The highest yield of root crops (745.5 c / ha) is achieved with a density of 100 thousand plants per hectare (5 plants per running meter), however, there is a slight decrease in sugar content (by 0.2%) compared with a density of 4.2 plants per running meter. A further increase in crop density (over 120,000 plants per hectare) leads to a decrease in both yield (up to 569.8 c/ha) and sugar content (up to 16.6%).

Keywords: sugar beet, hybrid, sowing dates, seeding rate, standing density, sowing method

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Ye. Oryngozhin[1,3], Ch. Alipbekova[4], K. Abaeva[2], N. Miletenko[5], K. Augambayev[1], R. Turekeldiyeva[6]*

*[1]Al-Farabi Kazakh National University, augambaevkayrat2710@gmail.com**
[2]Kazakh National Agrarian Research University, abaeva1961@mail.ru,
[3]Institute of Mining named after D.A. Kunaeva, e24.01@mail.ru,
[4]Department of Biology, Kazakh National Women's Pedagogical University, chaimgul@mail.ru,
[5]Academician Melnikov Institute of Comprehensive Exploitation of Mineral Resources - IPKON, Russian Academy of Sciences, Moscow, Russia, nmilet@mail.ru,
[6]Taraz Regional University named after M.H.Dulati, Department of Ecology, rimm_1205@mail.ru

ECOLOGICAL-LANDSCAPE ZONING OF INFRASTRUCTURE SUSTAINABILITY IN AGRICULTURE

Abstract

This scientific article presents the basic information on the study of ecological and landscape division of sustainable regional infrastructure in the agro-industrial complex. At present, zoning of the boundaries of landscape-territorial units is of great interest in connection with the greening of society. The ecological and landscape division of territories has a special character and significance, since its study is aimed at determining the exact economic laws and calculations of regions, as well as their ecological solutions and features.The main objective is to determine the spatial ecological and landscape homogeneity of territories, as well as a quantitative and qualitative assessment of the relationship between human activity and nature in space, including the use of land resources. In this regard, the theoretical and methodological foundations of the ecological-economic definition of territories should be based on philosophical, ecological-economic ideas about the relationship between the environment, ecology and the economy, which represent a single complex natural ecological-economic system that is in constant development. Landscape and ecological land management works reflect the results of the ecological and economic assessment of lands and establish the qualitative and quantitative cadastral characteristics of lands. Substantive zoning by means of zoning makes it possible to compare different areas of the plots, as well as environmental, soil protection and restoration measures or more rational placement of production and to calculate the socio-ecological properties of a certain territory, as a result of which it is possible to determine the most appropriate direction for the development of production.

Key words: *agriculture, infrastructure, ecological-landscape zoning, theory, principle, research.*

Introduction

The main difficulty in determining the scheme of ecological landscape zoning is that the territory is, on the one hand, a natural object, and on the other, a socio-economic territorial complex. The studied economic differentiation determines the economic mechanism of zoning and assessment of the state of the environment, as well as the ecological-landscape definition of zoning, is responsible for the development of territories, effective management of investment policy, and the development of programs for the rational use of land.

The definition of ecological and economic characteristics is necessary when planning and building new enterprises for various purposes, placing specializations in regions, as well as the importance of planning and implementing key measures to change and preserve the ecological and natural environment, for the development of social and labor programs. The study of ecological and landscape zoning requires a special approach and can only be carried out on the basis of accurate and reliable land cadastral information and monitoring data on determining the state of the environment, as well as research into the prospects for economic development and the characteristics of the main sectors of the economic complex that affect the ecology and the environment [1, 2 - 6].

Therefore, when performing certain zoning, it is necessary to take into account the main existing economic and environmental characteristics and certain economic and environmental data, natural characteristics and environmental consequences of the surrounding area for further development.

