UDC 631.4

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Systemic control of transformation directedness and fertility of soils

Aim. To show importance of passing to the mode of system management of soils a transformation orientation after the vector of gradation development for the sake of their maintenance and extended recreation of their fertility. A basic task of management is an increase of productive and ecological functions of the landed lands, assistance to the balanced development of land-tenure. On the basis of analysis and retrospective view of provision of population the landed lands and taking into account development of processes in the modern evolution of soils, a sharp requirement is reasonable in the input of the constantly operating ground monitoring. For a rational choice and correction of operations it is necessary severely to adhere to basic principles of system management, in particular to principle of «feed-back». Conclusions. Actuality and perspective of decision of problems of system management transformation of soils are shown and them by fertile potential. The role of the ground-landed resources is reflected in strategy of the balanced (permanent) social development. To the factors all threatening and scale degradation of soils scientifically reasonable control system by the ground resources and processes of their transformation counteracts

Key words: the ground-landed resource, transformation of soils, management of soils fertility.

Modern changes are in the social mode, urgent requirement in completion of the landed reform and introduction of new forms and modes ofrebonding, integration in a world market economy substantially sharpen the problem of maintenance of the ground-landed resources and management their fertility. Not for nothing widely the problems of halt of degradation of soils and contaminations of environment, that acquire all more threatening, sometimes catastrophic scales, come into question the home and world association of soil science. The orientation of modern evolution of soils is caused by development of such negative phenomena, as water erosion, deflation, changes, chemical contamination, rebondingof layer of soils, their exhaustion, acidifying, alcalination, swamping, underflooding, settling of soils of different family by pathogenic microorganisms, encumber earth by domestic and industrial wastes, and other it Follows to admit that degradation of soils and environment — one of peracute socialtechnogenic, global problems of the second half of XX of century and it remains such in present XXI of century Realizing the role of soils as an irreplaceable philanthropist biosphere and society [1] in providing of health of nation, softening of negative consequences of the growing external loading, adaptation to the forecast changes of climate, it is worked out world society (Global Soil Partner Ship — GSP) of soil science and offered to the countries-participants of this society to that in 2014 Ukraine joined, Program of stable management the ground resources (Sustainable Soil Management — SSM) with determination of strategic priorities in industry of guard of soils. In the context of this Program CEC is work out strategy of defence of soils from degradation and maintenance of biological variety. In most international documents basic attention legitimately concentrated on the very issue of the daymaintenance of the ground resources and halt of their degradation. However question of steady gradation development of processes and increase of fertile potential of the ground resources that is intensively used for the production of food, unfortunately, lighted not enough up.

Aim of researches — to show actuality and sharp necessity of introduction of the mode of system management of soils, their maintenance and purposeful transformation, fertile potential after the vector

of gradation development for the sake of increase of productive and ecological functions of the landed lands, steady social development.

Methodological approaches. Confessedly methodological basis of study of any system is structural-functional approach according to that every concrete object of nature is studied and estimated after firmness and efficiency of his functioning. 3 basic directions of transformation of natural objects are certain, in particular soils: vector of orientation, as a result of that there is disorganization of the ground systems, decouplig between her structural components and environment, weakening or privation of the system of natural mechanisms of her functioning; near-equilibrium vector of structural-functional transformation of soils, at what change of the ground processes under act of the external loading is not substantial and does not result in irretrievable negative changes in a structure and functions of soils, loss of their buffer (self-regulating) ability; the gradation vector of evolutional development of soils is sent to the increase of level them structural-functional organization, extended recreation of fertility, strengthening of connections between interflow structural elements and environment, id est speech goes about forming of soils with the high level, ecological firmness and fertility.

