The European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2021.07.31

LEASECON 2020
International Conference «Land Economy and Rural Studies Essentials»

METHODOLOGY FOR ASSESSING THE INVESTMENT AND RESOURCE POTENTIAL OF AGRICULTURAL LAND

Stanislav I. Komarov (a)*
*Corresponding author

(a) State University of Land Use Planning, Kazakova str., 15, Russia, komarov@zemcad.ru

Abstract

In Soviet times, in the absence of land ownership rights and, consequently, the real estate market, the valuation of land plots was undeveloped, but there was a developed and actively applied mechanism for qualitative assessment. In addition, there was an economic assessment of land aimed at the suitability of agricultural plots for the production of various types of agricultural products. In modern Russia, such work has not been carried out, but now there is a need to assess land use from the perspective of hidden resources. The article describes the authorial methodology for assessing the investment and resource potential of agricultural land use. The investment and resource potential is formed by a cumulative construction of 5 private potentials, reflecting the ability of land use to generate income in comparison with surrounding land uses. Private potentials include soil potential, natural potential, location potential, production potential, and market potential. Soil potential is the resource potential of land use generated by soil varieties contained within land use boundaries. Natural potential is climate, terrain, and other natural factors. Location potential – factors that affect the logistics of a land-use-related business and form the cost part of it. The production potential consists of the demand on commodity markets for products that land use specializes in. Market potential – factors that form the value of land use in terms of the market under the influence of existing combinations of demand, supply, price situation, etc.

Keywords: Agricultural land, investment potential, land valuation, resource potential, value based management

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

Agricultural land is the second largest category of land in Russia, occupying more than a fifth of the total land fund of the country. These lands are annually used in the production of agricultural products worth more than 5 trillion rubles, contributing over 3.5 percent to the GDP of the country. The importance of agricultural land is also increasing by the global trend of the growing demand for land resources and agricultural products against the background of increasing land degradation (Gulan & Stamenovic, 2015; Koohafkan, 2009).

For a long time, domestic land valuation works also used the term "economic valuation of land", which was understood as one of the stages of the assessment process, during which the comparative productivity of different land plots was indicated on the basis of soil valuation data. The resulting criterion of economic evaluation was gross production, output of feed units, gross and net income, unit cost, efficiency of additional costs, etc.

At present, the use of economic assessment is difficult due to incomplete comparability of results, emphasis on natural rather than cost criteria, etc. But at the same time, there is a need for a high-quality assessment among owners, authorities, and other market participants. Therefore, the use of elements of economic assessment and the formation of a new methodology that calculates an indicator that allows one to assess the potential hidden in land use in terms of resources and from the point of view of the market based on a significant amount of accumulated factual data is timely and relevant.

2. Problem Statement

Agricultural land use management needs an indicator that could serve as a benchmark for assessing the effectiveness of implemented and developed management decisions, management quality, and attractiveness as a potential capital investment. One of the options for this indicator is the cost of land use. In recent years, the theory that it is the value of a land plot that is an integral indicator for practically all types of activity is becoming more popular. The authors agree that an increase in the value of a land plot always follows an increase in the efficiency of land use and land management. Such an increase in value should be considered as one of the main goals of strategic planning for the development of land use and land-use system since the increase in value goes hand in hand with rental income (Zasyad-Volk, 2009).

The management concept focused on increasing the value of managed property, also called value based management, emerged in the late 80s. Accordingly, the effectiveness of land use management or other real estate objects can be considered in terms of increasing or decreasing value. This approach gained a new surge in popularity after the 2008 crisis when the value of a company or an asset began to be viewed not only through the prism of owners, but also of all stakeholders (Munteanu et al., 2012).

This method is based on cost and flexible relative criteria that can be used to track the effectiveness of enterprise or land use management (Favaro, 2004).
The Federal Law "On Valuation Activities" and the Federal Valuation Standards distinguish 4 types of value: market, investment, liquidation and cadastral (Varlamov & Komarov, 2015).

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

3. Research Questions

These types of value are not always appropriate for use in land management and land use in the agro-industrial complex of the country.

