GLOBAL TRENDS ON RESEARCH TOWARDS THE VALUATION PROCESS OF AN AGRICULTURE LAND

Silvia CHIOREAN, Iulia COROIAN, Tudor SĂLĂGEAN, Mircea Emil NAP, Jutka DEAK, Ioan LUPUȚ

USAMV Cluj-Napoca, Mănăștur Street, no. 3-5, Cluj-Napoca, Romania, E-mails: silvia.chiorean@usamvcluj.ro, iulia.coroian@usamvcluj.ro, tudor.salagean@usamvcluj.ro, mircea.nap@usamvcluj.ro, jutka.deak@usamvcluj.ro ioan.luput@usamvcluj.ro

Corresponding author: ioan.luput@usamvcluj.ro, jutka.deak@usamvcluj.ro

Abstract

The increased use of data analytics and machine learning algorithms enables better prediction of land values based on various factors such as soil quality, climate, and historical performance by processing large datasets. The primary objective of this paper is to underscore the significance of addressing the topic concerning the evaluation process of agricultural land. Concurrently, it seeks to accentuate the interconnectedness across various domains of study, encompassing strategic management, agronomy, ecology, agricultural practices, and agricultural policies. Advanced technologies such as satellite imagery, remote sensing, and Geographic Information System (GIS) tools are being integrated for more accurate and efficient land valuation. In the present study, a retrospective and descriptive bibliometric analysis using the Web of Science platform was conducted, identifying 1,630 papers on the "valuation of agricultural land" from the year 2000 to 2023, which were then analyzed with VOSviewer and Microsoft Excel to generate visual representations of keyword frequency over time. The paper reveals a notable increase in published articles, emphasizing their relevance due to their economic and financial impact, with a focus on environmental sciences and economics, confirming the topic's importance and its association with ecosystem services, land use change, and willingness to pay. The results demonstrate that this theme is increasingly addressed by researchers.

Key words: *valuation, global trends, agriculture land*

INTRODUCTION

In recent decades, a significant portion of the world has undergone swift and extensive urbanization [4].

Land is a valuable resource that necessitates strategic utilization in response to the swift growth of the global population. In the course of this planning, addressing the legal assessment, definition, and registration of real estate becomes imperative [6].

Recognizing the finite availability of natural resources has prompted experimentation and the adoption of new technologies aimed at curbing the consumption of these resources and mitigating the adverse effects resulting from human activities [5].

Due to the rapid advancement of technology in recent years, there has been a growing demand for automating the data processing involved in real estate evaluation. The new technologies are useful for obtaining spatial information of real estate [1] and they are profoundly impacting the field of real estate appraisal [11]. This is driven by the desire for easier calculations and time efficiency in handling such data.

The presence of cultivable land has been instrumental in propelling the progress of humanity over successive generations [10]. Farmland serves as a crucial source of sustenance for numerous individuals globally, including agricultural and livestock producers, developers, and investors. This diverse group, along with government officials in due course, would derive significant advantages from comprehending the catalysts behind farmland price volatility and gaining insights into the factors that impact farmland prices [10].

Traditional economic theory posits that farmland values are established by the discounted stream of future rents. Therefore, in rural areas where agricultural land is exclusively utilized for agricultural production, land prices remain unaffected by the demand for its use in urban activities

(Tavares, Tavares and Santos, 2022) [10].

Throughout history, a significant portion of agricultural and forestry endeavours in Europe were perceived to possess high natural value. However, advancements in technology during the twentieth century, including mechanization, fertilizers, and pesticides, effectively removed obstacles to the intensive exploitation of the soil's productive capacity [3].

Unquestionably, rapid urbanization has produced a series of impacts on the ecological environment [12]. The substantial expansion of cities and the subsequent increase in energy consumption in urban areas underscore the necessity of implementing measures to address climate change. This is particularly crucial in regions with high energy consumption and low utilization of renewable energy sources [7].

Collaboration among farmers, researchers, and governments is crucial to discovering effective and sustainable solutions within the climate change in the agricultural sector [9].

The transformation of the urban environment, driven by dynamic processes of innovation, plays a significant role in altering the original territorial dimension of a city. From an economic and evaluative standpoint, it becomes feasible to identify and track the impact of these changes by observing fluctuations in the real estate market [2].

Currently, in Romania, the Property Valuation Standards are issued by the National Association of Appraisers from Romania [8], ANEVAR, for short.

