Ecological Consequences of the Intensification of Agricultural Production and Land and Agrarian Reforms (Based on Materials from the Altai Territory)

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Abstract. Altai Krai is traditionally classified as a major industrial and agricultural regions of the country. The machine-building complex (production of tractors, agricultural machinery, wagons, engines, boilers), the chemical and petrochemical industries (tires, artificial fibers, plastic products, chemical products), the food industry (meat, cheese making), and the light industry (manufacturing) are quite developed. Fabrics, knitwear), mining (mining of polymetallic ores, gold, table and glauber salts, coal). Agriculture prevails in agriculture in the Altai Territory. Altai Territory is one of the largest producers of grain, milk, meat and other agricultural products. The territorial specialization of agricultural production in the region is determined by the complex mechanism of interaction of natural and climatic factors, as well as soil and geomorphological features. Among cultivated crops, cereals prevail. Hard and strong varieties of zoned spring wheat are grown in the most provided warm steppe part of the territory of the region. Altai Krai is the only region beyond the Urals where sugar beets are grown. Among oilseeds, the lion’s share is occupied by sunflower, although commodity production of oilseed flax, mezeum, long flax, rapeseed and other industrial crops is gradually developing.

1. Introduction
The climatic conditions of the Altai Territory predetermined the development of agricultural production, the main resource of which is land. During the land reform, the Altai Territory successfully resolved the problem of providing individuals with land for gardening and horticulture. However, another problem has emerged today - the full and rational use by citizens of the allotted land. Unfortunately, the area of land used for horticulture and gardening is reduced annually. 2. Materials and Methods

Based on theoretical and methodological research - the work of domestic and foreign scientists on the development of organic agricultural production; Land development; research and recommendations of the Russian Academy of Agricultural Sciences, laws, presidential decrees and executive orders of the Government of the Russian Federation, regulations of the subjects of the Russian Federation, EU regulations on the development of environmental agriculture, IFOAM standards. The study uses a systematic approach to ensure the complexity and focus of scientific recommendations, analytical, abstract-logical, calculating-constructive, economic-statistical, economic-mathematical, monographic methods of research.
2. Results
About 70% of the land area of the Altai Territory is agricultural land - 11.5 million hectares. The share of forest land makes up more than 26% of the territory, other categories of land together account for about 5% of the total area of the region [1]. (Table 1).

Table 1. The structure of the land fund of the Altai Territory.

| Indicators | 01.01.2012 | 01.01.2018 | difference |
|------------|------------|------------|------------|
|            | area, thousand ha | % | area, thousand ha | % | thousand ha |
| Agricultural land | 11546,3 | 68,7 | 11537,2 | 68,7 | -9,1 |
| Land settlements | 381,5 | 2,3 | 381,6 | 2,3 | +0,1 |
| Land of industry, energy, transport, communications, broadcasting, television, computer science, land for space activities, land of defense, security and other special purposes | 125,6 | 0,7 | 125,8 | 0,7 | +0,2 |
| Lands of Specially Protected Areas and Objects | 44,8 | 0,3 | 44,9 | 0,3 | +0,1 |
| Forest land | 4423,8 | 26,3 | 4432,9 | 26,4 | +9,1 |
| Land water fund | 195,1 | 1,2 | 195,1 | 1,1 | - |
| Land stock | 82,5 | 0,5 | 82,1 | 0,5 | -0,4 |
| Total land in the administrative boundaries of the region | 16799,6 | 100 | 16799,6 | 100 | - |

Quite large areas of agricultural land - 1281 thousand hectares are used by individuals for haying and grazing of livestock, which leads to an increase in the number of livestock on the farmsteads of rural residents.