The market value is based on the typical behavior of the average buyer and seller, its value depends mainly on the expected annual income and on the interest of buyers in similar areas. Restrictions on using the resulting market value criterion arise from the high volatility of this indicator in unstable markets (this leads to restrictions on the use of a profitable approach to valuation), as well as the underdevelopment of agricultural land markets (this leads to restrictions on the use of a comparative approach) in the vast majority of Russian regions.

The liquidation value is used if the timing of the transaction with real estate differs from the market average downward. This value is calculated by reducing the market value by the amount of the liquidation discount. Consequently, the use of liquidation value in the process of agricultural land use management inherits all the restrictions on the use of market value. In addition, the liquidation value is too specific in nature, limited in its application, and by its economic nature cannot be used as an estimated target or actual performance indicator.

The cadastral value differs from the previous types since it is determined by the methods of mass rather than individual assessment. The cadastral value covers the majority of Russian lands, but, first of all, it has no noticeable dynamics, since the periodicity of reviewing the results of the cadastral value is 4 years. Secondly, and most importantly, the method of cadastral valuation of agricultural land is based on normative and historical data: the information basis for the calculation is the average data for the last three years on the yield and cost of crops cultivation. And on the basis of these average values, the rental income of the assessed land plots is calculated during the cadastral valuation process. Thus, the cadastral value records the results of economic activity on the lands under valuation in the last few years, i.e. in the past, another option for calculating rental indicators is the reliance on normative, scientifically based values. It is impractical to make management decisions based not on a forecast or plan, but on the results of the past time, especially on the basis of normative values. This fact imposes restrictions on the use of the cadastral value in planning and other stages of agro-industrial land use management.

The investment value, on the other hand, is forward-looking and calculated on the basis of a discounted cash flows model. Moreover, according to statistics, most transactions with agricultural lands in the world occur for investment purposes (Cotula & Berger, 2015), therefore, the investment value is more suitable for use as a value based management criterion than other types of value. But based on the essence of the investment value, the value of these flows is calculated for particular persons, taking into account their particular interests. Therefore, it is problematic to use the investment value as a management indicator that could be used by all interested parties (landowners, land users, investors, society, municipal, regional and Federal authorities).

In addition to the above difficulties in using the main types of value in the development and management decision-making process, it is rather difficult to automate the processes, which is one of the main criteria of modern assessment and management processes. Therefore, it is necessary to introduce an

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

indicator that would reflect the value of a land plot in terms of the resources concentrated in it and market prospects.

4. Purpose of the Study

The purpose of this article is to present the developed methodology for assessing the investment and resource potential of an agricultural land plot.

5. Research Methods

As it was shown above, among the legally approved types of value in Russia, investment value is the target criterion that reflects the quality of management.

The concept of "investment potential" is close in essence to investment value. The term "investment potential" is found in Russian scientific papers, where it is defined as:

- the cumulative ability of domestic and attracted to the region economic resources to provide investment activities (Ulturgasheva et al., 2011).
- the ability of all available economic resources to ensure the maintenance of a favorable investment climate and the implementation of investment activities based on socio-economic policy (Potapova, 2019).
- investment potential can be considered as a generalizing indicator of investment attractiveness, taking into account in its structure a set of objective factors and conditions for investment (Krasova & Gazieva, 2018).

In relation to land use, the potential is defined as the ability of the land to maintain the existing type of use without significant degradation of resources over a long period of time. From an economic point of view, land use potential is the maximum productivity of a system of factors relative to the quantity and quality of land plot products (Bollig & Bubenzer, 2009).

For the purposes of this study, the investment and resource potential of land use can be defined as the ability of land use to generate benefits to stakeholders based on the totality of resources inherent in given land use.

In relation to agricultural land, land use resources can be divided into the following types:

- soil potential;
- natural potential;
- location potential;
- production potential;
- market potential.

Soil potential is a set of soil varieties contained within the boundaries of land use. Soil differences affect the fertility of the site and is the main factor affecting the expected cash flows from land use.

The factors that form the soil potential are bonitet, rockiness, bushiness, susceptibility to water and wind erosion.

Land use can consist of several land plots, the territory of each of them is often located on several soil varieties. In addition, different fields and work areas may have different quality characteristics.

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Therefore, the values of the soil resource factors for land use in their entirety should be calculated as an area-weighted average.

