its technological properties, i.e. cost of application.

The use of phosphogypsum is effective in different soil-climatic zones for feeding grain, vegetable, technical and other agricultural crops, and increases the cotton yield and technological quality of its fibers. The use of phosphogypsum as a chemical meliorant improves chemical, physical and water - physical properties of the soil.

Foreign studies (USA, Australia) show that phosphogypsum is used for chemical reclamation of solonetzic soils instead of natural gypsum in dry areas under wheat, cotton, beets, carrots. Phosphogypsum is applied at a dose of 2.5-5 t / ha on soils without irrigation and 10t / ha under irrigation during plowing (after 3-5 years). At the same time, an increase in wheat yield from 420 to 1460 kg / ha in the first year reimburses 70-79% of the cost of using phosphogypsum. Beets and carrots provide reimbursement of all additional costs for land reclamation in the first year.

This paper discusses the technology of phosphogypsum application on irrigated lands of the pilot production site in the Syrdaryn province.

DISCUSSION

The introduction of phosphogypsum is most effective in the autumn for plowing. Autumn-winter precipitation (rain and snow) ensures the dissolution of phosphogypsum and the penetration of its solutions into the deep horizons of the soil profile, which accelerates the course of metabolic reactions as a result of an increase in the concentration of calcium ions in the soil solution. At the same time, the soil structure improves, the leaching of humic substances from the arable layer decreases, and the water permeability of the soil increases.

For the application of phosphogypsum, centrifugal machines were used (with a cargo capacity of 3 tons and 5 tons, respectively), which evenly distribute the meliorant over the surface of the site. On the day the ameliorant is applied, it is

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planted into the soil with cultivators or harrows, then they begin to plow the field.

Within each 5 ha area, 0.2 ha areas were allocated to which phosphogypsum was not applied (control plots), i.e. phosphogypsum is applied to 4.8 ha plots. The dose of phosphogypsum is 0.8 t / ha, i.e. for each 4.8 ha site, 3.84 tons of phosphogypsum must be added (4.8 * 0.8 = 3.84 tons). Phosphogypsum with a dose of 0.8t / ha on irrigated areas is recommended to be applied at intervals of once every five years. In the spring period (early April), before planting crops, watering of the plots is carried out (irrigation rate of 5m3 of water per 1 ha) for moisture recharging and leaching of exchange cations (Na, Mg). The total water consumption per site is 240m3. After planting crops in the plots in the first year, results were obtained on the average yield of these crops in the control plots (without phosphogypsum) and in the experimental plots with phosphogypsum with a dose of 8t / ha. The results of the experiments showed that the average increase in yield compared with the control plot was: for cotton 14 kg / ha; for wheat - 19 kg / ha; for corn - 45 kg / ha.

Thus, additional products were obtained at the experimental sites: cotton - 672 c (67.2 t); wheat - 912 c (91.2 t); corn - 2160 t (216.0 t): - for cotton –33049.2 US dollars; — for wheat - 18539.0 US dollars; — for corn - 531.15 US dollars.

Yield of crops in the control and experimental plots in the first year of the experiment

Crops	When making phosphogypsum	Without phosphogypsum (control)	The average increase in yield c / ha	The rate of application of phosphogypsum t / ha
	average productivity, kg / ha	average productivity, kg / ha		
1 plot - Cotton	28	14	14	8,0
2 plot - Wheat	30	11	19	8,0

Chemical reclamation of saline soils through the application of phosphogypsum contributed to an increase in the calcium content in the soil, an improvement in the structure and permeability of the soil, and an increase in crop yields on reclaimed soils.

In the field of agriculture in the Bukhara, Khorezm regions and the Republic of Karakalpakistan there are enough problems, but, nevertheless, this industry is

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improving its performance from year to year. The revival of the traditional way of life will significantly affect the formation of more stable and moral and national traditions of the indigenous population of the republic. It is clear that in the regions with the breakdown of agriculture, with the traditional livestock sector of the agro-industrial complex, the further development of livestock farming is a promising and very profitable industry [13,14,15,16,17].

CONCLUSION

In our work, we used cartographic and static methods to analyze the agricultural activities of the Bukhara, Khorezm regions and the Republic of Karakalpakstan. The preparation of a map of the region using GIS will help as a tool for spatial analysis to help research and describe the spatial differentiation of the region's economy, reflect the nature and relationship of economic entities, and identify nature management features. They are in demand when detailed visual spatial information is needed to identify possible points of growth of accelerated development.

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