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Economic Assessment of Land Degradation and its Impact on the Value of Land Resources in Ukraine

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ABSTRACT

Introduction: Economic assessment of land degradation has become one of the most important industrial-economic problems and it would be impossible to provide high environmental and economic efficiency of land use by future generations without solving it.

Purpose: The purpose of the article is to improve the scientific and methodical grounds of determining the social losses from land degradation.

Results: The investigation of the consequences of land degradation proves that total losses from degradation processes in the soil surface can be determined by the analysis of agricultural productivity reduction (value of under-received products) and the costs of land degradation recovery (re-cultivation, land recovery etc.)

To prevent the negative consequences, legal instruments of enforcement for landowners and users are offered aiming at ensuring the high culture of agriculture through the application of financial sanctions with the purpose of social losses compensation because of land degradation.

Conclusion: Taking into account the advantages and disadvantages of existing domestic and foreign methods and approaches to economic assessment of land degradation losses, the authors propose the method of determining the loss of social land degradation based on determining the share of capitalized rental income, which can be lost within soil fertility reduction in different levels of degradation, and the costs of recovering the fertility of the degraded and unproductive lands.

JEL Classification: C13; Q15; Q26.

Keywords: Land protection, soil degradation, soil conservation measures, economical evaluation, agricultural lands.

1. INTRODUCTION

The current state of agricultural land in Ukraine is complicated and characterized by many negative phenomena. The most serious are: land degradation, characterized by erosion and desertification; reduction of humus and essential nutrients in soils; pollution; salinization; waterlogging and so on. These factors have the most significant impact on crop productivity and economic efficiency of farming and agricultural sector as a whole.

Soils are complex renewable resources, their rate of degradation is significant, and the rehabilitation process is very costly and slow. Scientists on soil issues claim that exhausted and damaged soil will require significant investment in the future to restore its productive forces (Popova O. L., (2013); Ievsiukov T., Openko I. (2013)). Therefore, the assessment of the impact of land degradation and its impact on the value of land resources are extremely important in terms of determining the amount of damage and liability for inefficient and unsustainable farming of entities.

Efficiency of measures for the preservation of agricultural land and degraded agricultural land preservation is estimated by prevention of land degradation from the damage created by negative effects. In addition, such efficiency can be assessed by removing agricultural land from agricultural production and by the loss of heavily degraded lands.

Complex damage can be measured in the form of under-received production from degraded land by reducing their productivity and value, costs of removal or mitigation of degradation consequences. In monetary terms, the damage is estimated by the costs of society associated with changes in soil and determined by the need for the additional costs on elimination of consequences which are calculated according to the costs of under-received production and costs on the implemented measures aiming at restoring degraded farmland.

Despite the fact that soil fertility is considered to be a renewable resource, it is necessary to take into account the cost and time needed to restore it. Therefore there is a need for economic assessment of losses from degradation processes.

2. BRIEF LITERATURE REVIEW

Modern scientific and theoretical issues on economic assessment of land degradation and its impact on the value of land resources are reflected in the works of national and foreign scientists as O. A. Besonova (2011), O. B. Kuzmenko (2011), A. H. Martyn (2009), O. Ye. Medvedeva (2005), P. M. Nesterov (2002), O. L. Popova (2013), O. M. Chumachenko (2010) etc. However, in Ukraine there is a practical need to improve scientific and methodical approach to determining the social losses from land degradation, which would take into account the advantages and disadvantages of existing national and international methods and approaches to economic assessment of losses from land degradation.

3. THE PURPOSE

The purpose of the article is to improve the scientific and methodical approach to the economic assessment of land degradation impact on the value of land resources.

4. RESULTS

As it is known, the economic assessment of losses from land degradation is interpreted as the monetary value of land degradation under the action of degradation processes. In other words, economic assessment of losses from land degradation is determined by income reduction due to the deterioration of public land resources (soils) or the harmful effects on them.

Environmental assessment of losses from land degradation is in worsening human health due to the consumption of contaminated water and air pollution, crop yields reduction on the lands contaminated by industrial emissions etc. As a rule while measuring the damage caused to the environment, the first step is to detect changes (deterioration degree) in natural indices and then evaluate them (Bobylev S. N., Khodzhaev A. SH. (2003)).