These standards define market value as the most probable price, on a specific date, expressed in cash or cash equivalents or in another specified form, at which specified rights in real property could be sold after they have been adequately exposed in a competitive market. This occurs when all the conditions of a fair sale are met, and both the buyer and seller act prudently and with full knowledge of the relevant facts, assuming that neither is under undue pressure.

The objective of this paper is to furnish a comprehensive review of the research conducted on the topic of "valuation of agricultural land." Additionally, through bibliometric analysis, the associated fields of interest pertaining to the studied subject will be identified, along with an examination of countries exhibiting particular interest in this domain.

MATERIALS AND METHODS

To ascertain the historical progression in the incorporation of the subject matter pertaining to the evaluation of agricultural land within the domain of research, a retrospective and descriptive bibliometric analysis was conducted utilizing the Web of Science platform. Utilizing the Web of Science database, scholarly articles pertinent to a specific subject were extracted in textual format. Subsequently, employing the VOSviewer software, visual representations were generated, encapsulating keywords derived from the publications along with their frequency of usage across different years. The results of the search in the database specified above, on the topic "valuation of an agriculture land", returned a number of 1,630 papers, from the year 2000 to the year 2023. All the results were exported to a plain text file for the VOSviewer analysis and also to a Excel file to conduct multiple examinations and studies.

RESULTS AND DISCUSSIONS

The fields in which these scientific papers were included were represented by environmental sciences (632 papers) or environmental studies (592 papers), economics (329 papers), ecology (327 papers), green sustainable science technology (113 papers), forestry (111 papers), agricultural economics policy (92 papers), water resources (87 papers), biodiversity conservation (80 papers) and agriculture multidisciplinary (75 papers). Other categories in which papers have been published on valuation of a agriculture land are following: agronomy, geosciences multidisciplinary, geography, regional urban planning, engineering environmental, multidisciplinary sciences, soil science, geography physical, urban studies,

meteorology atmospheric sciences, energy fuels, development studies, remote sensing and business.

As depicted in Figure 1, the maximum number of publications was reached in the year 2021, with a total of 162 articles published. The number of publications exhibited a more pronounced increase starting from the year 2017. In 2023, a decline was observed with 133 articles published, contrasting with the preceding year, 2022, which recorded 156 articles.
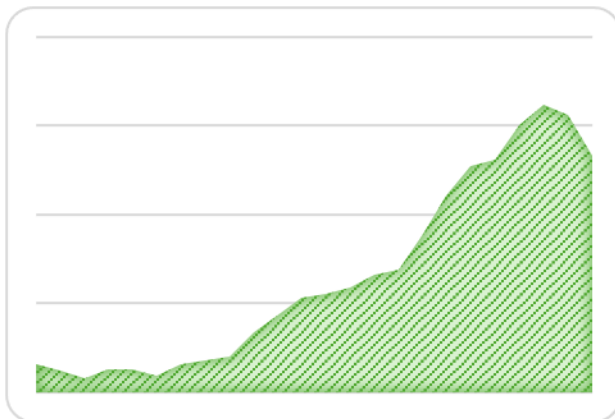

Fig. 1. The number of specialized papers analysed from the data base.
Source: own processing based on WoS results.

The published works can be categorized into ten main groups. The first and second categories are related to environmental sciences or studies, with a total of 1,224 papers. The third category is economics, with 329 papers, and the fourth category is ecology with 327 papers.

The following categories are green sustainable science technology, forestry, agricultural economics policy, water resources, biodiversity conservation, and agriculture multidisciplinary.

Most of the works are written in English. More precisely, 1,596 out of 1,630 papers were written in English, being the international lingua franca.

As depicted in Figure 2, the majority of publications originate from the USA (458 papers), followed by China with 216 papers, and in the third position is Germany with 174 papers. The ranking continues, with over 100 published papers originating from the

following countries: England (152 papers), Spain (134 papers), Australia (131 papers) and Italy (124 papers).The other countries in the ranking are: Netherlands, Sweden, France, Poland, Canada, Scotland, Brazil, Ethiopia, Indonesia, Switzerland, Belgium, Japan, Norway, India, Denmark, New Zealand, Portugal and South Africa. As evident from the information provided above, Romania is not included in this ranking.
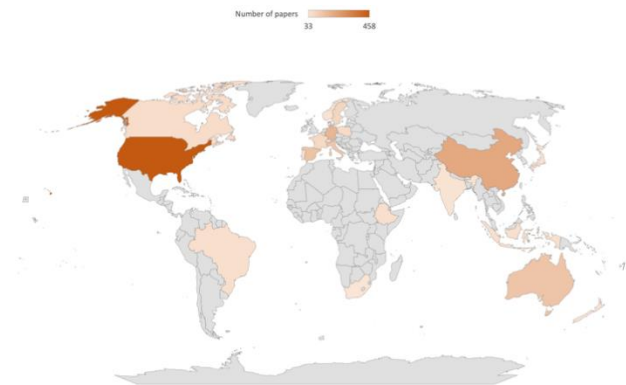
Fig. 2. The distribution of published articles by country.
Source: own processing based on WoS results.

