Methods of analysis and assessment of the efficiency of agricultural land use by agrarian universities

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Abstract: The paper is devoted to the study of the efficiency of the agricultural land use by agrarian universities. The need to consider this topic lies in the fact that agrarian universities, which train personnel for agricultural industries, face a number of problems in ensuring and developing the agricultural production on the basis of their capacity, including land being the main means of production. However, the universities do not have sufficient funds. Their resources are always limited, so, on the one hand, rational savings will allow maintaining the quality of education, but on the other – the absence of supporting measures reduces the possibilities of meeting modern requirements of education. The theoretical significance of the study is to summarize the data on the area of agricultural land and to study the specifics of their functional purpose. During the work, the analysis of the efficiency of agricultural land use was carried out, the indicators of which can be used as a basic element for increasing economic and entrepreneurial activity of universities. Hence, the study proposes a model of planning the maximum (minimum) value of assessing the level of agricultural land use by agrarian universities to ensure proper economic activities, as well as educational, practical and research works. The results of the study can be taken into account in the preparation of promising plans for the development of agrarian education.

1. Introduction
The use of agricultural land has always been the subject of state regulation. Over the past two decades, the legal framework has changed the state impact in land and property sphere and has abandoned the monopoly of state ownership of land in favor of various forms of ownership, land use and land tenure. Thus, the rational land use is now determined by the level of development of the productive forces of a particular owner (user). Ensuring the efficiency of agricultural industries has become a multidimensional task requiring various innovative methods [1].

In this direction, a multi-criterion assessment of agricultural producers (farms) seems interesting, since it takes into account multifunctionality obtained on the basis of requirements and expectations of the agricultural sector based on individual data in order to determine the sustainability indicator of such economy [2]. Such research is reflected in the analysis of agricultural production within agrarian universities: upon the request of state bodies the information on the use of land and the level of production is provided in the form of certificates and reports, which forms the basis for monitoring the land and property complex and efficiency rankings of universities. Besides, it is worth paying attention to a new approach to the concept of agricultural development by defining a policy for the formation of multifunctional agriculture (MFA), which includes the assessment of the importance of agricultural production and inclusion of the element of the agricultural (supporting) complex. This approach
highlights the profound changes not only in the use of agricultural land, but also in the use of rural areas in general. With the help of the choice experiment, a new view of improving the efficiency of agricultural development is proposed [3].

The foundations of Russian land legislation historically provide for the establishment of a large amount of agricultural land for universities that train human resources ensuring production and economic activities in the agro-industrial complex of the country.

In modern conditions, the territorial distribution of agricultural land of agrarian universities was developed on the basis of economic, natural-climatic, social and land-legal requirements. Taking into account the established functional purpose, the main types of their permitted use include educational and experimental fields, polygons, small processing enterprises, storage facilities, farms, nurseries and other agricultural objects and lands, which in the process of regulating the sphere of education were organized into university structural subdivisions – educational and experimental farms, small agricultural educational enterprises, scientific and educational bases. As a rule, administrative, production and economic facilities are located on the territory of such subdivisions providing for the implementation of educational, practical and research activities of universities.

2. Materials and methods

All lands of agrarian universities are classified as the federal property and are fixed on the right of permanent perpetual use. The total area of agricultural land is 231156.00 ha (Table 1).

| District                        | Number of universities | Area of agricultural lands, ha |
|--------------------------------|------------------------|-------------------------------|
| Central Federal District       | 18                     | 27130.79                      |
| Northwestern Federal District  | 2                      | 121.50                        |
| Southern Federal District      | 4                      | 40754.50                      |
| North Caucasian Federal District| 3                     | 2137.15                       |
| Privolzhsky Federal District   | 13                     | 33125.98                      |
| Urals Federal District         | 4                      | 19275.82                      |
| Siberian Federal District      | 6                      | 76843.13                      |
| Far Eastern Federal District   | 4                      | 31766.75                      |

To date, the lands of agrarian universities, including agricultural lands, are accounted in the information system providing for the maintenance of the register of federal property of the agricultural complex, where each land plot is reflected in the cadastral excerpt, cadastral certificate and marked on the cadastral plan of the territory. This aspect is formalized by law and successfully functions within the framework of state land regulation.

3. Study of the existing structure of agricultural land use

The practical complexity of the agricultural land use by universities is determined not only by the need for rational use of land plots, but also by the need to increase the efficiency of “performance” aimed at training highly professional specialists in the field of agriculture, as well as at the development of scientific, innovative and entrepreneurial activities of universities. A particular feature here is that the increase of crop yield, livestock productivity and the increase of agricultural production efficiency are inextricably linked with the systematic improvement of land use through the development and application of new technologies in soil processing, selective breeding of plants, animals, microorganism strains [4].

According to the Federal Law No. 217-FZ “On the introduction of amendments to separate acts of the Russian Federation concerning creation of economic societies by budgetary scientific and educational institutions for practical application (introduction) of results of intellectual activity” of 02.08.2009 the educational organizations have the right to increase the cost efficiency due to commercialization of intellectual activity. The funds received can be used to develop scientific capacity and to strengthen the logistics of the educational process.
At the same time, there are some significant problems in planning the use of agricultural land for educational and production tasks, organizing educational and practical classes, implementing independent works of students, ensuring scientific research.

Every university and organized agricultural production related to crop production, animal breeding or processing and sale of agricultural products seeks to increase the efficiency of its economic activity – to increase production and reduce production costs. The implementation of these tasks requires measures for the rational use of land, labor and material resources, the solution of organizational, economic and educational and scientific issues. At the same time, the need for material and technical resources, equipment, mineral fertilizers, capital investments shall be taken into account.