To calculate the soil resource of land use, it is necessary to have in the created system such indicators as: the area of each soil variety located on the territory of land use; bonitet for each soil difference; the proportion of land-use area subject to water erosion; the proportion of land-use area subject to wind erosion; the share of agricultural land located on the land-use area, overgrown with trees and shrubs; the number of stones per unit area of agricultural land.

Natural potential refers to climate, terrain, and other natural factors that affect yield, growing costs, and other components of cash flow.

As natural factors of investment potential, the sum of active temperatures, precipitation, terrain slope, slope exposure, the share of land-use territory occupied by ravines, and the share of land-use territory occupied by washouts should be taken into account.

Location potential is a factor that affects the logistics of a land-use-related business and is directly proportional to the cost part of it. The location of an agricultural enterprise determines the ability to access the main sales markets, processing plants, transport routes and storage facilities, among other factors, the volume of production costs is determined.

This type of resource can be assessed using indicators of the distance of land use from the nearest railway station (seaport), distance from the nearest regional highway, distance from the nearest federal highway, distance from the center of the municipality and distance from the center of the region.

The production potential consists of the demand on commodity markets for products that land use specializes in.

The potential of land use in terms of production is determined by the forecast of gross and net income from the use of land resources. The positive flow from land use is influenced by factors such as the optimal crop structure (from the point of view of market demand for products and from the point of view of agricultural science), the forecast of prices for agricultural products, and the projected crop yield. The negative part of the flows is formed under the influence of the forecast of costs for products cultivation.

To calculate the production resource of land use, it is necessary to have such indicators as: the share of crops produced per each of the cultivated crops; projected yield values for each cultivated crop weighted average by area of soil varieties; the projected unit costs for growing each crop, weighted average over the area of soil differences; projected specific net income from agricultural production.

Market potential – factors that form the value of land use in terms of the market under the influence of existing combinations of demand, supply, price situation, etc.

The market situation on the agricultural land market can be characterized by the number of conducted transactions, the number of advertisements for the sale and lease of agricultural land plots, the total area, the average level of land prices for the forecast period, the level of market absorption.

To assess the market resource researcher must have data on: the index of the number of implemented transactions, the supply index of land plots, the price index of the agricultural land market, the market absorption coefficient.

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

6. Findings

Methodically, the determination of the investment potential of land use can be presented in the form of the following stages:

Stage 1. Accumulation of initial information. The key difference between the proposed investment and resource potential of agricultural land use and the existing cost indicators is a combination of elements of accounting for possible land use productivity taking into account natural characteristics (which is a characteristic feature of cadastral valuation) together with market conditions, including a combination of supply and demand, projected net rental income, and risk indicators (these characteristics usually act as price-forming factors in market assessment).

To improve the accuracy of the calculated indicator, it should be based on a significant information array, part of which is dynamically updated. The data require processing, correction of the forecasts made and monitoring of changes in the resulting indicator. The source information accumulated in the software environment must be processed using big data methods, and then used to calculate the required indicator.

Stage 2. Information processing. As can be seen from the table, the data that is the source information for assessing investment potential has different dimensions, different accuracy, and different frequency. In order to make these factors comparable, it is necessary to normalize the factors by replacing their natural values with normalized values that lie in the range from 0 to 1.

During normal processing of source information, it should be taken into account that different factors have a multidirectional impact on the growth of investment potential.

It is advisable to normalize factors for which low values are more preferable using the formula (Yashina et al., 2019):

$$Y_{\text{н}} = \frac{Y_{max} - Y_i}{Y_{max} - Y_{min}}, \quad (1)$$

where: Yн is the normalized value of the resource factor; Yi is the current value of the resource factor; Ymax and Ymin are the maximum and minimum values of the resource factor within the analyzed sample.

Factors committed to increasing are normalized by the formula:

$$Y_{\text{н}} = \frac{Y_i - Y_{min}}{Y_{max} - Y_{min}}. \quad (2)$$

Thus, after processing the source information, the information array is ordered, as a result of which the values of all factors lie in the same interval and have a direct impact on the resulting indicator.

