Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 24, Issue 3, 2024
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ROMANIA'S RURAL DIGITAL TRANSFORMATION AND IMPLICATIONS FOR AGRICULTURE

Marian BUȚU[1,2], Vili DRAGOMIR[1], Daniela Nicoleta BĂDAN (VOICILA)[1]

[1]Research Institute for the Economy of Agriculture and Rural Development, 61 Mărăști blvd., District 1, 011464, Bucharest, Romania, Phone: +4021.313.60.87, Fax: + 021.313.60.96, E-mails: marian_butu@yahoo.com, dragomir.vili@iceadr.ro, badan.daniela@iceadr.ro
[2]National Research and Development Institute for Biological Sciences, 296, Splaiul Independentei, Bucharest, Romania, E-mail: marian_butu@yahoo.com

Corresponding author: dragomir.vili@iceadr.ro

Abstract

This paper aimed to analyzes the development of access to the internet in Romania for the last decade highlighting digitalization in rural areas. The main indicators studied in this research are: household access to the Internet in different regions of Romania and in the EU, and internet usage of households in Romania and the EU, analyzed in their dynamics in the period 2014-2023, based on Eurostat data. The results proved an increase in internet connectivity across three tiers of location: cities, towns, and rural areas. While internet reached almost the entire population of the cities, this has been more than doubled in rural areas: from 41.08% in 2014 to 88.12% in 2023. Despite these increases, Romania still ranks behind most the EU countries regarding overall digitalization, particularly at a rural level. In this context, the rapid increase in rural internet access indeed points to an improvement in digital infrastructure, but further investments in improving the gap will be required. The study, therefore, highlights the importance of sustained efforts toward improving rural digital literacy and connectivity for all, but in particular for embracing digital agriculture technologies.

Key words**:** *digital divide, rural development, Romania*

INTRODUCTION

Digitalization has become an essential driver for growth in the majority of European economies. There is still inequality between the towns and the countryside, and many gaps remain to be filled-especially for countries like Romania [9]. Digitalisation will produce important changes in labour market regarding high IT skills and training level [8], as well as in the capacity to process big data [3], and to improve technical endowment and infrastructure in all the EU countries [17] and not only.

In this respect, the European Union has promoted policies and provided significant funding in recent years for policy actions, such as CAP and the Digital Agenda for Europe in order to make sure that all countries are digitally included and work toward rural development [13, 6]. The facilitation of digital technologies has gone so far in rural areas within Western European countries, while many countries like Romania still have huge infrastructure and digital literacy gaps that will not let them fully realize the digital transformation in rural areas [2].

Up to now, economic development and the technological advance of rural areas in Romania remain minimal when comparing to the rest of Europe [15]. This trend started to turn around over the last two or three years. According to [10], through National Rural Development Programme (NRDP), European funding has been very important for digital infrastructure and to support entrepreneurship in rural areas of Romania. The availability of funds is present, while other challenges regarding poor access to the Internet, low digital skills, and institutional support restrain further development compared to other EU countries [11].

The infrastructure, digital literacy, and socio-economic barriers are so wide in rural areas that more efforts are needed on the part of Romania toward true rural digitalization [7].

Digital transformation in agriculture and rural development has been one of the major focus

areas for Romania. Considering that rural areas are usually lagging behind in technological infrastructure, recent developments of digital tools have changed the scenery [12]. Thus, in agriculture, for instance, digitalization has shown promising signs of development: productivity, sustainability, and efficiency. Rural areas, however, still present specific challenges due to socio-economic factors and gaps in infrastructural conditions [16, 5]. While national and EU initiatives have accelerated this process of bridging the gap in the digital divide, there is still an acute need for comprehensive solutions that integrate local needs with digital literacy and economic incentives [10]. Whereas cities have raced ahead, rural areas are now rapidly catching up as smart farming technologies and data-driven agricultural practices gain momentum [1].

Against this background, the paper analyses the differences in access to internet between Romania and other European countries, pointing out both the advances and areas that need further efforts with respect to rural development.