Figure 3 shows words interrelated with valuation of an agriculture land, namely ecosystem services, valuation, contingent valuation, land use and willingness to pay and land use change. These sections constitute 12 clusters, as depicted in Figure 3.

The first cluster refers mostly to agricultural landscapes, land use, landscape or landscape planning or change, rural areas, rural development, spatial planning, and agricultural landscapes. Cluster 2 includes terms such as economic valuation, gis, green infrastructure, land consolidation, land management, land use planning, land valuation, landscape metrics, mapping, sustainable agriculture, sustainable development, urban planning, and urbanization.

Cluster 3 is correlated with expressions such as: economics, ecosystem services, ecosystems, environmental valuation, evaluation, land-use change and spatial analysis.

Fig. 3. Connectivity of key word used (valuation of a agricultural land) with other related terms
Source: own processing based on WOS results using VOSviewer.

The fourth cluster resonates with terms such as biodiversity, climate change, contingent valuation, ecological restoration, erosion, farmers, forests, organic farming, or willingness to accept. The fifth cluster is identified with terms such as adaptation, agroecology, agroecosystems, agroforestry, ecosystem service, governance, monetary valuation, soil conservation and urban agriculture. Terms like forest management, forest conservation, nonmarket valuation, profitability, or soil erosion are found within cluster 6.

The seventh cluster encompasses concepts such as benefit-cost analysis, economic value, ecosystem management, ecosystem services value, natural capital, social- ecological system and socio-cultural valuation.

Cluster 8 is identified by the following terms: habitat quality, invest, invest model, land cover and land degradation and the cluster 9 refers to the following terms: hedonic price, land, open space, and synergies.

The tenth cluster resonates with terms such as remote sensing and spatial heterogeneity.

The last two clusters, the eleventh and twelfth,

are characterized by terms such as deforestation, willingness to pay and precision agriculture. Moreover, Figure 4 delineates the associations among the key terms utilized in the database search and other pertinent terms that have been employed across diverse publications over time.

As evidenced by the Figure 4, in the recent period, post-2020, the emphasis in publications has shifted towards terms such as "invest" or "investment model", "carbon storage", "socio-cultural valuation" and others.

In the period 2016-2018, specialized articles in the studied field highlighted terms such as "ecosystem services", "climate change", "land use change", or "land valuation."

In the year 2014, the following terms were prominent:
"contingent valuation", "willingness to pay", and "rural development" or "nonmarket valuation".