In short form, from a methodological point of view, agricultural production for individual producers can be presented as the economic and mathematical model taking into account both the use of necessary facilities, area indicators, and the distribution of products, as well as their volumes.

The model for planning the maximum (minimum) profitability of agricultural production can be presented as follows (1, 2):

\[
P (P_{sub}) = \sum_{j=1}^{g} P_{js} (P_{js \_sub}) \times Q_{js}
\]

under the condition:

\[
\sum_{j=1}^{g} nz_{ij} \times Q_{js} \leq V_{R+sub} \quad (i = 1, 2, ... m)
\]

where \( g \) – total number of production types of different products; \( P_{js} (P_{js \_sub}) \) – product value (product value taking into account subsidizing); \( Q_{js} \) – production volume of j-products; \( nz_{ij} \) – cost standards of i-resource for the production of a unit of j-product; \( V_{R+sub} \) – amount of resources of i-type of products taking into account state subsidies; \( S \) – agricultural production areas; \( m \) – list of types of production resources.

The model takes into account the costs of production resources, planted areas, labor, material resources and the cost of production, which in turn includes a large number of regulatory, basic, corrective factors and may contain a percentage of state subsidies [5].

Thus, the efficient use of agricultural land, and consequently labor, technology, is possible with sufficient level of financial support [6, 7]. The volume of financial income at agrarian universities depends, first, on the factor of its own level of achievement of certain economic indicators and characteristics of economic efficiency for all types of activities. An important link here is the understanding that with high profit values, the economic efficiency of the production itself can be quite low. On the contrary, quite often there are situations when a highly efficient enterprise (production, cultivation, breeding, inventions, etc.), especially prolonged in time, gives insufficient results in terms of profit – economic effect.

The second factor that plays a huge role in the efficiency of the use of university resources is state financial subsidies through the executive authorities of the Russian Federation. Every year agrarian universities issue a large number of report forms on activities and achievements in the statutory area, which includes a document on the availability and use of property, including land plots, which provides for the state support.

State subsidies are one of the fundamental bases for the development of agrarian universities. In market conditions, taking into account the interaction of demand and supply for educational services in the field of agricultural production, with low elasticity of supply for agricultural products, the subsidies provide significant support in improving the profitability and competitiveness of universities (Figure 1).

The impact of subsidies is optimistic. The laws of economic development of any system are under the influence of demand (D) and supply (S), price (P sub) and production quantity/output – (Q). With small volumes of functioning, the agricultural education or production system is at the equilibrium point O and may tend to regress and deficit. State support of subsidies in the form of various types of subsidies activates the mechanisms of education and production, positively affects the price of services or products and increases the volume of production, which in turn stabilizes the agro-industrial sector of the country. This system works well in long-term periods.
An important trend in the development of modern higher education is the promotion of Russian universities to the leading positions in the international space. In this regard, agrarian universities have great advantages, as they provide specialists and innovative developments to the public sector of agricultural production, namely the participants of agricultural business. Due to these directions, each university needs to develop short-term and medium-term local planning (forecast) documents in the form of agro-economic justifications for the organizational and economic land management and modules for the development of innovative and entrepreneurial activities, which should take into account the prospects stipulated in the federal targeted programs of the agricultural sector.

The methodology for analyzing and evaluating the efficiency of the agricultural land use by universities includes the following system of indicators:

- **industrial and economic**: composition of agricultural land; specialization of agricultural production; forecast yield and productivity of livestock; livestock population, feed demand, fed crops, feed balance; structure of cultivated areas; volume and value, including cost of crop and livestock production (gross, commodity) and distribution; need for fertilizers, agricultural machinery, petrol, oil and lubricants and labor; need for fixed and working funds, capital investments; profits, other income and expenses, capital turnover and cash flow; profitability, etc.

- **educational, practical and research**: forecasting the demand for graduates of industry specialization; development of new training profiles; availability of professional qualifications for employees, students and graduates; implementation of educational programs taking into account the development of agro-industrial sector and changes in the corresponding types of professional activities; availability of vocational accreditation of educational programs; organization of qualification assessment centers; efficiency of research work and scientific development – creation of varieties, hybrids of crops, vaccines, serums, diagnostic agents, therapeutic agents, machines, tools, working objects, etc.

These indicators are considered both individually and are modeled into a functional system of dependencies, which makes it possible to comprehensively reflect the level of economic and educational efficiency of universities, the general form of which may be presented as follows:

**Figure 1. Impact of state support on university performance**

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\[ E_{ua} = \frac{(Z \eta P \eta Q \eta R \eta K \cdot Y \cdot M \eta \text{Result})}{\Sigma F} \]

where \( E_{ua} \) – efficiency of university activity, \( Z \) – objectives, \( P \) – plans, \( Q \) – resources, \( R \) – risks, \( K \cdot Y \cdot M \) – management functions, Result – efficiency, \( \Sigma F \) – total income from all sources.

The creation of a dynamic and innovative education system in the field of agriculture with a strong base of practical skills in agro-industrial production will allow the Russian agro-industrial complex increasing the available agricultural potential of universities thus achieving the growth targets and ensuring sustainability [8].

4. Conclusion
Sustainable management of an educational institution on the basis of the most powerful resource and human potential allows introducing experimental developments in the field of crop production, animal husbandry, veterinary and mechanical engineering, etc., which has a qualitative impact on the development of agricultural sectors.

At the same time, any agrarian university acts as the sector of production of knowledge and training, the unit of production and the cluster of scientific developments based on the primary component – means of production – agricultural land. The rational use of agricultural land by agrarian universities is possible provided that all available resources and a favorable financial climate are optimized.

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