The processes of degradation of soils prevail in modern [2, 4-6, 8 other]. For the sake of their halt and increase of fertile potential, foremost soils with high quality descriptions, methodology of system management the ground-landed resources, them perceived a transformation orientation and fertility as range of problems of modern soil science that requires permanent perfection and decision. Increase of production of agricultural goods for an internal consumption and export aims, biopower, fibres, forage, other products, introductions of organic agriculture, use of the newest sorts of agricultural cultures with the increased necessities to the water-mineral feed require a high-professional administrative level understanding of meaningfulness of genetic nature of soils and conformities to law of motion of the ground processes lies in basis of that. Without the marked information the decision of methodological problem of system management transformation of soils is done by impossible and them by fertile potential after the vector of gradation development.

Scientifically reasonable control system by the ground resources and processes of their transformation counteracts the factors of all more threatening and more scale degradation (disorganizations) of the ground systems. It is necessary to notice that to manage the functions of soils in an isolation from a vegetable cover there is not sense. A management comes true in the single and indissoluble system «soil is a plant» through the analysis of «entrance — to the exit» (the external loading on soil is parameters of changes). A management process and his efficiency often become complicated by insufficient definiteness of nature and mechanisms of motion of many interflow processes and physiology reactions of plants on the change of these processes. For cognition of modern processes it follows to get to the worldand nanostructural elements of the system «soil is a plant», thermodynamics specific of their intercommunications and functions, in full using to possibility of modern laboratory-instrumental base, absence of that deprives the country of prospects of innovative development.

Basic methodological principles of management the difficult natural systems are well-known. However in practice of land-tenure, and a «management» actually comes true, as a rule, intuitively, «blindly». Such approach in the developed civilized society is impermissible. Foremost neglectedsuch key methodological principle of management, as direct and reverse connections. Adherence of this principle gives an opportunity in good time to unscrew the risks of degradation of soils at the terms of the growing reclamative, climatic and other loading on the ground cover and to direct his transformation after the vector of gradation-adaptive development. Permanent, only and effectively operating government monitoring service activity of that is built on modern instrumental-technological and methodical achievements is needed for this purpose, improved to the certification of soils, their classification, cartography and quality estimations in harmonization with the European and international standards, criteria and indicators, regulations and others like that. It should be noted that attempts of receipt of effective and unfolded administrative model without the deep structural-functional analysis of management object «soil is a plant» as a methodological key completed, as a rule, by a failure.

After the provision of the landed and ground resources Ukraine occupies a priority place among in the world. On different sources [3, 7, 9], in a calculation on a 1 habitant in Ukraine by the state on 2012 approximately is 1,32 hectare the landed territory, 0,92 hectare agricultural lands, 0,71 hectare croplands and 0,59 hectare black earth soils (table. 1). On these indexes we pass ahead the almost entire countries of Europe and world. Will mark that per capita in the world is only 0,19 hectare cropland and 0,045 hectare — black earth [3].

1. A provision of earth and black earth soils is in the separate countries of the world

At thoughtless, elemental, sometimes predatory external of earth, complete neglect environments by the processes of scale degradation of soils the ground resource and him fertile potential lost beyond retrieve. Such vector of development for Ukraine as important, world meaningfulness of producer of agricultural produce is unacceptable and threatening. Ukraine goes out on leading positions in the world trading in grain and other agricultural produce, and a loss of these positions is impermissible. Opposite, they must be fastened. Will mark as chance offers, that on Ukrainian black earth due to their properties — high buffer ability, sinergistical balanced microelement pool, high and to other useful functions — and at the terms of rational management the water-mineral feed of plants we get, as a rule, high-quality, healthy for an everyday consumption products. For this reason it follows to expect that a competitiveness and claimed of the agricultural produce produced in Ukraine on the European and world markets constantly will grow together with the increase of her quality culture.