Stage 3. The calculation of individual potentials. After normalizing the factors, the values of each of the partial potentials can be calculated by summing the normalized values of the factors. Based on formulas (1) and (2), as well as taking into account the set of resources that affect different types of resources, it is possible to compose expressions for calculating partial potentials:

$$SP_i = BS_i + S_{eri} + S_{di} + Y_{bi} + Y_{sti} + Y_{sali} + Y_{soli} + Y_{cari} + Y_{humi} + Y_{tigi}, \quad (3)$$

where: SP_i – soil potential of the i-th land use with a value in the range from 0 to 10; BS_i– a normalized average bonitet by i-th land use; S_{eri}– the normalized proportion of the i-th land affected by water erosion; S_{di}– the normalized proportion of the i-th land subject to wind erosion; Y_{bi}– the

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

normalized brushy level the i-th land use; Y_{sti}– the normalized level of stoniness of the i-th land use; Y_{sali}– the normalized level of salinity of the i-th land use; Y_{soli}– the normalized level of alkalinity of the i-th land use; Y_{cari}– the normalized level of carbonate of the i-th land use; Y_{humi}– the normalized level of saturation of the i-th land use; Y_{tigi}– the normalized level firmness of the i-th land use.

$$NP_i = T_i + N_i + d_i + S_{oi} + K_{eli}, \quad (4)$$

where: NP_i– the natural potential of the i-th land use with a value in the range from 0 to 5; CT_i– a normalized sum of active temperatures in the area of i-th land use; N_i– the normalized average annual precipitation in the area of i-th land use; d_i– the normalized slope of the terrain observed on the territory of the i-th land use; S_{oi}– the normalized share of the i-th land use attributable to land unsuitable for use; K_{eli}– the normalized coefficient of elongation of the plot.

$$LP_i = R_i + R_{qi} + R_{rwi} + R_{hwi} + R_{fhwi} + R_{di} + R_{ri}, \quad (5)$$

where: $МП_i$–the potential location of the i-th land use with a value in the range from 0 to 7; R_i– normalized number of roads in the vicinity of the land; R_{qi}– the normalized number of roads with a quality surfacing in the vicinity of the land; R_{rwi}– the normalized distance of the i-th land use from the nearest railway station; R_{hwi}– normalized distance of the i-th land use from the nearest regional highway; R_{fhwi}– the normalized distance of the i-th land use from the nearest federal highway; R_{di}– the normalized distance of the i-th land use from the regional centre; R_{ri}– the normalized distance of the i-th land use from the capital of the subject of the Federation.

$$PP_i = GI_i + E_{pri} + E_{feri} + RR_i, \quad (6)$$

where PP_i – the production (revenue) potential of the i-th land use, with a value in the range from 0 to 4; GI_i-normalized projected specific gross income of the i-th land use, weighted average for soil differences and cultivated crops; E_{pri} – normalized projected specific costs for agricultural production of the i-th land use, weighted average for soil differences and cultivated crops; E_{feri} – normalized projected specific costs for maintaining soil fertility of the i- th land use, weighted average for soil differences; RR_i – normalized projected risks inherent in the i-th land use;

$$MP_i = ID_i + IS_i + IP_i + EP_i + IA_i, \quad (7)$$

where: MP_i– the market potential of the i-th land use with a value in the range from 0 to 5; ID_i– normalized projected annual index of the number of transactions in the area where the i-th land use is located; IS_i– normalized projected annual index of the number of deals in the area where the i-th land use; IP_i – the normalized projected annual price index in the area where the i-th land use is located; EP_i– the normalized projected exposition term of land plots of agricultural purpose in the area where the i-th land use is located; IA_i– normalized predicted annual index of the absorption coefficient in the area where the i-th land use is located.

Stage 4. Calculation of investment and resource potential of land use. Based on the available values of partial potentials, it is possible to calculate the main required indicator. The total investment potential of land use should be determined by the sum of the potentials for different types of resources:

$$IRP_i = SP_i + NP_i + LP_i + PP_i + MP_i \quad (8)$$

https://doi.org/10.15405/epsbs.2021.07.31
Corresponding Author: Stanislav I. Komarov
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Based on formulas (3) – (8), it can be stated that the values of the investment potential of land use lie in the range from 0 to 31.

Stage 5. Factor analysis of investment and resource potential. After calculating the final indicator for the effective use of the obtained results, it is necessary to assess the influence of the primary indicators on the value of the investment potential.

Stage 6. Zoning based on investment and resource potential. Zoning the territory of a municipality or region on the basis of the calculated investment and resource potential will make it possible to single out homogeneous territories and justify the differentiation of state and regional policies in the field of agricultural land use.

