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БАЯНДАМАЛАРЫ

ДОКЛАДЫ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

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THE TRUE ESSENCE OF RECLAMATION OF AGRICULTURAL LANDS: MISSION AND DEVELOPMENT TRENDS

Abstract. To identify the reasons for the current situation in the irrigated lands of Central Asia and South Kazakhstan, on the basis of philosophical and methodological reasoning of a general nature, sticking out of a cognitive attitude to the environment on reality and focused on one value, that is, at any cost to get a «record» harvest from agricultural crops, led to an ecological and reclamation crisis in irrigated lands in general, requiring the development of the main directions of activities to improve the human habitat with other natural and bio spheric processes.

As a result, for the first time in world practice, irrigation and drainage (collector-drainage) systems were designed in parallel in the zones of insufficient moisture for the regulation and management of hydrological regimes of ground and surface waters in rice systems, despite violating the principles of natural analogy and the integration of knowledge, where the sovereign interests of a person prevailed by sovereign “interests" of Nature.

At the same time, world experience shows that the new knowledge gained on irrigation of rice as an aquatic and terrestrial crop, surface irrigation along the furrow, sprinkler irrigation and drip irrigation systems in combination with doses of macro fertilizers, made it possible to formulate a scientific hypothesis of cost-effective and environmentally safe management of the water regime providing targeted regulation of the soil-forming process.

Keywords: irrigation, land, harvest, crops, ecology, reclamation, management, analogy, integration, knowledge.

Relevance. Science is a system of ordered knowledge and knowledge of the world, the truth of which is verified and constantly refined in the course of human production activities. Science comprehends the world in concepts, by means of logical thinking and thought activity, which are given to a person at the genetic level, for the knowledge of natural phenomena in the course of their environment-forming activities. With the help of concepts, the essence of phenomena, processes is cognized, their essential features are generalized in the course of nature management and environmental engineering, in order to ensure the ecological, social and economic needs of society. The most general and essential properties, sides, relations between the phenomena of reality and cognition are reflected in the main concepts and categories.

Concepts and categories form the logical framework of a scientific theory, but they mean incomparably more than simple «bricks» or «blocks» of this framework, where on the basis of their humanity they want to build an ecologically sustainable and safe activity-natural systems (ANS), which are a concept and including elements of three categories: activity (A), natural material (NM) and material transformed or designed by man (TM) [1]. In each concept, along with the concept of an object (phenomena, process), is essentially a program of active influence on it in order to obtain a pre-planned result. With the use of concepts, a dialogue between science and production takes place, its function as a productive force is carried out, which is a system of objective and subjective factors of labor and a certain technological mode of production, which conditions the transformation of matter and energy of nature into forms that satisfy the needs of society. Concepts gleaned from the language of science, along with methodological support for the formation of activity-natural systems (ANS), where a person and his

environment are put forward as the main value, it is advisable to use the method of ascent from the abstract to the concrete.

All of the above forces us to approach with great responsibility the assessment of the accuracy and completeness of the content of the concepts used by land reclamation science, that is, this procedure consists in highlighting several hierarchical levels of abstraction and saturation of the ANS concept with specific content.

From the first level of abstraction (ANS), a transition is made to the second - the «person-environment» system, and the third level - «human activity-natural environment» and the fourth level - the direct object of the impact of reclamation is the «soil» and at this level the system «reclamation activity - soil», is considered as a model of the activity-natural object (ANO) «Soil», which represents the unity of cognitive activity, transforming activity and an integral natural system, that is, with such a philosophical and ideological aspect, they wanted to comprehend in the field of methodology of natural sciences, research in the sphere of nature management and agricultural reclamation [1].

Formulation of the problem. The main natural function of the river basin is environment-forming, that is, firstly, runoff, this is a special activity of the geosystem that ensures the unity of hydrogeochemical flows, secondly, the human habitat, which requires ensuring their ecological safety and, thirdly, this is the spatial basis for nature management and environmental management, taking into account the interests of all people living on it, that is, the Trinity of natural functions of the river basin. The desire to use the fruitful power of land and water in the catchment areas of the river basin for thousands of years served as a powerful stimulus for the economic and spiritual development of peoples who were engaged in agriculture and animal husbandry. The formation and flourishing of ancient civilizations are primarily associated with the development of agricultural and irrigation culture remained unchanged, passed down from generation to generation, that is, a reverent, respectful attitude to land and water, which for many centuries entered the flesh and blood of the inhabitants of the catchment areas of the basin rivers.