In order to carry out zoning of territories of special significance, it is also necessary to identify land plots with varying degrees of natural, natural or anthropogenic impact on lands and determine the importance of various biocenoses in the purification of the natural environment, as well as the ability to self-regulate. Methodology for cleaning soil, atmosphere, rivers, reservoirs, groundwater and pollutant emission sites depending on wind direction, as well as determining the actual anthropogenic load on nature, such as population distribution, actual industrial and transport load, including the placement of industrial enterprises and transport pollution, the level of toxicity and emissions into the atmosphere, etc.

The system of ecological-landscape zoning is determined by the influence of various factors of both natural and economic nature. In the main sense of territorial zoning, macroregionalization factors are determined and regional physical-geographical differentiation of the macrolevel by landscape-ecological levels and natural values is recognized. This proves that the natural process takes into account the gravitational transfer of substances and energy products of human activity to land, since their emissions into the atmosphere can reach the earth's surface and feed water bodies, and then accumulate in certain natural areas.

Therefore, due to the physiological heterogeneity of large rivers and lakes, a very high climatic differentiation is observed, caused mainly by frequent discrepancies in the direction of transfer of man-made emissions that form the ecological state of the territory, and the directions of runoff and wind that distinguish landscape-ecological zones of nature [2, 4, 6 - 13].

The zones are determined on the basis of calculations based on a set of indicators that systematize the main nature of the manifestation of anthropogenic hazards of changes in the natural environment and development of the territory of the environment. Taking into account the main features of the criteria, a group of key indicators of territorial degradation and population growth, deterioration of sanitary and hygienic conditions, as well as a decrease in the natural resource potential for depletion and environmental load has been established. Changes in the genetic integrity of landscape lands due to the degradation of key components such as soil, water, plants, etc. When zoning with consideration of environmental requirements, the definition of territorial boundaries of landscapes is of particular interest in connection with the environmental state of society.

The most important ecological-landscape territory has its own meaning, oriented towards real economic data and ecological features. The main goal is to determine spatial-ecological and landscape-homogeneous territories, quantitative and qualitative assessment of the relationship between human activity and nature in space, including the use of land resources.

Methods and materials

The zone of ecological districts is determined by the natural boundaries of the territory and often coincides with the areas of distribution. In this regard, landscape-geosystems formed under the influence of homogeneous geological factors, geosystems with one dominant type of soil, relief, climate, vegetation - landscapes occupy a decisive place in the landscape-ecological zoning of the territory.

The average ecological zoning of the territory is intended to ensure the rational use of lands and the protection of the territories used by means of a set of scientifically based indicators, as well as to link landscape-ecological territories and zonal types of territories, as well as types of ecological zoning of lands, etc. [1, 2, 14 - 21].

The main local taxonomic unit that corresponds to the territorial integration of geosystems at the main local level. Using these types to describe landscape types and relief types, ensure the allocation of ecological-economic units for all land categories that determine territories created for a specific purpose and having a specific composition.

In agricultural production, fields are divided into fields, hayfields, pastures and perennial plantings, organized in accordance with the definition of hayfields and pasture crop rotations. And also divided into three groups of land massifs, such as steppe and soil-protective, special, etc., then several types of ecological categories can be distinguished.

The lands of populated areas include lands for housing construction, lands for public use, lands for agricultural purposes, lands occupied by urban forests, etc. Lands for nature conservation, health, recreational and other purposes are allocated according to an objective principle, but taking into account environmental requirements. These requirements are met by industrial, transport, communications, etc. enterprises. Security, prohibited and other zones are created around the facilities. The system of landscape-ecological zones and territories, types and types allows for the implementation of comprehensive background monitoring (CBM) of lands and the creation of a network of stations for monitoring the state and changes in the natural environment in the process of creating federal monitoring, as well as the state land cadastre at the federal and interregional levels. The definition of land types (together with their land categories) provides for the organization of land management, land cadastre and land monitoring systems.