MATERIALS AND METHODS

Data used within this paper have been retrieved from national and European statistical sources, such as Eurostat and the National Institute of Statistics-INSSE, Romania. These refer to the period 2014-2023. The subject of this analysis is the use of the internet in households in three regions: cities, towns, and rural areas in Romania. Data were divided into such geographic categories for assessing digitalization tendencies and gaps between urban and rural households.

In this regard, annual usage percentages were subjected to a longitudinal analysis to depict the digital divide and the stepwise progress that has occurred in Internet penetration. Data were further matched against urban and rural areas to show trends and test the effectiveness of national policies with respect to improving digital infrastructure across rural communities. Descriptive statistics were used to outline the increase in internet penetration, and the results were discussed in terms of digital transformation in agriculture and rural development.

The analysis involved establishing the rate of change in internet access over the ten-year period, underlining all the important points of inflection when rural internet penetration started to climb rapidly. These trends in data would then be wrapped into a broader discussion of implications for rural development, with particular interest in digital agriculture and prospect for technological adoption in underserved.

RESULTS AND DISCUSSIONS

Connectivity through the Internet in rural areas serves as a vital component in expanding economic growth, social inclusion, and modernization of different sectors, particularly agriculture.

With this, farmers in the countryside are able to access a wider spectrum of technologies-precise agriculture, for example-operating on optimized resources for better productivity and sustainability.

The general trend of the internet access in Romania was steadily increasing from 60.54% in 2014 and to 92.00% by 2023 across all households (Figure 1).

Urban households (cities) registered the highest percentage of individuals with internet access throughout the period, starting from 79.10% in 2014 to 96.04% in 2023. Rural households have experienced the most significant increase in internet connectivity, rising from 41.08% in 2014 to 88.12% in 2023. Town households also registered a rise from 62.98% in 2014 to 91.84% by 2023, reflecting great achievements in digital access.

This is even more relevant for the discussions on digitalization in rural areas. It puts forth that there has indeed been progress toward bridging the digital divide. Because rural areas started with much lower penetration, the rapid growth of the past decade actually demonstrates that efforts to improve digital infrastructure in these regions are paying off.

This is essential to enable rural populations to become connected and participate in the digital economy, access e-services, and improve agricultural practices by applying digital tools.

Yet, even as the gap narrows, it still persists. Thus, investment in digital infrastructure should be continued across the rural areas in order to ensure equality in the digital age.