Table 2. Distribution of land used by organizations involved in agricultural production by type of rights in 2018 [1].

| Indicators | Area, thousand ha | % |
|------------|------------------|---|
| Land owned by legal entities | 195,6 | 3,1 |
| Land in common ownership | 3068,2 | 50,1 |
| Of them | | |
| - shared | 3068,2 | 50,1 |
| - of which land shares of citizens | 3057,4 | 49,9 |
| - of which unclaimed | 400,6 | 6,5 |
| - land shares of legal entities | 10,1 | 0,2 |
| - land shares of municipalities | 0,7 | - |
| State owned land | 2287,4 | 37,4 |
| Of which are granted on the right: | | |
| - use | 610,3 | 10,0 |
| - rent | 1677,1 | 27,4 |
| Lands of other citizens and legal entities issued for urgent use by enterprises, total | 573,5 | 9,4 |
| Of which owners of land shares | 561,2 | 9,2 |
| Total land | 6124,7 | 100 |
Based on the table data presented, it can be concluded that 59% of the land used by agricultural organizations belongs to individuals, of which 59% are in common shared ownership.

The ownership of legal entities consists only of 3.3% of the land - these are land shares purchased and invested in the authorized capital of the enterprise. Land owned by this category of users makes up about 37% [6].

There is a tendency towards an increase in the area of land owned by legal entities, which is due to the ongoing process of redemption of land shares by enterprises and organizations and registration of ownership rights to land by legal entities. Tivated by peasant (farm) enterprises is private property. Of these lands, only 14.5% are owned by peasant (farmer) farms and their workers, and almost 59% of the land is leased by peasant (farmer) farms from other owners of land plots. 527 thousand hectares, or 26.7%, are used of land plots from state-owned peasant (farmer) farms [16].

Of the total area of land provided for gardening purposes, about 40% are owned by citizens, the remaining part of the land is either the property of gardening partnerships - 39.7%, or owned by citizens on the basis of the right of permanent (unlimited) use or lease - 20.6% [10].

Land plots provided for the purposes of gardening, haying and grazing are state property and are granted to individuals on the basis of urgent use or a lease.

For the maintenance of personal subsidiary plots, 273.5 thousand hectares of land were provided, of which 256.8 thousand hectares are agricultural land. Over the reporting year, the area of these lands increased by 6.7 thousand ha in connection with the allocation of land plots for land shares.

3. Discussion

The history of agricultural development confirms the fact that at different stages of the development of agricultural production various farming systems were used. Both those used in the past and the existing farming systems have been formed in accordance with the level of development of social productive forces. It should be noted that the attitude to the applied farming systems in the country has changed many times. So, the periods of close attention to the prevailing agricultural systems, expressed in public and scientific discussions on their management, began, and the content of agricultural systems also changed.

The agricultural production of the USSR and Russia over the past few decades has advanced far in the direction of intensification. So, in 1948, a special resolution was adopted “Plan of afforestation, introduction of grass crop rotation, construction of ponds and ponds to ensure high and sustainable yields in the steppe and forest-steppe regions of the European part of the USSR”, which received the second name - Stalin's plan for the transformation of nature. In terms of content, this resolution was a kind of program for the ecologization of land use, in which the targets were measures to preserve soil fertility and water resources. Unfortunately, in 1954, the implementation of this program of greening agriculture was suspended due to the beginning of large-scale (over 40 million hectares) development of virgin and fallow lands in the eastern part of the USSR. The development of virgin and fallow lands in the early years was marked by a high increase in the production of grain crops, but at the same time, the ill-considered large-scale involvement of salt marshes, sand, slope and other unproductive land in the agricultural industry in the late 1950s led to the appearance of wind erosion of soils and dust storms [7].

During the period of extensive development of agricultural production, the economic interests of the state dominated the environmental requirements. The economic results of production growth were mainly provided by natural resources, which predetermined the development of new land resources and the expansion of arable land. However, the lack of a scientifically based concept of an optimally balanced ratio of natural and used production lands has led to agrotechnically unreasonable and forced plowing of virgin lands, often of low productivity. As a result, a fragile natural balance was upset, which led to a deterioration in the ecological condition of land, fodder base and, on the whole, reduced soil productivity of cultivated fields. Negative erosion processes began to manifest at a rapid pace, soil fertility worsened. According to experts, the environmental situation was also aggravated by an excess increase in livestock numbers.
In order to reverse the current situation in the agricultural system in the 60s of the last century, Soviet agricultural science and practice was given the task of developing a fundamentally new soil-protective system of agricultural farming, capable of saving virgin and fallow land resources involved in circulation, and preventing wind erosion of soils in at the same time increase the level of grain production. To achieve this goal, Academician A.I. With the collective participation of scientists of different profiles, Barayev substantiated a fundamentally new soil-protective farming system, which was successfully introduced into the agricultural production of Northern Kazakhstan, the Trans-Urals and the regions of Western Siberia. At that time, the state of the agricultural economy and ecology in the USSR determined the transition to an intensive method of agricultural production, taking into account the introduction of soil and environmental agricultural technologies. These measures allowed a little delay in the growing negative consequences of wind soil erosion [2, 4].