In Figure 5, the key word density is depicted, characterized by varying colours dependent on the number of articles in proximity to the node.
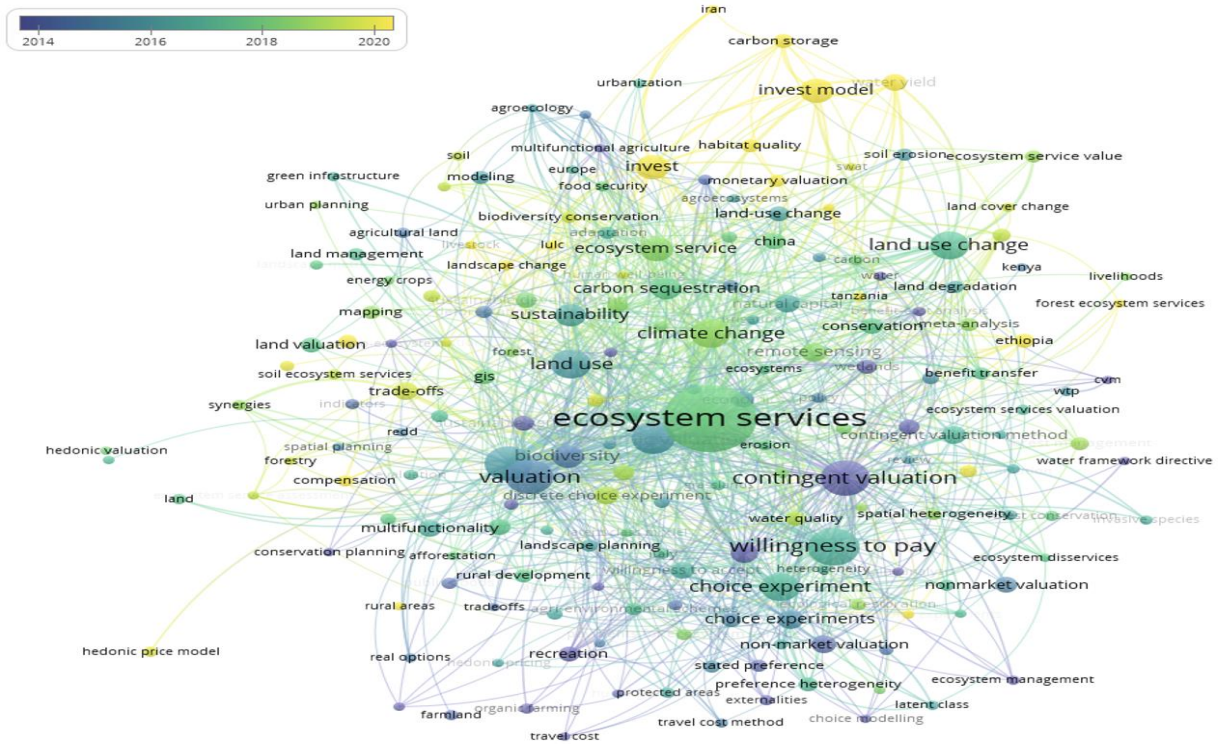
Fig. 4. Linkage of valuation of an agricultural land with other related terms categorized by years
Source: own processing based on WOS results using VOSviewer.

In Figure 5, the key word density is depicted, characterized by varying colours dependent on the number of articles in proximity to the node.

The yellow colour indicates the most frequently employed key words, whereas the blue colour signifies the less utilized terms

The yellow colour indicates the most frequently employed key words, whereas the blue colour signifies the less utilized terms within specialized articles.

It is noteworthy that terms such as "valuation", "ecosystem services" or "contingent valuation" consistently appear in specialized literature, as shown in Figure 5.
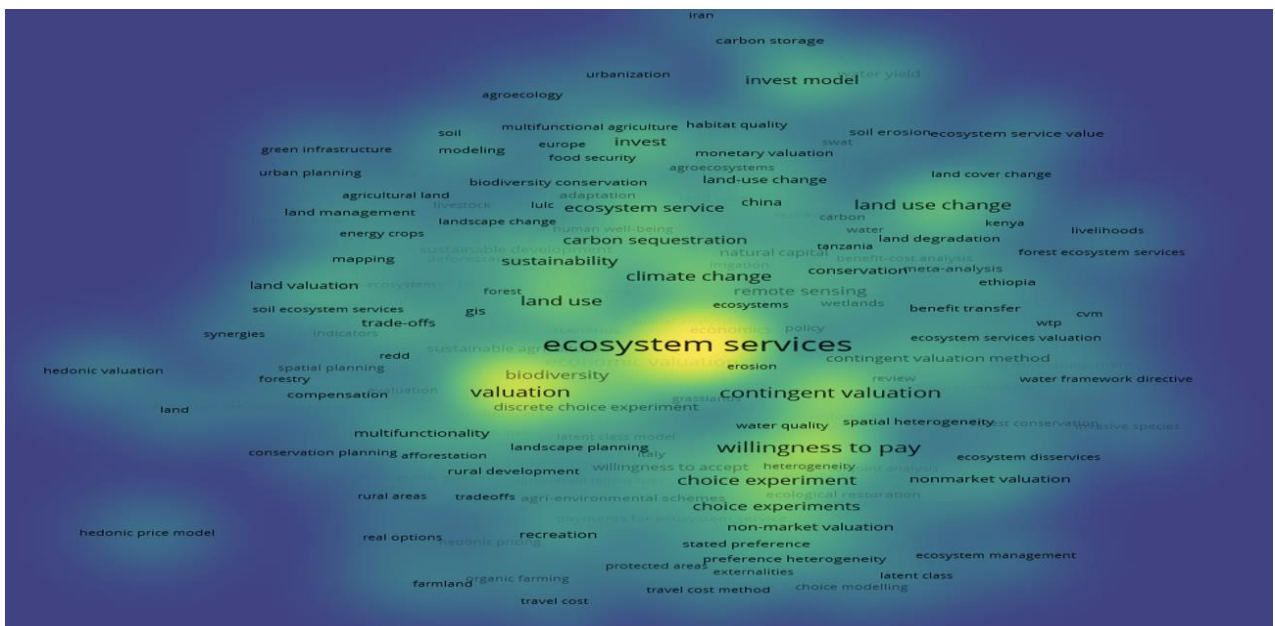

Fig. 5. The density of the key words
Source: edited by the authors based on WOS results using VOSviewer.

