SCIENTIFIC AND THEORETICAL FOUNDATIONS OF TRADITIONAL AND MODERN AGRO-ECOLOGICAL STUDIES OF GRAIN-SUITABLE SOILS IN AZERBAIJAN

Abstract. On a global scale, a number of natural complexes and ecosystems have undergone significant transformations under the influence of agriculture. As a result, agricultural land of anthropogenic origin was formed, covering 1/3 of the globe (perennial crops, meadows and pastures, including 1.5 billion hectares of arable land). Thus, areas with artificial agro-ecosystems or phytocenoses, which are plowed annually, fertilized and controlled by other agrotechnical and reclamation means, are classified as agricultural land of the field type. Likewise, orchards, berries, vineyards, tea and citrus plantations have formed perennial agro-ecosystems. Keywords: agroecology, ecosystem, agro-ecosystem, biocenosis, soil cover, agriculture.

Introduction

Large areas used for agricultural production belong to meadows and pastures. Unlike arable (field) and perennial crops, the formation of primary biological products in these agro-ecosystems occurs naturally and they are used to obtain secondary biological products (meat, milk). Thus, in the field of agriculture, in areas where there is an interaction between man and nature, functional units - agro-ecosystems (phytocenoses or agrobiocenoses) have formed.

Analysis and discussion

Agroecology is a branch of ecology that studies the scientific-theoretical and methodological bases of obtaining high-yielding and high-quality agricultural products with the application of ecological concepts and principles in the conditions of intensive agriculture. Other names used in the literature of agroecology are "agrocenology", "agrarian ecology", "training on cultural ecosystems". The general
goal of agroecology is to increase the productivity and quality of cultivated plants using biocenological patterns. Agroecology involves the development of land protection systems, taking into account the impact of agriculture, especially agriculture, on the environment, as well as the parallel impact of certain agricultural crops on the environment, zoning and micro-zoning of areas, taking into account the ecological requirements of agricultural crops. In modern post-industrial times, agroecology also serves as a means of protecting biodiversity and the human environment.

The most important component in agro-ecosystems is the soil cover that makes it up. Therefore, optimization of soil indicators, including the development of methods that help soil organisms (fauna and microorganisms) to activate biological nitrogen fixation and humusification, accelerate the decomposition of pesticide residues, control the mineralization and nitrification of organic matter is one of the important aspects of agroecology [1, 2].

However, it should be noted that the concepts of agro-ecosystem and agrobiogeocenosis are not unambiguously accepted by various researchers. According to VA Volkov (1990), agro-ecosystems are areas used on the basis of a single economic plan consisting of certain agricultural crops and animals. According to Oduma (1987), agro-ecosystems are civilized ecosystems, which in some respects are in the intermediate position between natural ecosystems (meadows, forests, etc.) and artificial systems (cities) [3].

According to N.F. Reimers (1990), the agro-ecosystem (agrobiogeocenosis) is an artificially created, unstable ecological system in which the flora and fauna are impoverished in terms of species composition and agricultural products are grown. The biotic part of agro-ecosystems, supported by technical means consisting of one or two plants and animals - agrobiocenoses, in contrast to biocenoses, are highly productive and less environmentally sustainable. This system is shaped and regulated by people to get a high yield [4].

Agro-ecosystems are distinguished by their high biological productivity and the dominance of several selected plant and animal species in the space. Unlike natural ecosystems, the plants and animals grown here are not natural, but are subject
to artificial selection. Due to the lack of self-regulatory mechanisms in agro-ecosystems, they are unstable, rapidly degraded without human intervention, become wild, and transform into natural ecosystems. Agro-ecosystems dominated by cereals exist for 1 year without human intervention, perennial grasses for 3-4 years, orchards for 20-30 years, then disintegrate and cease to exist. Field-protected forest strips, which are an important component of agro-ecosystems, cannot remain in steppe areas for more than 30 years. Without human support, it gradually becomes wild and becomes a natural ecosystem, or is destroyed.

Depending on the degree of anthropogenic impact and the level of management, the following types of agro-ecosystems can be distinguished:

1. cultivated (planned meadows and pastures) agro-ecosystems;
2. semi-cultivated (variable regulated artificial plantings - meadows of perennial grasses);
3. cultural (constantly regulated perennial crops, fields and melons);
4. intensive culture (greenhouses).

Agro-ecosystems are controlled from the outside and subject to external influences. Like any biocosystem, agro-ecosystems are multi-level and have a hierarchical structure. The following types of agro-ecosystems are distinguished:

*agrosphere* - a global ecosystem that unites all areas of the Earth, changed as a result of human agricultural activities;

*agrarian landscape* - an ecosystem derived from a natural landscape (forest, steppe, etc.) as a result of agricultural activity;

*agricultural ecological system* - ecological system at the economic level;

*agro-ecosystem* - field, garden, melon, greenhouse.