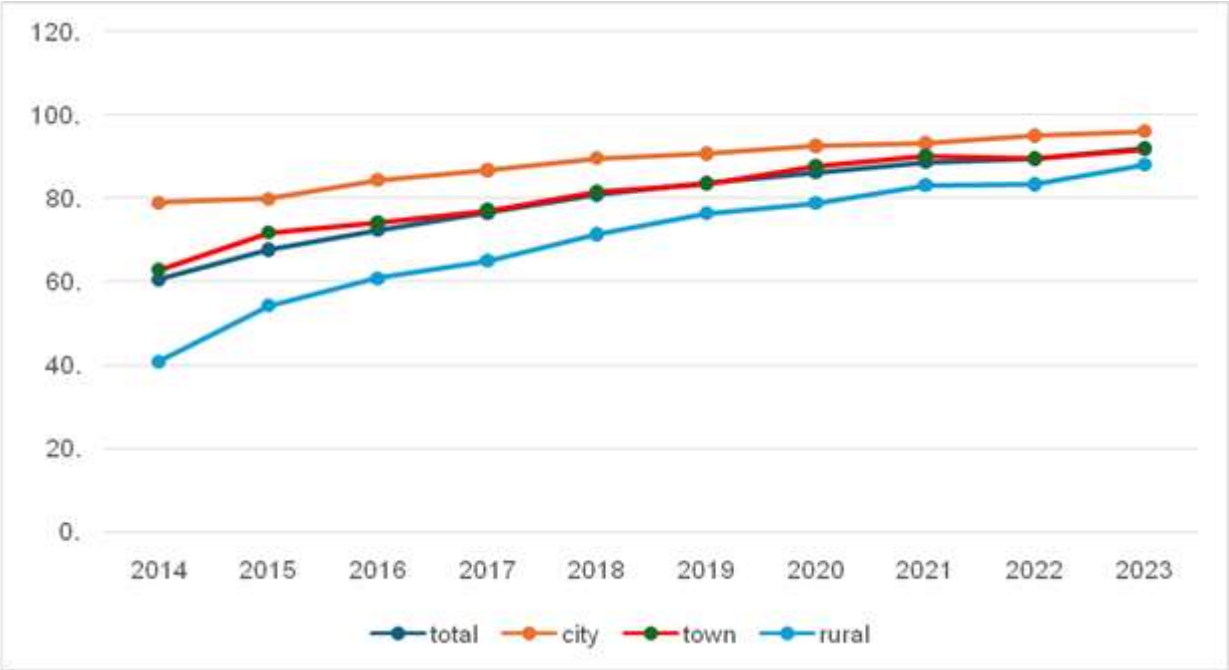

Fig. 1. Household access to the Internet in different regions of Romania (%)
Source: Authors 'own elaboration based on Eurostat data [4].

The chart in Figure 2 gives an overview of the percentage of households accessing the internet in various EU countries between 2014 and 2023. From a comparison of Romania to other European Union nations, it is easily perceived that Romania has grown much in its Internet penetration, yet stands lower in rank compared to most of its European counterparts.

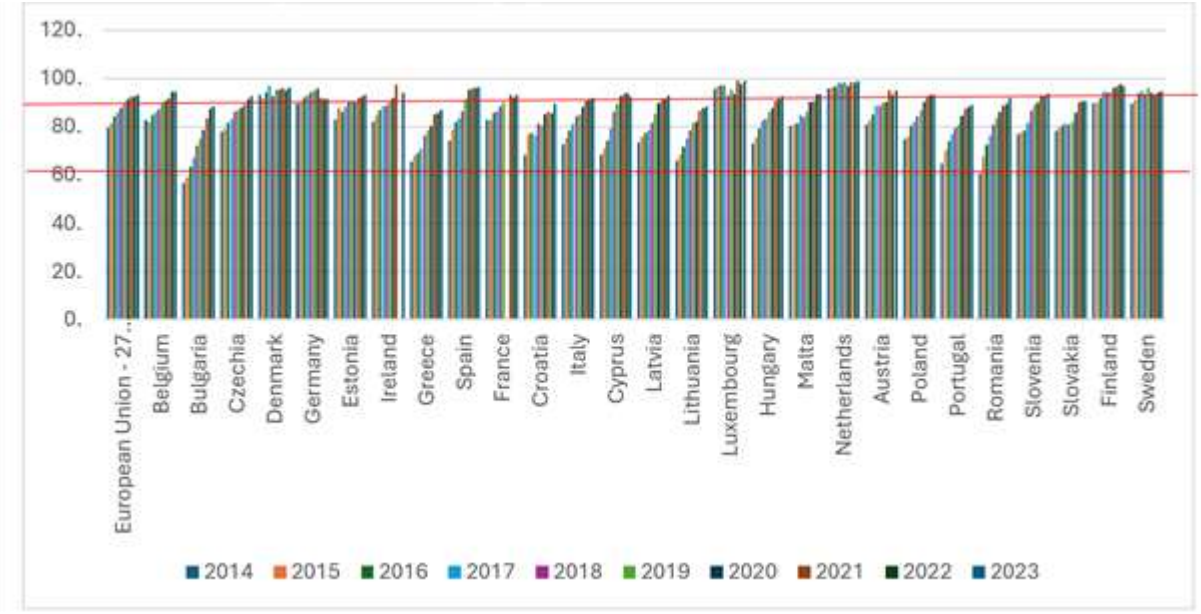

Fig. 2. Internet access of households in EU countries (%) red lines delineate the minimum and maximum for Romania)
Source: Authors' own elaboration based on Eurostat data [4].

While most of the EU member states show near-universal access by 2023, with figures tending to or above 95%, Romania, despite making several improvements, stays a little lower. The general trend for Romania is a steep increase in internet adoption, especially on the

latter part of the timeline; however, it hasn't reached the same level of connectivity as top-tier countries.