To understand the complexity of water and land relations, to understand the full extent of the danger of hasty and ill-considered decisions when justifying land reclamation in the catchment areas of the river basin, and for a correct understanding of the goals and objectives, it is necessary to accurately define the value system and designate the object of influence. Such values are a person and his habitat, and the object of influence is the soil, as the main component of the biosphere of the landscape as a whole and as the main means and object of labor in agricultural production. At the same time, land reclamation, as an activity that provides targeted regulation and control of the soil-forming process, was prepared by the entire history of interaction between man and nature and testified to the dialectical development of the philosophy of a holistic perception of the world, philosophy, which sees the solution to the problem of coexistence of man and nature.

To identify the reasons for the current situation in the field of environmental management, that is, in the field of reclamation of agricultural lands in Central Asia and South Kazakhstan, we will use some philosophical and methodological considerations of a general nature, that is, the development of land reclamation in all spheres of society (ideology, economics, science, culture) with philosophical positions are characterized by a cognitive (as opposed to activity), contemplative (or natural-scientific) attitude to the surrounding world.

Materials and research methods. Intensive development of irrigation at the end of the XIX th century in the catchment areas of the river basin of Central Asia and South Kazakhstan led to the disruption of natural hydrogeological and soil-reclamation processes, primarily in the lower reaches and deltas, causing a sharp deterioration in the soil-reclamation and ecological conditions of hydro-agrolandscapes. This process intensified somewhat in the catchments of the Amudarya, Syrdarya, Karatal and Ili river basins, in connection with the cultivation of rice, after the deportation from the Far East of the Koreans of Central Asia and Kazakhstan, as recognized specialists in the cultivation of this crop [2].

The homeland of rice is considered to be the tropical and subtropical belt of Southeast Asia, that is, the coastal sea zone of India, China, Indonesia, Bangladesh, Thailand, Vietnam, Myanmar, the Philippines and Korea, where vast territories are filled with water for a long time and become unsuitable for growing other agricultural plants.

The morphological and physiological characteristics of rice indicate its intermediate position between aquatic and terrestrial crops, therefore it is cultivated as a flooded or periodically irrigated crop.

In East, Southeast and South Asia, natural rice systems are located in the coastal sea and estuarine areas of river basins, where the hydrodynamic and morphological structure, properties of water masses formed when river and sea waters mix, during the ebb and flow, show their uniqueness as natural objects that are formed under conditions of high dynamics of channel and alluvial processes, but also the hydrothermal regime and are periodically aerial and aquatic. The duality of the hydrothermal regime, which determines the diversity and richness of natural resources, gives grounds to consider the coastal sea and estuarine areas of river basins as special natural systems, including two interconnected ecosystems - terrestrial and water.

The coastal sea zone of East, Southeast and South Asia, where the alluvial soils of river valleys and riverine lowlands, cohesive, poorly permeable, rich in silty particles contributed to the formation of a highly productive natural activity system for rice cultivation by seedling methods.

Many civilizations Ancient Egypt, Ancient China, Babylon developed and existed in the coastal sea and estuarine areas of river basins, or directly adjoined them, using these unique self-regulating natural systems for year-round rice cultivation, where the integrity of these natural systems is supported, on the one hand, by the originality of biological cycle formed by the type of accumulative balance, on the other hand, by removing a part of the accumulated matter, including salt during the ebb and flow of sea waters.

The functioning of natural-natural rice systems in the coastal sea and estuarine areas of river basins determines the mechanisms of formation and development of biotic abiotic elements, ensuring the stability of biological and geological cycles, and, consequently, the integrity of the natural system as a whole. As a property of natural rice systems in the coastal marine and estuarine areas of river basins, functioning is critical in cognition and dynamic characteristics and in developing natural resource management strategies.

Taking into account the complexity and multiplicity of factors on which the integrity and functioning of natural rice systems depends on the coastal sea and estuarine areas of river basins in East, Southeast and South Asia, during rice cultivation in the arid zone of Central Asia and South Kazakhstan in automorphic slightly saline soils river basins are recommended to grow them in conditions of constant flooding of checks.

At the same time, the cultivation of rice in the arid zone of Central Asia and South Kazakhstan in the automorphic weakly saline soils of river basins with constant flooding of checks from a formal point of view can be considered as a simplification of the problem of studying the dynamic properties and describing a system sharply differing in natural and climatic conditions, since on the basis of they could create favorable conditions for desalinization of the soil and the death of weeds.

Environmental stability of natural rice systems in the coastal marine and estuarine areas of river basins in East, Southeast and South Asia, in comparison with artificial rice systems of Central Asia and South Kazakhstan, in natural conditions remains constant, which is explained, firstly, by large litter reserves, secondly - the high buffering capacity of the soil of the aquatic ecosystem and thirdly - the presence of feedbacks, the more intensive the soil leaching, the more pronounced the accumulative type of biological cycle and vice versa.