Changes in the metabolism of substances occur in the agro-ecosystem. Thus, after plowing the area, the circulation of biogenic elements intensifies. Natural ecosystems and agro-ecosystems are similar in their autotrophism. However, in a natural ecosystem, nutrients move in a closed cycle, and the primary product, the flow of matter, is mainly realized within the system, without their separation from the system. Agro-ecosystems are created to remove products from the system. Other differences between agro-ecosystems and natural ecosystems are:
1. In agro-ecosystems, the diversity of other species has been sharply reduced in order to obtain maximum biomass from one product;

2. The sustainability of agro-ecosystems is supported by humans. Vegetation is carried out by deliberately replacing one cultivated plant with another cultivated plant;

3. In agro-ecosystems, the food chain is shorter than in natural ecosystems: product-human;

4. Incomplete circulation of substances occurs in agroecosystems: some nutrients are removed from the agro-ecosystem through the product;

5. Regular disposal of biological products is supplemented by the application of appropriate agricultural techniques (sowing, fertilization, soil cultivation);

6. The source of energy in agro-ecosystems is not only the sun, but also human activity. Agro-ecosystems receive additional energy through the muscular efforts of humans and animals, as well as land reclamation, irrigation, fertilization, and agricultural techniques;

7. The effect of natural selection on agro-ecosystems has weakened. Selection is done by man.

Although agro-ecosystems are in a simplified form, they have many biocenotic connections that ultimately affect productivity. It manifests itself in a large number of weeds, pests, primitive and terrestrial organisms. Even in a grain agro-ecosystem with a very simple structure, their number can be thousands of species [5, 6].

In natural ecosystems, the primary product of plants is used in many links in the food chain and is returned to the biological cycle through mineral salts and carbon dioxide. By protecting products from "natural consumers" and replacing natural wastes with organic and mineral fertilizers, the food chain is broken and the agro-ecosystem is unbalanced.

In essence, the attempt to obtain a high-quality product from individual plants for the benefit of man is a "struggle against nature" that requires great labor and material resources. Agricultural development of the area often leads to a violation of the mechanism of regulating the number of individual species. For this reason, the number of different species, especially pests, is increasing in agro-ecosystems.
Therefore, pest control is one of the important conditions for maintaining agro-ecosystems. It can also be seen as a struggle against species that are out of the control of natural regulatory mechanisms. In this case, strong means are used to control unwanted species - insecticides, fungicides, herbicides. However, these measures have a number of undesirable consequences. Reducing the number of pests by chemical means, in addition to polluting the environment and the entry of toxic substances into the food chain, creates a "boomerang effect" and leads to their rapid increase in subsequent years. The use of insecticides also has a negative impact on the natural enemies of pests, leading to their sharp decline. As a result, the next generation of pests are completely free from the influence of their natural enemies. Thus, the failure to take into account regulatory biocenotic mechanisms in agricultural fields also undermines economic interests.

The process of agricultural production in our country is carried out in various agro-ecosystems. Currently, the classification, grouping, zoning and micro-zoning of agro-ecosystems is one of the least studied areas. In the classification system of agro-ecosystems proposed by the UN FAO, five types of land use are divided according to the type of agricultural structures, and the classification of agro-ecosystems is carried out according to each type:

1. field land use - tillage and irrigated agro-ecosystems;
2. garden-plantation land use - plantation agro-ecosystems (river), garden (orchards, berries, vineyards) agro-ecosystems;
3. pasture land use - pasture agro-ecosystems;
4. mixed land use - mixed agro-ecosystems;
5. land use for the production of secondary biological products - agro-industrial ecosystems (milk, meat, egg production).

**Conclusion**

One of the most important issues of modern agriculture is its implementation in accordance with agro-ecological laws. From this point of view, the existing agricultural systems can be divided into two major classes: chemical-man-made and landscape-adaptation.

*In the first class* - chemical-man-made approach, energy efficiency, material
capacity and chemicalization (mineral fertilizers, pesticides, etc.) play an important role.

_In the second class_, the goal of the landscape-adaptation approach is to achieve the correct placement of agricultural systems within the space, taking into account the complexity and diversity of soil, relief and landscape conditions, thereby reducing its energy and material capacity.

The latter can also be called an agro-ecological approach to agriculture. The main role in this approach, of course, is to apply biological and biocenological methods of intensification, maximize the use of organic waste, as well as the use of soil-improving crops, minimizing the impact of machinery and equipment on the soil, chemicals to soil, surface and groundwater.

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