For example, the relationship between local taxa of ecological zoning and the existing system of state land cadastre allows us to determine the areas of distribution of negative phenomena and processes, such as a decrease in soil fertility, deterioration of melioration conditions; increasing their contamination with toxicants; destruction and degradation of lands due to anthropogenic loads and other processes. This is important for the organization of local monitoring, development and operational implementation of a set of land-cadastre, environmental, land reclamation, land and other measures in order to prevent the transformation of unfavorable phenomena and processes into zones of environmental disaster.

This systematic approach to the study of the land fund and its zoning, combining organizational, economic, ecological, landscape, land use and other methodological requirements and conditions, allows us to define an ecologically homogeneous, primary natural-territorial complex and taking into account the influence of a complex of natural and anthropogenic factors (global, regional, local), the main element of ecological zoning of the territory is formed on the basis of morphological units of the landscape (facies, natural boundaries).

Functional types of ecological-economic territorial-landscape systems are divided according to the economic process formed on the basis of the use of certain natural resources, for example, mining, agriculture or forestry. Depending on the relationship between economic activity and the natural environment, ecological and economic territorial landscape systems can be divided into three groups: industrial, agricultural, recreational and specially protected areas [4, 8, 22–26]:

1. Production, ecological and economic systems are characterized by significant changes in natural landscapes and weakening of the biological cycle, increasing air and water pollution. They are characterized by saturation with industrial facilities and infrastructure elements. These systems are characterized by man-made landscapes and a real cycle of things (production, processing, export).

2. Ecological and economic systems of agriculture – natural landscapes changed as a result of anthropogenic activity. These landscapes have somewhat lost their original appearance compared to the landscapes of the first group.

3. Recreational and protected ecological-economic systems - recreational zones, reserves, sanctuaries, national parks and other specially protected territories. Human influence here is aimed mainly at optimizing natural landscapes. Recreational systems almost everywhere experience significant anthropogenic load.

The ecological-landscape and economic subsystems represent a single system, the characteristics and functioning of which are largely determined by the natural resources of the landscape and anthropogenic activity. Their interrelation is reflected in the influence of economic achievements on environmental indicators. The unity of the ecological-economic subsystems presupposes the improvement of management of both the economy and the surrounding natural-landscape environment.

The determination of directions for further development of land cadastral territories on an ecological-landscape basis is based on a comprehensive analysis of long-term economic, ecological and social processes. Taking into account the efficiency of various types of production and distribution of anthropogenic and natural factors, when assessing these processes, alternative options for the development of ecological and economic zones, as well as integrated economic and natural management systems, are used.

When dividing land cadastral territories according to ecological and landscape features, the specialization and complexity of the economy, administrative and transport links, especially between large cities, are taken into account. Powerful industrial facilities, including dozens of enterprises and entire groups of cities and towns, are simultaneously the core of the ecological-landscape region, and the region itself is the initial generation of the ecological-economic landscape system of the region. Here the initial territorial connections between cities, towns and private enterprises are formed.

Therefore, the main basic information for determining land cadastral territories on a landscape-ecological basis can be divided into three main groups: materials characterizing the natural features of the region and assessing the state of the environment; on the placement of pollutants (enterprises of various sectors of the economy taking into account the prospects for their development, on the use of pesticides, mineral fertilizers, etc. in agriculture); on the analysis of the economic situation of the sectors of the national economic complex in the analyzed territory.

The regions, in turn, were divided into provinces, which are characterized by the type of hydrogeological structure, the set of soil-forming rocks, the structure of the soil cover, a closer connection of its parts (regions) than districts, this is a certain nature of interaction, the direction of change in the structure of land use in changing climatic and hydrogeological conditions. In urban planning, the main instrument for regulating the land use system in cities is zoning (architectural, urban planning, functional, territorial-economic). This zoning mechanism is aimed at reducing the likelihood of conflicts between different types of urban activity. Various legal regimes of land use have been established for the allocated territories. The division of urban territories into functional zones is the most general form of taking into account various requirements for rational land use, including a set of regulatory parameters (purpose of the site, its maximum dimensions, development coefficient, share of green and open areas, etc.).