This graph shows Bulgaria, Slovakia, and most of the other Central and Eastern European countries have moved similarly to Romania; in 2014, internet penetration started lower but grew faster. On the other hand, these continuous improvements in digital infrastructure represented by Romania's data signal a move toward closing the gap between this country and other EU members. By the year 2023, Romania has managed to get close to the EU average, but more digital infrastructure investment is still needed, especially in less densely populated regions.

Over recent years, an appreciable increase in the use of the internet has taken place across Romanian territory (Figure 3). In 2014, only 30.60% of households in rural areas had access to the internet, while in the urban ones, this was 65.29%. As of 2023, this number has more than doubled to 83.23%, which is a remarkable increase in bridging the gap between the rural and urban divide in the use of the Internet.

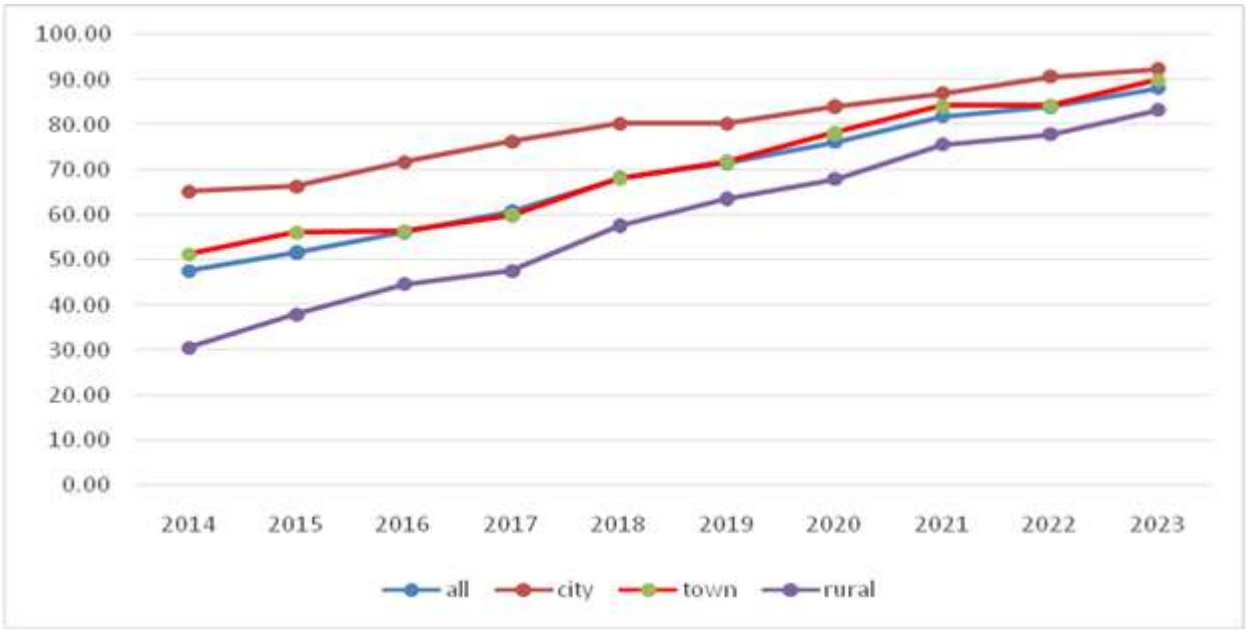

Fig. 3. Internet usage of households in Romania (%)
Source: Authors' own elaboration based on Eurostat data [4].

Comparing the rural versus urban areas, while the urban communities' usage of internet was reaching 92.42% of households connected by 2023, rural communities remain behind, with a steep increase only from 2017 onward, where rural internet access leaped from 47.57% to 83.23%. This is suggesting a focused effort in improving digital infrastructure within rural settings, which can be considered as an important enabler for the digital transformation of the agricultural sector in Romania. The more rural households become connected, the more opportunities will be opened for adopting digital tools, such as precision agriculture technologies.

In Figure 4 is showed the internet usage in selected European countries for the last decade. Romania had an upward trend in the usage of the internet, starting from 47.7% in 2014 to 88.05% in 2023, and it is well on its way with digitalization. This is anotable increase as compared with the EU average, which recorded growth from 72.48% in 2014 to 90.27% in 2023. Taking into consideration that a decade ago Romania was situated way below the starting baseline, and at this moment has been catching up with European median, this reflects a focused effort to extend the availability of the internet across the country.