According to this the ecological and economic assessment of land degradation losses in an agricultural sector is the direct losses of agricultural production, reduction of economic production results and compensatory costs directed at restoring the reduced fertility of agricultural land. While determining the value damage it is important to include the costs of the land recovery, the cost of lost fertility, the opportunity costs (income gaps). In these terms a complex approach to the calculation of damages caused to agricultural production by land degradation is demanded (Bessonova E. A. (2011)).

In Ukraine during the land reform the problem of neglecting their own land by owners appeared, and landholders are usually interested only in short-term business projects, which seek to obtain the maximum profit in the following years, without introducing any soil protective measures. Such activity leads to the increase of the level of degraded land, mostly agricultural land, which may exclude it from cultivated land in future.

One step of solution of this problem is the introduction of additional economic instruments of land relations regulation in the form of financial penalties, the so-called sanctions for those whose actions or negligence have caused or are causing degradation, during which soil fertility which had been formed during centuries is lost. For example, if during decades of its using the land is permanently degraded, there will be time that nothing will be protected. Therefore, in order to stop the degradation of lands the landowners have to be forced to impose high culture of agriculture and financial sanctions which are determined by the method of calculating the losses of social land degradation should be applied. Thus, in Ukraine the standardized methods for determining the losses from land degradation are not legally existed. Although in 2007 the Cabinet of Ministers of Ukraine adopted the Resolution “On Approval of procedures on determining the amount of damage caused by unauthorized occupation of land, land use in an inappropriate way, the removal of soil (topsoil) without special permission”, but it does not give an opportunity to assess land degradation, since it refers to complete destruction of topsoil, not only worsening its properties.

Earlier, in 2002, the Cabinet of Ministers of Ukraine adopted the Resolution “On approval of evaluation methods on losses from emergency situations of technogenic and natural character”, but it sets the standards of losses only from emergency situations of technogenic and natural character, not on economic activity of landowners and land users.

In agriculture, it is urgent to assess not only high quality land, but also degraded and destructed land according to their soil fertility to determine the losses caused by users. Public losses caused by degradation of agricultural land should cover not only losses in the form of direct losses of agricultural products and

reduction of economic indicators of production in the agricultural sector, but also compensatory costs - to restore soil fertility and destruction of its condition (Popova O. L. (2013)).

Studying international experience of establishing fines for the landowners whose activity leads to worsening the quality of lands and determining the level of caused losses, it should be noted that most EU countries do not have similar financial sanctions on land degradation because such matters are considered to be a private matter of landowner in those countries. It should also be pointed out that in European countries there is no control of fertile lands, because everything is basically subsidized there. That is, if the state wants landowners to use the land, it means that the land finances and stimulates the users.

Studying the experience of determining losses from land degradation of the nearest neighbours, it should be noted that in Russian Federation and Belarus there are statutory guidelines of practical calculation of losses from land degradation, which have a number of advantages and disadvantages.

Thus, in Russia the main document which establishes the procedure for assessment of losses from land degradation in field conditions is a “Method for determining the volume of damage from land and soil degradation” (1994). According to this method the amount of damage is calculated for each contour of degraded land, but this method does not take into account calculation of the expenses for restoration of degraded lands.

There is similar methodology to the mentioned above “Temporary methodology for determining the amount of economic damage caused by pollution, degradation and destruction of land” in Belarus (1997). According to this method, the economic damage from land degradation depends on the degree of deterioration of mechanical, biological, physical, agronomic, chemical and other characteristics of soil, economic and environmental importance of areas. Actually, the mentioned Belarusian method lost validity, so it should not be considered perfect for determining losses from land degradation.

It should be stressed that Russia has a “Temporary methodology for determining the prevented environmental damage”, due to which the estimation of economic damage from land degradation is regulated (1999). According to these documents the loss of land degradation is determined as a result of environmental activities. This method does not take into account the loss of annual income of the landlord of degraded lands as well as the costs for its recovery and, therefore, can not be taken into account in determining the economic damage caused by land degradation.