Research results. From the beginning of the birth of agriculture to the present day, the desire of people to get the maximum yield from one and the same plot with the means of cultivation of agricultural crops at their disposal is indisputable. The unambiguity of such a metaphysical (dogmatic) worldview sometimes reaches the point of absurdity, that is, the appearance among scientists and agricultural workers of the concept of obtaining a «record» harvest from an agricultural crop on a time scale, since biomass production is the most important property of the natural system, which consists in the synthesis of organic matter. infinitely, they depend on the biological potential of crops and the energy resource of the natural system.

Thus, the absolutization of one position leads to the absolutization of one value, in this case the agricultural crop has become an object of reclamation, despite the soil being them as a habitat and soil-forming process as an environment-forming system, that is, among scientists and workers in the field of agriculture as a result of a cognitive attitude to the world was formed from this position and as a mirror is reflected at all stages of development of agricultural land reclamation.

On the territory of the former USSR, rice was cultivated mainly in Central Asia and the Transcaucasus, and later rice sowing spread to the Far East, Kuban, Crimea, the lower reaches of the

Volga, Don, Dnieper, Bug, Danube rivers, in Central Asia and South Kazakhstan in the lower reaches of the river Amu Darya, Syrdarya, Ili and Karatal.

Natural-climatic and soil-hydrogeochemical conditions in the lower reaches of the river basins of Central Asia and South Kazakhstan, where it was planned to cultivate rice, which was located in zones of insufficient moisture with saline soils, would make it possible to use the morphological and physiological characteristics of rice for the scientific substantiation of irrigation methods:

- taking into account the automorphic soil-forming process with different degrees of soil salinity in the lower reaches of river basins, at the beginning of their development for cultivation of rice, in order to desalinate the soil, it would be possible with constant flooding of the check and further irrigation with deep furrows located inside the check, which made it possible for targeted regulation and management soil-forming processes in the corresponding energy resources of the natural system;

- automorphic soils with different degrees of salinity in order to create favorable conditions for soil desalinization and the death of weeds, rice cultivation in the lower reaches of river basins with constant flooding, for the construction of artificial rice systems based on the principles of natural analogies that reproduce natural-natural rice systems in the coastal sea and estuarine river basin areas of East, Southeast and South Asia.

The search for optimal options for rice cultivation in areas of insufficient moisture and on saline soils in the lower reaches of river basins in the territory of the former USSR, taking into account the visual ideas of scientists and workers in the field of agriculture about natural rice systems in the coastal sea and estuarine areas of the river basins of the East, South -Eastern and South Asia, has led to the creation of artificial rice systems with constant flooding, in the form of small checks, the size of which depends on the terrain and ensures uniformity of water depth on a spatial scale.

The practical needs of regulation and management of soil-forming processes, as a complex dynamic self-regulating system, were not provided for these artificial rice systems with constant flooding, since intensive waterlogging and soil salinization, a decrease in the vital activity of aerobic microorganisms and organic matter, the spread of specific weed plants, based on the law «predator-prey» V. Voltaire [3], were forced to use nomadic technologies, that is, they were periodically abandoned and new lands were developed for rice cultivation.

To ensure food security and independence in the lower reaches of the river basins in the territory of the former USSR and including Central Asia in the lower reaches of the Amu Darya and South Kazakhstan in the lower reaches of the Syrdarya, Ili and Karatal rivers, developed large irrigated areas, that is, Akdalin, Karatal, Kyzylkum, Tugesken, Novo-Shiliy, Kyzylorda and Kazalinsk for rice systems with permanent flooding. As a result of the constant increase in the flooding layer of rice paddies for the control of weeds, the widespread use of the washing regime for desalinating the soil and groundwater, an increase in the volume of mineral fertilizers and pesticides, there was a qualitative change in the water regime in hydro-landscapes, due to the addition of matter and energy when interacting with the environment sharply almost all natural processes were disrupted and, as a result, uncontrolled, uncontrollable and unaccounted for consequences of natural-man-made rice systems were formed.

As a result, for the first time in world practice, irrigation and drainage (collector-drainage) systems were designed in parallel in the zones of insufficient moisture for the regulation and management of hydrological regimes of ground and surface waters in rice systems, despite violating the principles of natural analogy and the integration of knowledge, where the sovereign interests of a person prevailed by sovereign «interests» Nature.