The soil farming systems developed and justified by agricultural scientists have not been able to be implemented everywhere, however, the systematic approach to land use in the regions, as well as the orderly introduction of new agricultural techniques, has led to a noticeable increase in the level and stability of agricultural production. In the Soviet Union, food production per capita increased - more than 750 kg of grain products, 31 - sugar, 222 - potatoes, 93 - vegetables, 31 - fruits, 10.5 kg of vegetable oil. At that time, the level of food production per inhabitant of the USSR was approaching that of economically developed countries of the world [7]. More than 1.8 million trucks, about 1.4 million tractors, about 1.4 million combine harvesters were produced for agriculture, a significant number of machines for the livestock industry. As a result, the energy-labor ratio of labor in agricultural production increased 1.4 times. Large-scale work was carried out on irrigation and land reclamation construction [15, 12].

In early 1985, the USSR adopted the Comprehensive Program of Chemicalization of the National Economy for the Period Until 2000, which provided for the formation of a powerful domestic production base for the production of mineral fertilizers, plant protection products and other chemical products for agricultural production. The implementation of this program allowed to significantly increase crop yields, increase the production of cereals, meat, milk, and generally strengthen national agricultural production [14].

However, the large-scale use of chemical products in agricultural production, unbalanced with farming systems, while non-compliance with environmentally sound agricultural technologies for crop production, has led to significant chemical pollution of both the manufactured products and the environment. The intensification of agricultural production through the use of chemicals, land reclamation, intensive agricultural technologies, complex mechanization in the cultivation of crops has predetermined a new range of problems: salinization, acidification, re-compaction and flooding of soils; the appearance of water and wind erosion; pollution of the soil and adjacent reservoirs with chemicals, the impoverishment of natural ecosystems, and the reduction in the species diversity of plants and animals.

The intensification of agricultural production had a significant negative impact on the quality of land resources in the Altai Territory. It all started in 1953 with a note from the Altai Territory Party Committee to the Central Committee of the USSR stating that the Altai Territory has considerable unused land resources that may be suitable for agricultural production, and above all for grain cultivation. In April 1954, 20 thousand virgin lands arrived in Altai Krai, and in all over the years of development of virgin lands about 50 thousand people. For the period from 1954 to 1960. In the Soviet Union, about 42 million hectares of virgin and fallow lands were developed, including 16.3 million hectares in Russia, and over 2.9 million hectares in the Altai Territory. During the first five-year period, the state invested more than 315 million rubles in the development of virgin lands in Altai, while the sale of grain crops from newly developed lands brought to the state budget over the first three years over 520 million rubles. In total, in the first three years of development of virgin lands, Altai Territory received about 18 million tons of grain, of which 9.4 million tons were delivered to the state. Already in the second half of the 50s, Altai annually supplied over 4 million tons of grain to the state bins [8].
The development of virgin lands was not limited to the production of grain. So even before the revolution, the territory of Altai was visited by a state research commission that examined the possibility of producing sugar beets. The tsarist commission recognized the suitability for cultivating sugar beets in the territory of the modern Pavlovsky district and proved the need for the construction of a sugar factory, which was realized during the years of development of virgin and fallow lands.

The development of virgin lands served as a stimulus in the development of the livestock industry of the region. Large specialized agricultural enterprises appeared, the number of livestock and poultry increased significantly, and the use of new technologies for keeping and feeding led to an increase in productivity. At the same time, with the introduction of new land in the region, the production of industrial crops, potatoes, and vegetables increased.