CONCLUSIONS

The paper examined the significance of the research topic "valuation of agricultural land," with a focus on analyzing articles published during the period 1998-2023.

According to the investigation, the number of articles has experienced a significant surge during the period 2018-2023, establishing the field of agricultural land valuation as one of considerable interest among researchers.

Furthermore, the frequency of related words used confirms that the valuation of an agriculture land is a key element for ecosystem services, valuation, land use change or willingness to pay.

Based on the conducted research, the authors can affirm that the topic "valuation of agricultural land" is of interest to researchers, particularly due to its economic and financial impact on the specialized market.

As demonstrated in this paper, a significant portion of the works revolves around environmental sciences or studies and economics. Thus, once again, the importance of the subject and its influence in the economic sector is underscored.

ACKNOWLEDGEMENTS

REFERENCES

[1]Brożek, P., Frosik, M., 2023, New technologies in real estate market analysis, Geomatics, Landmanagement and Landscape, 1, pp. 65–74. https://doi.org/10.15576/GLL/2023.1.65.

[2]Carbonara, S., Faustoferri, M., Stefano, D., 2021, Real Estate Values and Urban Quality: A Multiple Linear Regression Model for Defining an Urban Quality Index, Sustainability, 13(24), p. 13635. https://doi.org/10.3390/su132413635.

[3]Girão, I., Gomes, E., Pereira, P., Rocha, J., 2023, Trends in High Nature Value Farmland and Ecosystem Services Valuation: A Bibliometric Review, Land, 12(10), p. 1952. https://doi.org/10.3390/land12101952.

[4]Kwartnik-Pruc, A., Droj, G., 2023, The Role of Allotments and Community Gardens and the Challenges Facing Their Development in Urban Environments—A Literature Review, Land, 12(2), p. 325. https://doi.org/10.3390/land12020325.

[5]Locurcio, M., Tajani, F., Anelli, D., 2023, 'Sustainable Urban Planning Models for New Smart Cities and Effective Management of Land Take Dynamics, Land, 12(3), p. 621. https://doi.org/10.3390/land12030621.

[6]Mert, K., Zeynel Abidin, P., 2023, GIS-based real estate legislation information system design: The case of İzmir, Foça., Advanced Engineering Days, Mersin, Türkiye, pp. 77–79. aed.mersin.edu.tr.

[7]Mutani, G., Alehasin, M., Usta, Y., Fiermonte, F., Mariano, A., 2023, Statistical Building Energy Model from Data Collection, Place-Based Assessment to Sustainable Scenarios for the City of Milan, Sustainability, 15(20), p. 14921. https://doi.org/10.3390/su152014921.

[8]National Association of Appraisers from Romania ANEVAR, 2022, Property Valuation Standards. Bucharest.

[9]Sterie C.M., Dragomir V., 2023, Global Trends on research towards agriculture adaptation to climate change, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.23 (1), 759-765.

[10]Tavares, V.C., Tavares, F., Santos, E., 2022, The Value of Farmland and Its Determinants—The Current State of the Art, Land, 11(11), p. 1908. https://doi.org/10.3390/land11111908.

[11]Wei, C., Fu, M., Wang, Li., Yang, H., Tang, F., Xiong, Y., 2022, The Research Development of Hedonic Price Model-Based Real Estate Appraisal in the Era of Big Data, Land, 11(3), p. 334. https://doi.org/10.3390/land11030334.[12]Web of Science Platform, 2024, https://www.webofknowledge.com, Accessed on 12.02.2024.

[12]Zhu, S., Huang, J., Zhao, Y., 2022, Coupling coordination analysis of ecosystem services and urban development of resource-based cities: A case study of Tangshan city, Ecological Indicators, 136, p. 108706. https://doi.org/10.1016/j.ecolind.2022.108706.