The main reason for this situation lies in the contradictions between the global manifestation of these problems and private approaches to their solution, and the main task of land reclamation associated with violations is «to enhance the biological and all measures to slow down the geological cycles of water and chemicals in order to progressively increase fertility and soil-forming process, to prevent environmental degradation».

In these conditions, the scientists of ameliorative science faced a very difficult task, that is, ensuring high productivity of agricultural crops or soil-reclamation stability of hydro-agrolandscape systems, which, based on the level of mental activity, formed various positions and conflicts, based on the laws of the

dialectic of «denial of denial», expressing continuity, The spiral nature of development, the connection between the new and the old, a kind of repetition at the highest stage of development of some properties of a number of lower stages, justifies the progressive nature of development, did not see their need to build objects of a new type - activity-natural systems, considering anthropogenic and natural processes in a single set.

Traditionally, the main efforts of scientists of ameliorative science are directed at combating the means, and not with the causes, which were formed by their cognitive attitude to the reality around us, that is, under the scientific guidance of A.G. Rau to regulate the water-salt regimes of the soil of the Akdala, Karatal, Kyzylkum, Tugesken, Novo-Shili, Kyzylorda and Kazalinsk massifs, technologies have been developed to control the hydrochemical regimes of rice systems due to constant filtration of water from the root layer of rice during the growing season using closed or vertical drainage which provide an increase in land fertility and productivity [4]. A.I. Golovanov and S.I. Koshkarov, on the basis of the principles of landscape reclamation, in the conditions of the Kyzylorda and Kazaly irrigation massif located in the lower reaches of the Syrdarya River, within the framework of determining the «ecological capacity» of natural landscapes, developed technologies for irrigation of rice, based on the all-round reduction of the irrigation norms for rice on a time scale, taking into account the formation intensity «water reservoir», where the regulation of salt and air regimes in rice fields is carried out by filtration outflow and surface discharges [5].

As a result, in the conditions of the Akdala, Karatal, Kyzylkum, Tugesken, Novo-Shili, Kyzylorda and Kazaly irrigation massifs, uncontrolled and unregulated natural-man-made rice systems of meadow-boggy soils were formed, only suitable for rice cultivation, and marsh-bog systems adjacent gradually destroying ecological and reclamation stability of natural landscapes.

At the same time, world experience shows that the new knowledge gained on irrigation of rice as an aquatic and terrestrial crop, surface irrigation along the furrow, sprinkler irrigation and drip irrigation systems in combination with doses of macrofertilizers, made it possible to formulate a scientific hypothesis of cost-effective and environmentally safe management of the water regime providing targeted regulation of the soil-forming process [6; 7; 8; 9; 10].

For cognitive activity, any scientific work of scientists of ameliorative science is of high value and significance for the concept and understanding of the direction and intensity of natural-anthropogenic processes in the rice systems of Central Asia and South Kazakhstan, including in general on hydro-agrolandscape systems, since in science a negative result is important as well as positive, which serve as absolute criteria of truth, although there can be no two objective truths, all other positions, opinions, judgments are considered false.

Based on the fundamental work «Dialectics of Living Nature» [11], as well as the concept of land reclamation, developed taking into account modern reality, it is possible to form the following main directions of the ecological level of reclamation [12]:

- in accordance with the biological cycle of the continuity of life, it is advisable that the irrigation technology is also continuous, which should be ensured by the inclusion in the technology of cultivating crops in the existing natural cycles;
- taking into account the relative stability of biogeocenoses, provided by the biological cycle, it is logical that the technologies of cultivation of agricultural crops should be based on their natural basis, be adaptive;
- the main object of agricultural land reclamation should be the soil, in which the biological and geological cycle of water and chemicals begins and closes.

In the early 1990 s V.Kh. Khachaturyan, I.P. Aydarov [1] and Zh.S. Mustafayev [2] developed methodological principles of the natural-ecological concept of nature management and environmental management in the reclamation of agricultural lands, based on a critical assessment of the experience of irrigation development in various natural and climatic conditions of the former USSR, not only in the technical and economic, but also in the philosophical, worldview aspect to comprehend natural and anthropogenic processes, the development of which led to an ecological and reclamation crisis in the irrigated lands in general, for the development of the main directions of activities to improve the human environment with other natural and biospheric processes.

Obviously, a change in worldview is a complex, painful process that requires tens of years for its implementation, since the first steps, mainly of a general philosophical, methodological nature, are being made in this direction, although ideas of this kind were laid by V.V. Dokuchaev [13], A.N. Kostyakov [14] and V.I. Vernadsky [15] at the beginning of the twentieth century. This is evidenced by the absence of the concept of amelioration of agricultural lands and water management in the Republic of Kazakhstan, which are based on the fundamental and genetic basis of nature management and environmental engineering, a deeper understanding of socio-economic efficiency, geoecological restrictions, issues of environmental safety.