Results and discussion

The main task of landscape-ecological zoning of the territory of the country, republics, territories, etc. is to determine a scientifically substantiated system of taxonomic units (taxa) characterizing existing landscape-ecological zones (macro level) and land plots of the land fund. other taxa at the regional and local levels. They are the basis for a comprehensive assessment of information support for land monitoring of lands, the state of land resources and the timely detection of changes occurring under human influence, for forecasting, preventing and eliminating the consequences of negative processes, monitoring the state and protection of lands, ensuring their rational and efficient use.

To carry out zoning, it is necessary to select the main parameters that determine the natural, economic and environmental characteristics of the territory. Specify such characteristics as geographic location, size; natural conditions, resources; structure of the economic complex, features of infrastructure and placement, as well as the state of the main components of the natural environment.

When describing the geographical location of regions, special attention is paid to their proximity to large industrial centers, sources of raw materials and main transport routes. Geographical location has a significant impact on the rate of development of natural resources, the launch of new industries, the preservation and reconstruction of traditional industries, and the development of external relations. Natural conditions form a complex system of direct and indirect connections that have a great influence on the formation of ecological and economic characteristics of regions. Climate is a determining factor in the formation of large ecological and landscape territories that describe the main zonal features of territories that differ significantly from each other in ecological conditions and agricultural orientation. Geological structure, hydrographic, hydrological features, etc. within small territories located in one climate zone. In these cases, climatic and natural components are felt: the relief of the territory, the activity of erosion-denudation processes, hydrological and hydrogeological features, etc., in turn, act as direct factors in the formation of the region [1, 27 - 31].

Hydrographic and hydrogeological features of the territory and its water supply have a significant impact on the ecological features and economic development of regions. Distribution of water resources is a determining factor in the formation of large territories and their differentiation into smaller ecological-landscape territories. The configuration of the contours of large rivers, canals and large lakes is also important for determining ecological-landscape zones, since the geological structure influences the placement and purpose of economic facilities, being a direct factor in the formation of the territory. According to the scale of impact on ecosystems, the following geological factors can be distinguished: global, regional and local changes, which are the result of interaction at different levels. Global changes in the geological environment include movements of lithospheric plates, which lead to long-term changes in ocean waters and atmospheric air circulation, and also lead to changes in climate and, consequently, ecosystems.

In this case, global changes are determined by the dynamics of geophysical and geochemical fields, changes in the Earth's geomagnetic field, the Earth's wave electromagnetic gravitational fields, fluctuations in solar radiation, changes in the ionosphere and magnetosphere caused by volcanic eruptions, earthquakes, industrial explosions, etc.

This leads to global changes in the geological environment, as well as intensive use of mineral and energy resources for obtaining fuel and raw materials, since the volumes of their use in the current situation are comparable to the flows of substances on the earth's surface, due to which new oceanic crust is formed.

In addition, global change is associated with the impact of industrial, energy, agricultural and forestry activities on landscapes and soils. These changes are important to consider because they are related to meeting human needs for food and energy in the future. Regional geo-ecofactors determining the state of atmospheric air circulation depend on the features of the mesorelief and determine the risk of deterioration of the quality of the environment and the associated health of the population. The influence of regional geo-ecofactors on the health of the population is as follows (Table 1) [1, 2, 11, 32 - 34].

Table 1. The influence of regional geo-ecological factors on the health of the population

Description of geofactors and atmospheric processes caused by them.	Health status of the population
Intermountain valleys and basins. The average annual frequency of air stagnation lasting more than 5-10 days is 50-75%.	Mass cases of acute diseases. Increased mortality
Hilly plains and low mountains. The probability of air pollution is 30-50%, duration 1-5 days.	Violation of physiological functions of the body. Development of chronic diseases. Reduction in life expectancy

Oypat. The probability of air pollution is 15-20%. High concentrations of pollutants persist for up to 3 days.	Irritation of the senses. Changes in physiological functions

Many landforms serve as natural boundaries between ecological and economic regions or their groups. The distribution areas of anthropogenic landforms are also important for the formation of the territory.