At the same time, accelerated intensification affected the state of the soil cover - it was contaminated due to the use of mineral fertilizers and chemical crop protection products. The scale of pollution is quite serious, in particular in areas where agrotechnical requirements for the use of pesticides, fertilizers and plant protection products have been violated. Thus, the prolonged and systematic use of high doses of mineral fertilizers by the beginning of the 90s predetermined the process of accumulation of toxic components in the soil cover, which are secondary ballast elements of the applied mineral fertilizers. In particular, about 1 kg of fluorine got into the soil from 1 ton of phosphorus fertilizer, and up to 500 kg of chlorine components from 1 ton of potassium fertilizer. Impurities in mineral fertilizers of arsenic, lead, cadmium, strontium and other elements are of particular environmental danger. The concentration of these elements in crops above the MPC makes them dangerously toxic to the human body and farm animals.

The current realities in domestic agricultural production have sharply raised the question of preserving the ecological natural balance and soil fertility. So, the volume of mineral fertilizers in the soil of the Altai Territory in the period 1965-1990. continuously increased, however, with the beginning of the systemic and structural restructuring of the national economic complex of the country and the transition to market relations, the supply of mineral fertilizers to the region’s agriculture decreased significantly. These measures affected soil fertility and productivity, but to some extent they became a deterrent to further soil degradation and ecological imbalance in rural areas. The qualitative composition of the soils of the plains of the region is characterized by a significant variety of types of soil cover, but most of them are chernozems and gray forest soils [11].

In the Altai Territory, the problem of desertification and soil degradation is the main environmental problem. Thus, the increasing degradation of land resources, as well as a decrease in the natural fertility of soil fertility, are a serious obstacle to the strategic development of agricultural production in the region. The problem of soil desertification is determined by various processes of soil degradation, while degradation should be considered as a process, and desertification as an ecological state of the soil cover and the environment.

4. Conclusion
The main feature of the soil cover of the region is its geographical position on the border of two sharply uneven mountainous and lowland areas. At the same time, the presence of diverse soil cover predetermined the richness of land resources in the territory of the region and made it possible to use them for production and recreation in agriculture, forestry and conservation.

In a relatively small territory of the Altai Territory, almost all types of soils available in Russia are represented. The qualitative composition of the soils of the plains of the region is characterized by a significant variety of types of soil cover, but most of them are chernozems and gray forest soils.

It is advisable to consider the direction of production of organic products as an integral part of the system of sustainable development of agriculture and environmental protection. The use of technologies to produce organic products should not disrupt the natural functioning of the environment.

The modern intensive way of development of agriculture cannot fully ensure the environmental cleanliness and safety of products.
We believe that an important task of modern agricultural science is a comprehensive justification of the formation of a new type of agricultural economy - a more highly efficient and environmentally friendly one, which acts as an important component of the national economy. In our opinion, the comprehensive development of organizational and economic principles for the gradual involvement of unused and fallow arable land in the agricultural turnover for the purpose of producing organic products will increase the country's domestic food security, as well as open up access to environmentally friendly products for domestic agricultural producers on foreign markets.

Analysis of the ecological and economic state of agricultural production in Russia during the period of intensification and implemented agrarian transformations made it possible to identify the main socio-economic prerequisites that justify the need for the development of agriculture focused on the production of organic products. The most significant, in our opinion, are [12]:

- the imbalance of the applied farming systems and, in general, agricultural production with the environmental conditions of specific territories;
- a decrease in the quality characteristics and productivity of land resources due to the impoverishment of soil fertility, as well as various types of degradation processes of the soil horizon as a result of excessive technogenic load;
- a general decline in agricultural production;
- the emergence of a variety of organizational forms of land ownership and the desire of both landowners and land users to intensively exploit land resources without investing additional forces and means in order to improve quality characteristics and increase soil fertility.

In order to get the agro-industrial production out of this situation, it is necessary, in combination with other measures, to ensure a gradual transition of the domestic agro-industrial complex to new ways of managing, based on the principles of balanced development and taking into account the interconnections of natural-ecological and socio-economic systems.

5. References

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