Conclusions: The Republic of Kazakhstan has sufficient bioclimatic potential and land resources located in the catchment areas of the river basin, which have lost their «ecological capacity» as a result of violation of the basic principles of agricultural land reclamation. The revealed contradictions that arise in this case will make it possible to understand the need to develop methodological principles of the natural-ecological concept of nature management and environmental management in the reclamation of agricultural lands, corresponding to modern natural-economic conditions, the main trends of activity-natural processes, allowing to approach the strategic directions of future reclamation at the conceptual level.

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АУЫЛШАРУАШЫЛЫҚ ЖЕРЛЕРДІ МЕЛИОРАЦИЯЛАУДЫ НАҚТЫЛАУ: МІНДЕТІ ЖӘНЕ ДАМУ ҚАРҚЫНЫ

Аннотация. Қорошаған оратаға деген танымдылық қатынастың шындығына сүйенуден шығатын және бір құндылыққа бағдарланған, философиялық және әдістемелік пайымдаудың жалпылама сипатамасының негізінде, кез-келген жағдайда ауылшаруашылық дақылдарынан «рекордтық» өнім алуға негізделген, Орталық Азия және Оңтүстік Қазақстан аймағының суармалы егістік жерлердегі қалыптасқан жағдайдың, яғни бүкіл суармалы жерлерді экологиялық-мелиоративтік дағдарысқа алып келу себебін анықтау, адамның тіршілік ортасынан басқа табиғи және биологиялық саласының жүргілерін жақсартуға арналған қызметтің негізгі бағыттарын айқындауды талап етеді.

Нәтижесінде, әлемдік тәжірбеде алғаш рет табиғи ұқсастық және ілімді жақындастыру қағидасынының бұзылғанына қарамастан, құрғақшылық аймақта, күріш жүйелеріндегі жер асты және жер үсті суының гидрологиялық тәртібін реттеу және басқару мақсатында, суару және құрғату (кәріз-коллектор) жүйелері параллель жобаланды, яғни адамның егемендік мүлделері, табиғаттың егеменді «мүлделеріне» қарағанда басым болды.

Сонымен қатар, әлемдік тәжірибе көрсеткендей, судада және құрғақтада өсетін дақыл ретінде күрішті суару жер бетімен жүйектеп, жаңбырлатып және тамшылатып суғару жүйесімен тыңайтқыш қоректік заттарды мөлшерлеп беру туралы алынған жаңа ілім, топырақтың даму жүргісін мақсатты басқаруды қамтамасыз ететін, күріштік жүйелердің суару мөлшерін үнемдеудің және су ресурстарын экологиялық тұрғыда қауіпсіз басқарудың ғылыми гипотезасын құруға мүмкіндік береді.

Түйін сөздер: суару, жер, өнім, ауылшаруашылық дақылдары, экология, мелиорация, басқару, ұқсастық, жақындастыру, білім.

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МЕЛИОРАЦИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В РЕАЛАХ: МИССИЯ И ТРЕНДЫ РАЗВИТИЯ

Аннотация. Для выявления причины сложившейся ситуации на орошаемых землях Центральной Азии и Южного Казахстана на основе философского и методологического рассуждений общего характера, вытекающих из познавательного отношения к окружающей среде на действительности и ориентированных на одну ценность, то есть любой ценой получить «рекордный» урожай от сельскохозяйственных культур

привело к эколого-мелиоративному кризису в целом орошаемых земель, требующих выработки основных направлений деятельности по улучшению среды обитания человека с другими природными и биосферными процессами.

В результате в зонах недостаточного увлажнения для регулирования и управления гидрологическими режимами грунтовых и поверхностных вод на рисовых системах впервые в мировой практике параллельно проектировались оросительная и осушительная (коллекторно-дренажная) системы, вопреки принципам природной аналогии и интеграции знаний, где суверенным интересам человека преобладали суверенные «интересы» природы.

При этом мировой опыт показывает, что полученные новые знания по орошению риса как водной и наземной культуры поверхностными поливами по борозде, дождеванием и в системах капельного орошения в сочетании с дозами внесения макроудобрений позволило сформулировать научную гипотезу экономически эффективного и экологически безопасного управления водным режимом почвы, обеспечивающий целенаправленное регулирование почвообразовательного процесса.

Ключевые слова: орошение, земли, урожай, сельскохозяйственная культура, экология, мелиорация, управление, аналогия, интеграция, знание.

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