The soil cover has great regional significance. For example, the main massifs of eroded soils are located on the highest and most fractured areas. The greatest concentration of soil disturbance by mining enterprises is also observed here. Therefore, zones of soil disturbance by natural (erosion, denudation) and anthropogenic processes can often be used as an auxiliary factor in establishing the boundaries of ecological-landscape zones of regions.

When determining the degree of resistance of natural components to anthropogenic impact, it is necessary to take into account the ability of natural objects to self-purify and absorb pollutants and the range of use of natural resources. Key natural resources include mineral, land, forest, water and recreational resources that people are increasingly using.

In this case, it is necessary to determine the ratio of different types of natural resources, indicating the leading resources in the economic development of the region, as well as promising resources that can play an important role in the further use of natural resources. development of the territory and its natural resources. The structure of natural resource use is changing and becoming more complex. Some types have been used for a long time, while others have changed as a result of active anthropogenic activity, so careful analysis is needed when forecasting the use of natural resources.

The characteristics of natural resources have a significant impact on the economic state of the ecological and landscape territory. When studying the structure of production and economic characteristics of a land cadastral region, it is necessary to take into account that the leading feature is the specialization and location of production. It is also necessary to take into account the size of industrial enterprises, the capacity of energy systems, sources of raw materials, the position of the region in the economic complex of the region, the connections between industries and enterprises within the region, and the main intermediate connections.

When analyzing agriculture, first of all, the signs of specialization, the total area of land, the area of arable land (agricultural land in relation to the population of the region and its total area, the volume of production) (the total volume of production per unit of land) are determined; land use area and the share of arable land in the area of agricultural land use and other indicators of economic activity that affect the condition of land use.

When analyzing the pollution of atmospheric air and water sources, the average annual concentration of dust, sulfur dioxide, nitrogen oxides and other pollutants characteristic of a certain territory over the past 5 years is determined.

When analyzing the sanitary condition of surface waters, it is necessary to analyze the places of discharge of wastewater and its quantity, the concentration of harmful substances in wastewater, the presence of waste-free water use technologies and wastewater reuse; the composition of industrial production in the region under study, etc.

Chemical contamination of soil is assessed by the volume of areas where biochemical contamination has occurred. Soil contamination zones are roughly determined taking into account materials on natural zones of biogeochemical contamination, as well as taking into account the spread of chemical contamination of atmospheric air and water from industrial facilities.

Emissions from industrial enterprises have a negative impact on plants. Pollution of air and soil with gases and dust affects plant growth. For example, in experimental plots located near pollution sources, the height of plants was 60%, the length of leaves was 69%, the length of inflorescences was 8%. The concentration of the most common harmful substances should not exceed: sulfur dioxide - 785 g/m^3, ozone - 59, nitrogen dioxide - 4700, hydrogen fluoride - 0.08, ethylene - 6...7, chlorine, hydrogen sulfide and ammonia - 1500...1700 g/m^3.

Favorable conditions, if more than 75% of the territory is outside the zones of influence of noise and sources of air, soil, water and vegetation pollution and less than 25% is in zones with maximum permissible concentrations of pollutants: relatively favorable - with a ratio of 50:50 and unfavorable if more than 50% of the territory is in the zone of influence of noise and pollution sources with a concentration exceeding permissible standards [1, 2, 11, 32 - 34].

Conclusion

Research by scientists shows that industrial pollution has a significant impact on the quality of agricultural crops and livestock productivity in various ecological and economic regions. Damage to agriculture depends on the type and intensity of industrial pollution.

Therefore, it is necessary to determine the optimal parameters of the state of the atmosphere, at which the losses of productivity and quality of agricultural crops are minimal. Such parameters are developed individually for each ecological and economic region.

