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CONSERVATION OF DEGRADED AND LOW-PRODUCTIVE ARABLE LANDS AS THE BASIS FOR PRESERVING THEIR FERTILITY

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Statement of the problem

Land has been always considered as a special natural resource that, simultaneously, is the basis of human vital functions. However, today there is such a situation in our country when only a lot of promises of land protection are made at various levels, but not many people think over its destiny. Instead of positive changes, land relations have been reformed, and privatization has taken place, which has led to an ineffective use of land, non-cultivation of land, significant reduction in the efficiency of agricultural production, degradation, and increased top soil erosion. The only way out of this situation may be the conservation of degraded and low-productive arable lands, which consists in setting-aside the lands for a certain period to implement measures aimed at restoring the soils and achieving their environmentally satisfactory state.

Connection with important scientific and the practical tasks

Implementation of conservation of degraded and low-productive arable lands in Ukraine is based on major legislative acts, decrees of the President of Ukraine, Verkhovna Rada (Parliament) of Ukraine and the Cabinet of Ministers of Ukraine, purpose-oriented programs of individual regions and administrative-territorial formations. In particular, paragraph 1 of Article 172 of the Land Code of Ukraine stipulates that degraded, low-productive, and anthropogenically polluted lands are to undergo conservation. According to the draft law of Ukraine On the Conservation of Lands, proposed by MPs S.M. Tereshchuk and Yu.O. Lytvyn, degraded and low-productive land, the commercial use of which is environmentally unsafe and economically inefficient, as well as anthropogenically polluted land plots, by using which it is impossible to obtain environmentally safe products and dangerous to the local residents' health, are due for conservation [7].

Analysis of recent research and publications related to the solution of the problem

In recent years, the problem of expansion of degraded and low-productive lands and specificity of their conservation have been addressed in works by the following Ukrainian scientists: Yu.M. Alboshyy, D.I. Babmindra, S.Yu. Bulyhin, M.D. Voloshchuk, V.V. Horpachuk, D.S. Dobryak, A.P. Kanash, V.A. Leonets, L.Ya. Novakovskyy, S.V. Rozumnyy, A.J. Sokhnych, M.G. Stupen, A.M. Tretyak et al. Some practical issues of land conservation have been tackled in the publications by V.B. Balakirskyy, L.M. Kovalenko, S.V. Rohovskyy, V.F. Sayko and others.

Unsolved parts of the general problem

In our opinion, despite the fact that the conservation of degraded and low-productive arable lands is supposedly paid much attention to by state agencies, issues such as the assessment of the fertility of the lands and their location within the territory of Ukraine remain largely unsolved. Equally important is the fact that approved measures to conserve the lands in the country are often not implemented due to lack of funding and similar reasons.

Statement of the problem task

The purpose of the present article is to assess the current state of emergency and development of degradation processes in soils and to analyze the occurrence of low-productivity arable lands within individual regions of Ukraine. Still another purpose is, on the basis of the above-mentioned, to suggest scientifically substantiated methods for conservation of degraded and low-productive arable lands taking account of their zonal features.

Presentation of the main material of the problem

The experience gained in Ukraine and abroad relating to conservation of degraded and low-productive arable lands shows that, in the first place, conservation is closely linked with the existing factors of soil degradation, as well as with the occurrence of low-productive lands.

Soil degradation is soil spatial deterioration caused by changing conditions of soil formation due to natural factors or irrational anthropogenic activities, accompanied by a decrease in nutrient content, destruction of the soil structure and reduction of the top soil fertility [5].

Soil degradation has certain peculiarities caused by different factors and processes. With this principle in mind, there are following types of soil degra-

dation: mechanical, physical, chemical, physical-chemical, biological and hydro-ameliorative [1, 2].

In many cases, one of the causes of soil degradation is their water erosion. In case of water erosion and due to solid and liquid runoff, a significant amount of humus and nutrients get lost annually, along with deterioration of soil physical and physical-chemical properties, and reduction or loss of the main function of soil – its fertility. Erosive processes lead to conditions, under which arable farming using power land becomes inefficient or unprofitable. [1, 4, 6]

Due to excessive tillage in Ukraine during recent years, de-humification, that is, a sharp decrease of humus in the soil, increased. Thus, the results of agrochemical certification of agricultural lands during 1986-2010 reveal that humus in soils decreased by 0.5%. During the past 10 years alone, the application of organic fertilizers decreased from 8.6 tons per 1 ha of arable land in 1990 to 0.5 tons per 1 ha in 2013. Furthermore, the decline in fertility of Ukrainian soils is revealed by a negative balance of nutrients. Thus, if in a period of intensive use of chemicals (1976-1990), the nutrient balance was on average 20-30 kg/ha more than the equilibrium, so since the beginning of the 1990s, a negative balance of all nutrients, especially of nitrogen and potassium, has been recorded.

The major cause of the soil degradation has been the reduction of chemical land reclamation measures in recent years and the use of physiologically acid and alkali chemical fertilizers, which increase the processes of soil acidification and alkalization. As is known, acidic and alkaline soils limit the achievement of high and quality yields of agricultural crops. According to the agrochemical certification, the soil areas that require urgent liming to reduce acidity make up 3.9 million hectares, while in 2011 the liming was carried out on the area of 78.3 thousand hectares, which makes up only 2.0 % of the area. In addition, in the steppe zone, the area with a strong and very strong alkaline reaction of soil solution makes up 1.8 million hectares and is growing every year.

The data in Table 1 below show the occurrence of degraded and low-productive arable lands in Ukraine.