Revising the experience of the legal framework in different countries, as well as the scientific works of both foreign and domestic scientists, it is worth noting that some of them try to assess the economic losses from land degradation.

Thus, O.Ye. Medvedeva (2005) in her scientific papers suggests counting the economic damage from land degradation in certain formulas. However, using these formulas when assessing the economic damage is not appropriate because they do not include calculations of damage caused to the environment and require additional evaluation of degraded lands within analytical calculations.

P.N. Nesterov and A.P. Nesterov (2002) believe that the economic damage from pollution, including land degradation, can be represented as the sum of local losses in agriculture (the amount of the lost production, the price of the lost production, the costs of degradation processes liquidation, etc.). The mentioned formula can not be taken into account in determining the economic damage from land degradation

because it firstly, does not include assessment of damage caused to the environment, and secondly, authors do not indicate the purpose of certain factors.

In his dissertation O.A. Bessonova offers to calculate the damage resulting from degradation of soils through the amount of costs to assess the amount of loss and elimination of negative consequences as well as through the cost of lost or damaged natural objects. One of the drawbacks of the formula is the fact that it does not consider the loss of annual revenue of the landowner which is not obtained because of land degradation. Although its advantage is in the fact that the damage must be assessed by categories and types of land usage which are permitted including area-based provincial features of soil for each type of land degradation and pollution.

Examining the works of domestic scientists it should be noted that, according to O.B Kuzmenko (2011), the method of estimation of losses from deterioration in the quality of the soil is considered to be the loss of properties as the main means of production and cost reduction of one hectare of the land. However an integrative indicator of such assessment is the land evaluation score, which usually varies before and after the lease.

O.M. Chumachenko (2010) in his dissertation proposes to estimate losses from land degradation through normative monetary value, which should be based on consideration of the coefficient of land productivity reduction due to land degradation in determining differential rental income on cultivated land. Accordingly, the author of the scientific work gives the assessment of reducing the market value of cultivated land in Ukraine through their degradation and evaluation of social and economic losses as the result of tax violations using agricultural land.

However, the main drawback of the approach to determine the loss of land degradation that is offered by above-mentioned authors, O.B. Kuzmenko and O.M. Chumachenko, is the absence of expenditures for the restoration of degraded lands. Therefore, these approaches can not be used when assessing the economic losses from land degradation because they are incapable to complete assessment of the costs which are put on landowners and land users whose actions or negligence had led to land degradation.

In A.G. Martyn's and O.Yu. Shyyanov's (2009) scientific work the approaches to the determination of agricultural production losses caused by the deterioration of land are proposed, but the calculations of losses from land degradation are not covered.

Social costs of degradation of agricultural lands, as it has already been mentioned, are manifested not only in agricultural production shortfall, but in land tax and landlords' rent for the use of these and other lands. Therefore, despite the obvious practical needs, and taking into account the advantages and disadvantages of existing national and international methods and approaches to economic evaluation of losses on land degradation, we developed a formula which is the best adapted to the conditions of Ukraine and will allow to assess in a full degree the economic losses from land degradation:

$$L_d = S \times C_r \times F_r + K_f$$

where, L_d – is the size of losses from degradation of agricultural land, UAH; S – area of degraded land, hectares; C_r – standard of capitalized rental value of farmland, UAH/hectare; F_r – recalculating factor of changes depending on the extent of land degradation; K_f – the total cost of restoring the fertility of disturbed lands and unproductive lands (landings), UAH.

The standards of capitalized rental value of farmland are determined by the method proposed by A.G. Martyn (2013). It is based on the formation of the total rental income on agricultural land by summing up such parts:

- the operating results of the farm, which is accounted in rental income and can be determined by comparing the statistical data on the profitability of operational activity of enterprises by economic activity;
- the costs of agricultural enterprises, accounted for the rent payment to owners of land (land shares (shares));
- the costs of agricultural enterprises accounted for the payment of rent for land plots of the state and municipal property;
- the absolute rental income, which is formed by the state support of agriculture in Ukraine.