In addition, it has been established that the biosphere is most polluted in areas where ferrous metallurgy, coke, chemical, and coal industries are located. An analysis of the reduction in agricultural crop yields depending on the degree of air pollution showed that it reduces the concentration of sulfur dioxide and industrial dust in the air by 0.1 mg/m3, nitrogen oxides, phenols and ammonia by 0.01 mg/m3. The deficit of basic grains is 20-25%, vegetables - 15.20 m, feed - 25-30%. In areas with a predominance of tire production and metalworking, a reduction in the concentration of sulfur dioxide, hydrogen sulfide and dust by 0.1 mg/m3 will increase the yield of the main grain and leguminous crops by 12-15%, as well as vegetables - 15-20, and fodder crops - up to 25% [1, 2, 11, 32 - 34].

The anthropogenic load on a certain territory is determined not only by the degree of environmental pollution, but also by the consumption of natural resources (minerals, water, etc.).

The results of the analysis of the state of the natural environment can be summarized in the form of partial and integral maps recording areas with varying degrees of environmental damage.

When describing the characteristics of settlements and the abundance of labor resources in ecological-landscape areas, it is advisable to use such indicators as the absolute population size and its density. The combination of these indicators is sometimes called the load area or pressure. In urban and rural areas, the different degree and quality of this load generates different ecological-economic processes.

The study of demographic characteristics and territorial distribution of the population in cities and small towns is one of the main areas of research in land cadastral zoning on an ecological-landscape basis.

In addition, it is necessary to take into account the history of population formation, its decisive influence on the organization of national, social and industrial activities, the development of transport communications, the provision of consumer, cultural and medical services.

However, the formation of urban agglomerations is also accompanied by a significant reduction in agricultural land and an increase in unjustified traffic. The concentration of population leads to an increase in anthropogenic pressure on the natural environment and may cause negative consequences in the future.

In conclusion, when zoning, local territories of the urban development system structure are considered and distinguished according to the following aspects of its functioning: transport-functional, visual-spatial, natural-ecological, historical-cultural, engineering-technical. The result of zoning is a land zoning plan: a graphic document with an explanatory note, developed as part of the city's general plan (if it is absent, a separate document). The composition of city lands in combination with the general features of the proposed functional use is determined by indicating the degree of prospects and efficiency of their use. Land zoning in a market economy is a permanent form of control over the use of the territory of populated areas as a mechanism for managing land resources.

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Е.С. Орынгожин[1,3], Ч. Әліпбекова[4], Қ. Абаева[2], Н. Милетенко[5], Қ. Аугамбаев[1]*, Р.Т. Турекельдиева[6]

*[1]Әл-Фараби атындағы Қазақ ұлттық университеті, augambaevkayrat2710@gmail.com**

[2]Қазақ ұлттық аграрлық зерттеу университеті, abaeva1961@mail.ru

[3]Д.А. Қонаев атындағы Кен істері институты, e24.01@mail.ru,

[4]Қазақ ұлттық әйелдер педагогикалық университеті, chaimgul@mail.ru

[5]Жер қойнауын кешенді игеру проблемалары институты – ИПКОН РҒА, Мәскеу қ., Ресей, nmilet@mail.ru