From the 2-ї half of past century the index of sharply began to go down and for period 1950-2000 diminished twice — from 0,48 to 0,24 hectare. However due to «green revolution», to mastering of other sources for the production of foodstuffs of catastrophe it did not take place in the provision of population food and raw material, although their deficit in many countries of the world remains too perceptible. Millions of habitants of our planet presently are in the state of permanent malnutrition, food deficit and unbalanced feed. From data of different sources, possibilities for expansion of areas of agricultural lands and foremost earth of the intensive use for the production of basic foodstuffs almost outspent. Is not the further decline of level not only through the making progress increase of population but also because of worsening of the quality state of the landed lands, degradation of soils, exception of them from the sphere under different to the sort of building and, that more anxious in all for Ukraine, is an exception black earth and soils and other especially valuable earth.

On a world scale it is overcame (in % from the general area of are 4,62 milliards and) by water erosion — 23,7%, by wind — 11,9, by chemical degradation — 5,1, physical — 1,7%. On benchmark expert estimates [2, 6], water erosion is widespread on an area 13,3 millions and; wind — 6; chemical degradation — 14, physical degradation is 12,6 millions and (table. 2). Such state confirms high probability of the further diminishing of areas of croplands and worsening of population of Ukraine and whole world. It means that in the nearest and farther prospects of increase of production of agricultural goods it will not take place due to expansion of the landed lands. It remains only to carry out radical changes in the system of land-tenure and increase fertile potential of the ground-landed resources, providing purposeful transformation of soils after the vector of gradation development in close combination with plant-breeding and progress.

2. Scales of degradation of soils are in Ukraine and world

Due to high potential of the ground resources Ukraine together with other leading countries of the world is under an obligation to be brought over to the decision of global problems of non-admission of growing deficit of food and real risks of global world food crisis. Potential possibilities for the complete food providing of world humanity yet are powerful enough. To it the comparative analysis of the productivity and productions of basic goods of plant-grower testify in Ukraine and leading countries of the world in a calculation on a 1 man (table. 3). Yes, say, after the level of the productivity of grain-

growing cereals, corn, potato and vegetable cultures Ukraine substantially yields to German federal REPUBLIC, France, Great Britain, Canada, USA [9, 10]. However after the amount of production of grain calculating on the soul of population we pass ahead the entire developed countries of the world, except for the USA and Canada, and after the production of potato and vegetables Ukraine occupies a 1-ше place. Thus, the further increase of production of goods of plant-grower in Ukraine is constrained not so much with internal necessities, as with export capacities and prospects. Under these circumstances high quality of products of agrarian production, foremost to the products of processing with a valueadded, in control system by effective fertility of soils after the vector of the extended recreation is foreground having a special purpose job of present time and in strategy of steady agrarian development.

3. A comparative analysis of production of plant-grower goods is in Ukraine and separate countries of the world (AV for 2010-2013)

A system management fertility requires the permanent correction of administrative models and decisions in accordance with the change of factors, straight the use and market necessities. Is attention presently accented at most low hierarchical level of managementlocal communities and directly. A management foresees the achievements of tactical having a special purpose tasks (receipt of cost-effective harvest) and strategic — economies for the coming generations of fertile potential of the ground-landed resources. Today very much it is necessary to perfect and give to the evaluation criteria of fertility of corresponding normatively-legal status. Without it it is impossible to carry out of money estimation of earth. On the basis of these criteria carry out monitoring and management of soils and ground cover a transformation orientation, in time removing the risks of their degradation, homogenize (even) fertility of every processed lot land, strengthen the processes of nitric-carbon sequestration, biological rotation of substances and energy and others like that.

It follows to consider agriculture — complex of measures the main instrument of management a transformation orientation and fertile potential of soils from the simple extended recreation of fertility of soils, from optimization of the ground modes and, foremost narrowing of biological rotation of substances and energy, maximally possible return of their streams to the ground systems, balancing and/or prevailing of processes of the ground accumulation of biogenic elements above the processes of their emission, washing and bearing-out with a harvest. Such having a special purpose task decides at the terms of permanent maintenance of gradation vector in the modern evolution of soils, harmonization of them productive and ecological functions. Agriculture in control system is the effective and factor of counteraction many will give out degradations of soils, foremost to the processes of their and exhaustion.