To assess the extent of land degradation the indicators, which set the threshold value of determining the loss of natural and economic value of lands are used. The level of land degradation of any of the mentioned indicators, having two or more of their significant changes, can be assessed in terms of indicator which establishes the maximum degree of degradation. To determine the amount of damage depending on changes in the degree of degradation of the previous and current surveys the re-calculation indices are introduced. Details of the method of determining the re-calculation index depending on the change in the degree of land degradation can be found in the monograph of Shevchenko O. V., Martyn A. G. (2016).

It is known that one way of restoring the fertility of damaged and low productive land is re-cultivation of degraded land and land recovery of unproductive land.

According to the Law of Ukraine “On Land Protection” (articles 48, 52) in the implementation of city construction activities related to the destruction of the surface layer of soil, the land owners and land users must carry out the removal and storage of topsoil in certain places with the following usage of it for improving the low productive land, land re-cultivation and improvement of human settlements and industrial zones.

All calculations of the total cost of restoring the fertility of degraded lands and unproductive lands (land recovery) must be determined on the basis of the working draft of land system on lifting, moving and applying of the fertile layer on unproductive land. When developing this project it is necessary to use current materials of soil survey and agrochemical land passport. This will allow to assess objectively the changes of its soil.

The method is tested on an example of the model of the 5,28 ha land plot (Shevchenko O. V., Martyn A. G. (2016)), where unsustainable farming caused land degradation (from non-degraded to low degraded), thus losses are determined:

$$L_d = 5,28 \times 26\,870,50 \times 0,25 + 330\,293,61 = 365\,762,67 \text{ UAH}$$

According to these calculations the landholder who has caused the development of degradation processes due to extensive farming must compensate the public loss of 365,8 thousand UAH (\$13,5 thousand, USA).

Thus, this example gives the opportunity to estimate practical aspects of compensation of losing land fertility in calculation on capitalized rent income and expenses related to the restoring the fertility of degraded lands and low productive lands.

According to the Land Code of Ukraine and Law of Ukraine “On Land Protection” the land owners and land users while carrying out business activity must save useful properties of land and never destruct the fertility of soil.

However in these normative acts there are not any statements about responsibility on destructing the soil fertility in every concrete field, the material damage as well as the system of compensation are not determined; the system of control in changing the natural properties of soil is not formed.

Nevertheless the agreements of lease have the statement according to which the landholder is obliged not to destruct the quality of land, but there is no any clear method of implementation of this statement as well as there is no article on responsibility for the damage.

5. CONCLUSIONS

The proposed set of methods in determining the amount of losses from degradation of agricultural land should solve the above problems of modern land legislation in Ukraine.

To provide a clear mechanism for the compensation of the loss of land degradation in conjunction with the proposed method of determining the amount of loss from the degradation of agricultural land we have to follow the following principles:

- taking into account that under the Constitution of Ukraine “property is obliged to be kept” landowner must bear the responsibility for not deteriorating the qualitative characteristics of land irrespective of who the landowner or land user is;
- in a legal way to oblige landholders, before the land lease and after its completion, to draw up a technical report for the survey and soil agrochemical passport of land. It is necessary to make agrochemical passport of land that is leased, based on the soil, agrochemical, geo-botanical, soil-reclamation, geological, planning, mapping and other surveys. While conducting inspections, the areas of degraded lands as well as the changes of the degree of degradation are determined. These tasks are performed at the expense of the landholder;
- restoration of the degraded land should aim land recovery of topsoil, provided by the creation of the working draft of land management regarding to withdrawing, replacing and covering the topsoil of unproductive land with the fertile layer of soil. The projects of the land recovery of degraded land should be developed on the basis of existing sanitary, environmental, construction, water management, forestry and other regulations and standards, taking into account regional natural conditions and location of a degraded land;
- in the field of land use it is necessary for bodies of state supervision (control) to apply economic sanctions (fines) in an obligatory way for those landowners who caused damage (quality deterioration) of land in the process of agricultural use;
- it is essential to encourage landowners and land users to improve the culture of agriculture through economic incentives for sustainable land use and protection in the form of benefits or

compensation for certain expenses from the state (e.g. reduction of land tax) for landowners and land users whose activity does not degrade the quality of land.

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