[6]М.Х. Дулати атындағы Тараз өңірлік университеті, rimm_1205@mail.ru

АУЫЛ ШАРУАШЫЛЫҒЫНДАҒЫ ИНФРАҚҰРЫЛЫМНЫҢ ТҰРАҚТЫЛЫҒЫН ЭКОЛОГИЯЛЫҚ-ЛАНДШАФТЫҚ АЙМАҚТАУ

Аңдатпа

Бұл ғылыми мақалада ауыл шаруашылығындағы инфрақұрылымның тұрақтылығын экологиялық-ландшафтық аймақтауды зерттеудің негізгі мағлұматтары берілген. Қазіргі кезеңде қоғамды жасылдандыруға байланысты ландшафттық аумақтық бірліктердің шекарасында экологиялық талаптарды ескере отырып аудандастыру үлкен қызығушылық тудырады. Экологиялық-ландшафтық жер-кадастрлық аудандастыру күрделі сипатқа ие және дербес мәнге ие, өйткені ол аймақтардың нақты қалыптасқан экономикалық заңдылықтарын және олардың экологиялық ерекшеліктерін есепке алуға бағытталған. Оның негізгі мақсаты – жер ресурстарын пайдалануды қоса алғанда, ғарыштағы адам қызметі мен табиғаттың арақатынасын сандық және сапалық тұрғыдан бағалауға мүмкіндік беретін кеңістіктік

экологиялық-ландшафттық біртекті аумақтарды анықтау. Нәтижесінде жерді экологиялық-экономикалық аудандастырудың теориялық және әдіснамалық принциптері табиғаттың, экологияның және экономиканың байланыстары туралы философиялық, экологиялық және экономикалық идеяларға негізделуі тиіс, ол тұрақты түрде дамып келе жатқан біртұтас кешенді табиғи экологиялық-экономикалық жүйені құрайды. Экологиялық-ландшафтық жер-кадастрлық аудандастыру экологиялық-экономикалық және ландшафттық бағалау нәтижелерін көрсетеді және тек сапалық емес, сонымен қатар сандық жер-кадастрлық сипаттамаларды белгілеуге мүмкіндік береді. Мұндай аймақтарға бөлу қоршаған ортаны қорғау, топырақты қорғау және қалпына келтіру шараларын немесе өндірісті неғұрлым ұтымды орналастыруды қажет ететін әртүрлі аумақтарды салыстыруға, сондай-ақ белгілі бір аумақтың әлеуметтік-экологиялық қасиеттерін белгілеуге мүмкіндік береді, соның нәтижесінде ең қолайлы өндірістің даму бағытын анықтауға болады.

Ғылыми мақала Қазақстан Республикасы Ауыл шаруашылығы министрлігінен мақсатты қаржыландыру шеңберінде «2.0 технологиялары мен қағидаттарын пайдалана отырып, Қазақстан Республикасының кеңістіктік деректер инфрақұрылымын қалыптастыру» ғылыми-техникалық бағдарламасының (жеке тіркеу нөмірі – БР 22886730) қаржылық қолдауымен жүзеге асырылды.

Кілт сөздер: ауыл шаруашылығы, инфрақұрылым, экологиялық-ландшафтық аймақтау, теория, принцип, зерттеулер.

Е. Орынгожин[1,3], Ч. Алипбекова[4], К. Абаева[2], Н. Милетенко[5], К. Аугамбаев[1*], Р. Турекельдиева[6]

*[1]Казахский национальный университет им. Аль-Фараби, augambaevkayrat2710@gmail.com**

[2]Казахский национальный аграрный исследовательский университет, abaeva1961@mail.ru

[3]Институт горного дела им. Д.А. Кунаева, e24.01@mail.ru

[4]Кафедра биологии, Казахский национальный женский педагогический университет, chaimgul@mail.ru