The implementation of this stage can be represented as four steps:

1. Determining the optimal number of zones using the Sturgess formula:

$$m=1+3,322*\lg N, \quad (9)$$

where: m is the number of allocated zones, and N is the number of zoning units (land use or municipal districts).

2. The combining (clustering) of zoning units.
3. Graphical visualization of the zoning results obtained by creating a cartogram.
4. Analysis of selected zones (Ioseliani, 2018).

Stage 7. The use of the results.

Following this sequence, you can get a point value of the investment and resource potential of a land plot, land use, municipality or region from the point of view of agro-industrial production. A comparative analysis of this value, especially in dynamics, can give a significant increase in the quality of the information base, without which effective management is impossible (Vanclay, 1994).

7. Conclusion

Determination of the investment potential of land use in the region will allow landowners and land users to have information about the value of their assets, which can be used, firstly, when assessing the results of adopted and implemented management decisions, secondly, when developing long-term strategic activities related to land use, thirdly, when attracting borrowed funds, fourthly, when searching for investors in calculating the effectiveness of investment projects, etc. The use of the digital platform module aimed at determining the investment potential of land use will allow regional authorities to differentiate the territory of the region and its zoning on the basis of investment attractiveness, secondly, to develop a set of measures to increase the attractiveness of land use for domestic and third-party investors, and thirdly, to forecast budget revenues.

The results of determining the investment potential can also be used in the analysis of the most effective use of land.

The analysis of the best and most effective use involves comparing alternative options for land development. Investment potential is calculated for each development option. Its highest value corresponds to the best and most effective variant of its use.

Acknowledgments

Article is prepared with assistance of a grant of the Ministry of Education and Science (The agreement of December "10", 2019 No. 075-15-2019-1939. Unique identifier of the project RFMEFI60719X0302.

References

Bollig, M., & Bubenzer, O. (2009). *African Landscapes: Interdisciplinary Approaches*. Berlin, Springer.

Cotula, L., & Berger, T. (2015). *Land deals and investment treaties: Visualising the interface*. London, IIED

Favaro, J. (2004). Value Based Management and Agile Methods. *Extreme Programming and Agile Processes in Software Engineering: 4th International Conference*, p. 25-37. Genova.

Gulan, B., & Stamenovic, M. (2015). Land potential. *International Scientific conference EUROBRAND.* Zrenjanin, TQM Centar

Ioseliani, N. A. (2018). Methodological approaches to assessment zoning for the purposes of State Cadastral Valuation. *Property relations in the Russian Federation, 7,* 41-49.

Koohafkan, P. (2009). Land resources potential and sustainable land management: An overview. *Natural Resources Forum, 24*, 69-81.

Krasova, E. V., & Gazieva, E. A. (2018). Modern methodological approaches to assessing the investment potential of the region. *Azimuth of Scientific Research: Economics and Administration, 8*(3), 124-128.

Munteanu, V., Danaiata, D., Hurbean, L., & Bergler, A. (2012). The value-based management approach: from the shareholder value to the stakeholder value. *6th international management conference "Approaches in organizational management"*. Bucharest

Potapova, D. S. (2019). Investment potential of the Krasnodar territory. *4th International conference of students and young scientists "Youth and system modernization of the country",* pp. 364-370. Kursk.

Ulturgasheva, O. G., Lavrenko, A. V., & Profatilov, D. A. (2011). Economic essence and structure of the region's investment potential. *Problems of Modern Economics, 1,* 227-229.

Vanclay, J. (1994). Resource Inventory for Land-Use Planning. *Seminar on Land-Use Planning and Land Tenure to Secure the Permanent Forest Estate,* p. 7-16. Yokohama, International Tropical Timber Organization

Varlamov, A. A., & Komarov, S. I. (2015). *Valuation of real estate objects.* Moscow, Forum.

Yashina, N. I., Makarova, S. D., & Makarova, I. A. (2019). Investment potential of Russian regions: multi-criteria assessment. *Economics and Management: theory and practice, 5*(1), 10-16.

Zasyad-Volk, V. V. (2009). *Land use policy in the management system of socio-economic development of the region*. Saint Petersburg, SZAGS.