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Economical and Ecological Assessment of Chalk Suspensions Use for Agriculture.

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ABSTRACT

There is a nationwide problem of soil acidulation. In this context The Long Term Target Program "Liming of Acid Soils on The Territory of Belgorod Region During 2010-2015 Years" was adopted. The program involves the usage of chalk powder, lime, defecates. There are man-made deposits of chalk at mines of Kursk Magnetic Anomaly, suitable for use in melioration. The existence of approved and patented technology of preparation of chalk suspensions out of overburden chalk to use as soil fertilizer is indicated. The method of determining economical-ecological efficiency of usage of overburden chalk is introduced. The concept of ecological stability of an enterprise as a point of determining the possibility of environmental-economic condition of the enterprise management is introduced.

Keywords: Kursk Magnetic Anomaly, overburden chalk, economic-environmental benefits for the use of melioration, chalk suspension, ecological stability of the company, soils acidulation.

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INTRODUCTION

The importation of carbonates serves as an effective remedy of increase of fertility and fight against degradation processes of soils. agro-ecological researches show that the actual alternative to importation of carbonates at fight against acidulation of soils is not present [1].

In Russia acidulation of soils is a serious problem. On July 16, 1998 the Federal law N 101-FZ "About state regulation of ensuring fertility of lands of agricultural purpose" was adopted [2]. In 2010 in the Belgorod region the Long-term target Program "Lime Application of Sour Soils in the territory of the Belgorod Region for 2010 - 2015" is accepted [1].

As ameliorants the Long-term Program assumes to use defecates (waste products of beet sugar), a lime and cretaceous flour. The cretaceous flour used for melioration prepares of high-quality natural chalk [1].

At the same time at the mountain enterprises of the Kursk Magnetic Anomaly (KMA), when developing iron-ore fields over 20 million tons of a chalk from which only 4 million tons for production of cement are used are annually extracted, the rest is placed in dumps.

This chalk is gratuitous as primal problems on its production – opening and warehousing – are expenses by production of the main mineral resource. The mineral structure of overburden chalks of KMA is investigated, it meets the standards accepted in agriculture. Moreover, trial tests on use of KMA chalk in the territory of the Belgorod and Tver areas [3] were carried out.

In this case cretaceous dumps of fields of KMA are that in the modern literature is called as a technogenic field [4], and a chalk from overburden breeds is a secondary mineral resource [5]. There is a question of bringing overburden chalks to a stage at which they can be used for melioration. It is offered to use the technology of receiving cretaceous suspensions tested in practice from overburden chalks just before importation to the soil [3].

Chalk from dumps of mining production is delivered in the raw, lump look. As it will be shown further, even free annealing of such chalk can be economically justified. For preparation of suspension inexpensive installation [6] can be used. Installation was successfully tested in trial operation in the Belgorod and Tver areas and showed high technical production characteristics [3].

METHODS

Traditional calculation of economical and ecological effect in our case cannot be applied to the enterprise [7-12] under construction as it is offered to use already got overburden swept, the representing technogenic fields containing at the expense of the enterprise extracting ore. The method described in [13] is more narrow, than offered in this work. It is important that has to be is considered not only economical and ecological effect of the enterprise, but also economical and ecological effect of the interacting branch – agriculture. Difference is also significantly smaller significance of economic effect of the mining enterprise before ecological and social effects and economical and ecological effect in agriculture.

MAIN PART

The economical and ecological effect of land reclamation consists of economical and ecological effect of the manufacturing enterprise and economical and ecological effect of the territory of melioration:

$$E_o = E_{ent} + E_{eet} \quad (1).$$

The economical and ecological effect of the enterprise includes economic effect of chalk sale. The enterprise can sell a chalk at minimum price to compensate expenses according to the maintenance of cretaceous dumps and annealing of cretaceous raw materials.

$$E_{ent} = E_{sale} + E_{costs}, \quad (2),$$

where E_{sale} – effect from chalk sale,
E_{costs} - effect from decrease in charges of dumps.