[5]Институт проблем комплексного освоения недр, Москва, Россия, nmilet@mail.ru

[6]Таразский регионалный Университет им. М.Х.Дулати, rimm_1205@mail.ru

ЭКОЛОГО-ЛАНДШАФТНОЕ РАЙОНИРОВАНИЕ УСТОЙЧИВОСТИ ИНФРАСТРУКТУРЫ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

Аннотация

В данной научной статье изложены основные сведения по исследованию экологического и ландшафтного деления устойчивой инфраструктуры региона в агропромышленном комплексе. В настоящее время зонирование границ ландшафтно-территориальных единиц представляет большой интерес в связи с экологизацией общества. Экологическое и ландшафтное деление территорий имеет особый характер и значение, поскольку его изучение направлено на определение точных экономических законов и расчетов регионов, а также их экологических решений и особенностей. Основная цель — определение пространственной экологической и ландшафтно-однородности территорий, а также количественная и качественная оценка взаимосвязи деятельности человека и природы в пространстве, включая использование земельных ресурсов. В связи с этим теоретические и методологические основы эколого-экономического определения территорий должны базироваться на философских, эколого-экономических представлениях о взаимосвязи окружающей среды, экологии и экономики, представляющих собой единую сложную природную эколого-экономическую систему, находящуюся в постоянном развитии. Ландшафтно-экологические землеустроительные работы отражают результаты эколого-экономической оценки земель и устанавливают качественные и количественные кадастровые характеристики земель. Содержательное районирование путем зонирования дает возможность сопоставлять различные территории участков, а также природоохранные, почвозащитно-восстановительные мероприятия или более рациональное размещение производства и

расчетно определять социально-экологические свойства определенной территории, в результате чего можно определить наиболее целесообразное направление развития производства.

Работа выполнена при финансовой поддержке научно-технической программы «Формирование инфраструктуры пространственных данных Республики Казахстан с использованием технологий и принципов 2.0» (индивидуальный регистрационный номер – БР 22886730) в рамках целевого финансирования Министерства сельского хозяйства Республики Казахстан.

Ключевые слова: сельское хозяйство, инфраструктура, эколого-ландшафтное районирование, теория, принцип, исследование.

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Н.С.Мухамадиев, А.М.Чадинова,
Г.Ж.Меңдібаева, Н.Д.Курмангалиева, М.А.Тайшиков*

ТОО «Казахский НИИ защиты и карантина растений им. Ж. Жиембаева», Алматы, Казахстан, nurzhan-80@mail.ru, aizhan_chadinova@mail.ru, www.gulnaz87.kz@mail.ru, n.kurmangalieva77@mail.ru, maliktaishikov777@gmail.com*

БИОЛОГИЧЕСКАЯ ЗАЩИТА СОИ ОТ ТУРКЕСТАНСКОГО ПАУТИННОГО КЛЕЩА (*TETRANYCHUS TURKESTANI* Ug. et Nik) В УСЛОВИЯХ АЛМАТИНСКОЙ ОБЛАСТИ

Аннотация

Соя является ценной масличной и высокобелковой культурой, именно поэтому ее производство в мире постоянно увеличивается. За последние 20 лет отмечается увеличение посевной площади сои в мире в 1,82 раза, а валового производства — в 2,64 раза. Вследствие благоприятных экологических и почвенно-климатических условий для возделывания сои в посевах широко распространены болезни и вредители.

При формировании и созревании бобов сои доминантным видом является туркестанский паутинный клещ (*Tetranychus turkestani*). Значительное повышение температуры воздуха положительно влияет на скорость и интенсивность размножения клещей, существенно увеличивая их количество. При таких условиях резко возрастает и активность подвижных стадий клеща и их вредоносность. Имаго и личинки клеща вредят с июня по сентябрь, во время фаз ветвления - бутонизации высасывают сок из нижней пластинки листьев, оплетая паутиной листья, цветки, молодые бобы.

В статье приведены результаты испытания по технологии внесения жидких пестицидов против вредных организмов с БПЛА на посевах сои. Результаты испытания против вредителя туркестанского паутинного клеща при внесении жидкого пестицида Актарофит 1,8 *(Streptomyces avermitilis),* с нормой расхода 0,9 л/га с помощью БПЛА показали высокую биологическую эффективность - 84%.

Ключевые слова: *соя, вредитель, пестицид, опрыскиватель, БПЛА, биологическая эффективность.*

Введение

Соя – самая распространенная в мире высокобелковая и диверсификационная культура, широко используемая в технических, кормовых и пищевых целях [1]. Согласно данных ФАО, занимающейся проблемами продовольствия при ООН, мировые потери урожая сельскохозяйственных культур от вредных организмов (вредители, болезни, сорняки)