The external natural and anthropogenic loading is on the ground cover depending on character energystreams, their frequency and intensity move the ground potential of fertility in 3th directions: toward his gradual exhaustion, simple or extended recreation. The last is the basic having a special purpose task of system management fertility. At the terms of incomplete recreation of fertility there is negative balance of humus substances and biogenic elements, of correlations last, that reduces the productivity of earth and results in forming of bad quality plant-grower products.

Parameters of changes of separate functions of soil (providing of plants water, by air, by nutritives and others like that) are main criteria of choice of administrative decisions. In the structure of the ground cover of Ukraine an important place (to 40% of the landed lands) is occupied by soils that tested degradation, soils with the low level of natural fertility, soils of the wind-eroded slopes and others like that. After any choice straight the agricultural use (processed earth with growing of the basic field cultures after intensive technologies, natural and improved forage lands, vegetable cultures, gardens and berry patches and others like that) of earth with the underproductive ground cover is required by applications of reclamative measures, on a background that efficiency of management transformation processes and fertility of soils rises substantially. As a present level and terms of water-mineral feed

dissatisfy the physiology necessities of modern high-yield sorts of agricultural cultures, extended recreation of fertility not only soils require, but also potentially fertile black earth. Biological potential of modern sorts not fully will be realized exactly from the deficit of moisture, mineral feed of plants, making more frequent of climatic anomalies and others like that. Ambitious plans (say, stable average annual production of grain in Ukraine — at the level of 80 millionand anymore), ignoring objective realities, carrying out is almost impossible. Very much necessary is a model of reasonable of internal, export and imported streams of various products of agrarian production with the consensus account of business benefit, possible ecological risks and strategy of transition of our state on the rails of steady social development.

The complex of measures from agriculture, under act of that there is the extended recreation of fertility of soils, is developed and is corrected on basic principles of system management — determination of criteria for the choice of the most effective and sinergistical constrained technological and reclamative measures, direct and reverse connections, estimation of changes and permanent correction of administrative decisions. To manage, it follows to have a sufficient choice of instruments for a management. Modern and reclamative innovations give an opportunity it is enough effectively to direct evolutional development of soils after a gradation vector. Such vector of purposeful development is provided by a rational choice for introduction of innovative reclamative-technological achievements among that :

bioengineering complex of arrangement;

contour-reclamative organization of territory;

exact (guided) agriculture, local cultivating

(land-reclamation) of soils;

ecologically safe, resource saving systems of fertilizer and till of soils, bioconversion and bioland-reclamation;

the systems of tiny irrigation are in combination with optimization trophyfeed and by the methods of defence of plants;

systems of new generation;

on streamside earth;

organic production of agricultural goods;

recultivation of the degraded and broken landscapes;

strengthening of biological rotation of biogenic elements

but carbon-nitric ability of soils;

use of modern physiological active substances, microelement chelate connections, selective biologics of universal action and others like that.

Thus, agriculture foresees a rational and informatively reasonable choice and use in control system by the transformation processes of soils and by their fertility of the marked higher innovative developments. As each of these developments contains various combinations, forms, norms, methods and terms of realization of separate technological operations, methods and methods of land-reclamation, then case frames it follows to develop on the differentiated principle taking into account ground-climatic and terms, business and ecological interests in their severe harmonization and balanced.

Conclusions

It is possible to establish on the basis of retrospective analysis of modern state of the ground-landed resources, that the clearly certain structure of system management a guard and fertile potential of the ground-landed resources counteracts modern development of degradation of soils. The basic tasks of guard of soils and system management their fertility are halts of development of processes, aspiration of modern transformation of soils in a river-bed them gradation development and extended recreation of fertility.

Important methodological principle of management is direct and reverse connection, realization of that comes true in the system «soil is a plant» at the terms of the constantly operating monitoring.

Instruments and sources of choice of administrative decisions are evaluation criteria of the state of soils, modern innovative achievements in industry of agriculture and land-reclamation of soils.

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Acted 16.08.2015.