Apparently from a formula (2) economic effect can be reached even at free annealing of a chalk for needs of agriculture due to decrease in charges of dumps, a necessary condition for this purpose is realization of an inequality of C_{shp} costs of annealing of a chalk and C_{mtn} – a charge of career maintaining. From an inequality it is visible that the ideal decision at noncommercial annealing of a chalk is shipment at own expense.

Thus the following situations are possible:

- Need for Z more than Q, where Z – annual need of consumers for overburden chalks, tons, Q – annual production of overburden chalks. Thus volumes of dumps are reduced and there is a question of recultivation of lands;
- Need for Z < Q chalks Thus volumes of dumps grow more slowly or do not grow that allows to have economic effect of decrease of expenses of future periods.

The point of Z=Q is a point of ecological stability for a technogenic field of a chalk at which charges of cretaceous dumps and elimination of ecological consequences are stable and can be efficiently localized for management.

The economical and ecological effect of the territory of E_{eet} consists of actually ecological effect expressed as economic effect, and the social effect expressed as economic effect:

$$E_{eet} = E_{ect} + E_{soct}, \quad (5),$$

where E_{ect} – ecological economic effect, E_{soct} - social economic effect.

The economical and ecological effect is equal:

$$E_{eet} = E_{ns} + E_{wt} + E_{dst,} \qquad (6),$$

where E_{ns} – the economic effect of reduction of the areas of cretaceous dumps including effect from recultivation of lands;
E_{wt} – economic effect of decrease of a rigidity of natural waters of passing through more lamina of a chalk;
E_{dst} – economic effect of decrease of pollution of the atmosphere dusting of cretaceous dumps and the subsequent decrease in quantity the pylezabornykh of works.

Social economic effect of E_{soct}:

$$E_{soct} = E_{med} + E_{rstl} + E_{lndrc} + E_{местор}, \qquad (7),$$

where E_{med} – economic effect of decrease of diseases, bound to a dust content,

E_{rstl} – economic effect of the prevention of resettlements from the zones which are close located to cretaceous dumps

E_{lndrc} – economic effect of recultivation of the lands freed from cretaceous dumps
E_{svdpz} – economic effect of decrease of use of natural fields of a chalk.

The economical and ecological effect of the agricultural enterprise E_{agr} consists of ecological, economic and social components:

$$E_{agr} = E_{chkagr} + E_{eclagr} + E_{socagr}, \qquad (8),$$

where E_{chkagr} – economic effect of use of cretaceous suspensions,

E_{eclagr} – ecological economic effect,
E_{socagr} - social ecological effect.

Ecological economic effect is equal:

$$E_{eclagr} = E_{nodegr} + E_{org} + E_{par} + E_{fert} + E_{hrv} \quad (9),$$

where E_{nodegr} – economic effect of prevention of degradation of chernozems,
E_{org} – economic effect of reduction of loss of organic matter in soils,
E_{par} – economic effect of improvement of agrophysical properties and microbiological activity of the soil,
E_{fert} - economic effect of increase of effectiveness of use of mineral and organic fertilizers,
E_{hrv} - economic effect of increase of productivity and quality of agricultural production [3].

Social economic effect is bound to the prevention of consequences of reduction of fertile soils, including deterioration of food.

$$E_{socagr} = E_{struagr} + E_{medagr} \quad (10),$$

where $E_{struagr}$ – economic effect of the prevention of structural degradation of the agricultural enterprise,
E_{medsgr} – economic effect of decrease in incidence in the conditions of improvement of an ecological situation.

Economic effect of introduction of use of cretaceous suspensions pays off by a traditional method: comparison with the used alternate technology. Ways of calculation for soils of the Belgorod region explicitly are investigated and given in work [2].

CONCLUSION

As shown in article, economic effect for the producer of a chalk can be reached even at free annealing of a chalk for needs of agriculture due to decrease in charges of dumps and improvement of an ecological situation of the region. At equality of annual needs of consumers in overburden chalks and annual production of overburden chalks the point of ecological stability of a technogenic field, a perspective index for definition of methods of management of a technogenic field is reached.

The method of calculation of economic efficiency of use of overburden chalks of KMA given in article for fight against acidulation of soils can be used not only for a chalk, but also for other types of technogenic mineral deposits, for example the sand, clays, granite crushed stone having prospect for use in construction.

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