Table 1

The areas of degraded and low-productive arable lands in terms of natural and agricultural areas of Ukraine, ha (according to the data of the Institute of Land Management of the Ukrainian Academy of Agrarian Sciences)

Criteria of soil degradation	Natural zones							Ukraine-wide
	Polissya	Forest steppe	Steppe	Arid steppe	Dry steppe	Carpathian mountainous region	Crimean mountainous region	
Light grain size composition	10,6,4	175,2	79,4	6,9	31,1	–	–	399,0
Heavy grain size Forest steppe	–	55,1	136,8	34,2	1,9	13,0	–	241,0
Gritty consistence	15,9	0,8	1,8	38,5	–	34,7	10,0	101,7
Erodibility	27,3	1141,6	1132,5	217,0	26,9	52,4	33,5	2631,1
Soil blowing	30,3	1,9	61,4	45,5	16,5	–	–	155,7
Salinity	–	79,2	109,3	72,9	39,6	–	0,6	301,6
Alkalinity	1,2	12,2	60,1	64,2	319,9	–	5,1	462,6
Over-wetting and swamps	155,5	112,6	37,5	178,5	73,2	32,7	–	590,0
Marsh organogenic and mineral drained soils	86,8	28,3	0,9	0,1	–	3,7	–	119,8
Anthropogenically polluted land, including radionuclides	131,6	1,5	–	–	-	–	–	133,1
Total	555,0	1608,5	1619,7	657,8	509,0	136,5	49,1	5133,7

As shown in Table 1, the largest areas of degraded and low-productive lands in Ukraine are located in the steppe zone (1619.7 thousand ha) and in the forest-steppe zone (1608.5 thousand ha), and the smallest areas of degraded and low-productive lands areas are to be found in the Crimean mountain region (49.1 thousand ha) and the Carpathian mountain area (136.5 thousand ha). The main criterion of soil degradation is erodibility. Thus, in the forest-steppe zone, eroded lands make up 1141.6 thousand ha, and in the Steppe they account for 1132.5 thousand ha. In the Polissya zone, degraded and low-productive lands consist of loamy and sandy soils (106.4 thousand ha), as well as of over-wet and bogged lands (155.5 thousand ha) and of lands anthropogenically polluted with radionuclides (131.6 thousand ha).

Conservation land means temporary setting aside the degraded, low-productive and polluted arable lands and performing a complex of works on them aimed at restoring their fertility through the grassing-down or forestation.

Grassing-down and forestation measures belong to measures of the ameliorative nature; according to the Law of Ukraine *On Reclamation of Lands* dated January 14, 2000, *grassing down* is a soil improvement measure, which provides for the clearing and preparing of the ground surface for use for agricultural purposes, and *forestation* is a measure of agricultural and forest engineering reclamation, which involves a set of measures aimed at the radical improvement of land by planting forests in ravines, gullies, steep slopes, sands to protect the land from water and wind erosion, as well as the improvement of soil and climatic conditions of agriculturally used areas.

The lines of conservation of degraded and low-productive lands are largely dependent on the properties of soils in which they are located. For example, in case of the eroded land conservation, measures can be used, which are listed in the Table 2.

Table 2

Lines of the eroded land conservation

Categories	Features	Measures
1	Eroded lands of 5-7° with medium and hard washed-off soils	Grassing-down with leguminous and cereal mixed grass, and mellowing
II	Deformed slopes of up to 10° with the medium and hard washed-off soils	Complete grassing-down with perennial grasses (for haymaking) and if necessary creation of water regulating facilities (embankments, dams, etc.).
III	Eroded lands with the slope of 10-15°, dissected by ravines	Complete forestation using systems of water regulation facilities (water-retaining and drainage embankments and canals)
IV	Eroded steep slopes (over 15°), dissected by ravines, and destroyed by landslides	Complete forestation with the system of ground and water engineering works and performing agro-engineering measures in the water-retaining areas
V	Ravine systems (slope and bottom gullies, landslides and day stones)	Set of erosion control measures in the water retaining area and setting up recreational areas
VI	Land plots with day stones (sandstones, sands, limestone, clay)	Complete grassing-down in combination with introducing forest improving measures

It is expedient to use later grassed arable lands in the system of hayfield rotation or hayfield-and-pasture rotation with the regulation of terms of haymowing at different stages of plant development.

Simultaneously, the system of land conservation includes legal, organizational, economic, technological and other measures to discontinue any economic activities on these lands and to perform the necessary technological processes, aimed at restoring the soil fertility and quality, namely:

- developing standards, norms and rules according to which the land conservation should be performed;
- compiling an inventory of lands for agricultural use and identifying areas subject to conservation;
- developing national and region programs for land conservation;
- introducing economic incentives for landowners, who perform conservation measures of lands that are in their possession;
- monitoring the performance of the land conservation measures.

Land conservation should be performed according to the contract, concluded by the owner or user of the land plot and the design company that is licensed to perform land surveying work.

Lands that are under conservation are not excluded from the category of lands for agricultural use for the entire period of their conservation, and are specified by a separate line in the statistical reporting.

Land conservation measures are funded at the expense of the State budget, local budgets, as well as at the expense of funds of land owners and land users, and other sources that are not prohibited by law.

Conclusions

The above analysis shows that the implementation of the planned measures for the conservation of degraded and low-productive arable lands will provide an environmentally optimized structure of the Land Fund of Ukraine, as well as contribute to significant improvement of productivity of these lands

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Conservation of degraded and low-productive arable lands as the basis for preserving their fertility

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The paper explores the topic of land degradation, kinds of land degradation and diagnostic criteria. It reveals the causes that lead to land degradation and establishes the damage they cause. The paper analyzes peculiarities of occurrence of degraded and low-productive lands in certain separate zones of Ukraine. Concrete measures for conservation of degraded and low-productive lands have been indicated as well.