Compared to other countries within the EU, rural areas in Romania continue to face slower adoption relative to urban centres.

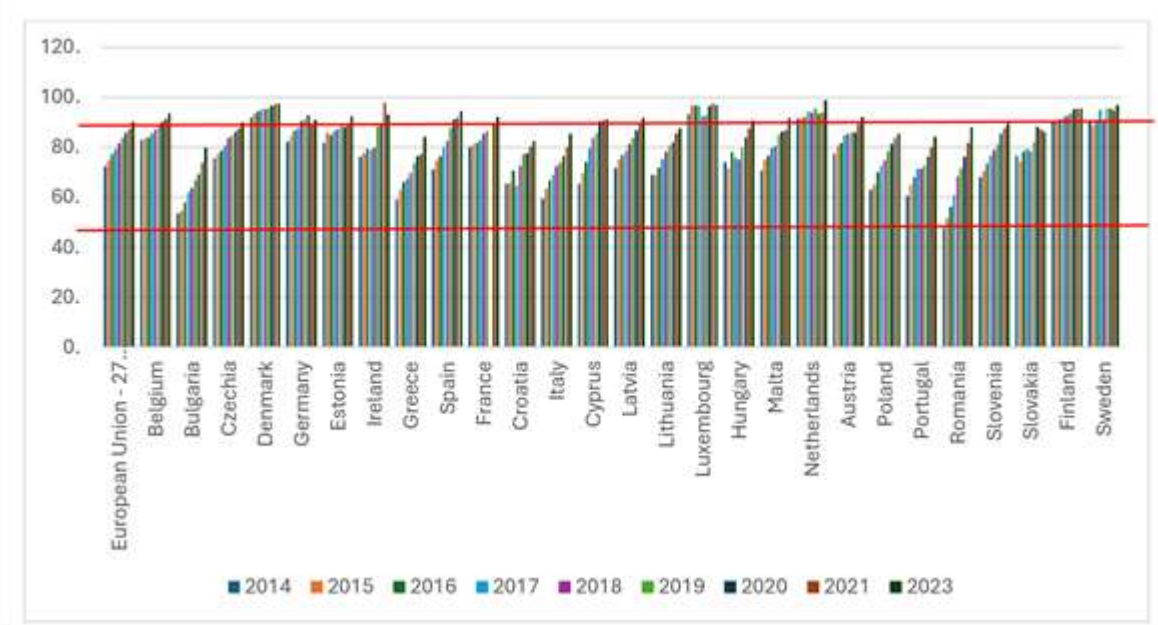

Fig. 4. Internet usage of households in EU countries (%) (red lines delineate the minimum and maximum for Romania)
Source: Authors' own elaboration based on Eurostat data [4].

For example, Denmark, Luxembourg, and Finland have consistently shown high internet usage, with their access rates exceeding 90% by as early as 2014.

Other countries, such as Bulgaria and Greece, while starting from a similar low baseline as Romania, have also seen similar positive trends. In 2023, at a value of 88.05%, Romania already surpassed the internet usage rate in certain EU countries such as Slovakia, which scored 86.06%, and was above Hungary with 90.63%, though it still lags behind digital leaders like Denmark, at 97.47%, and the Netherlands with 98.92%.

From this perspective, the implication of improving internet access and usage as one of the most valued drivers of digital transformation in agriculture and rural development is immense for Romania's rural area.

This represents steady growth in internet connectivity, aligned with the broader goals of digitalization within Romania, while bridging the gap and including rural communities in the economy through digital means.

At the same time, this also demands further investment to make sure that Romania catches up with EU leaders in terms of comprehensive internet coverage across all regions.

Yet, equal access between rural and urban areas remains a priority to ensure rural communities' participation in the broader digital economy.

This gap will be bridged, and a path toward more sustainable rural development will be achieved, with further investment in digital infrastructure coupled with efforts towards increased digital literacy.

CONCLUSIONS

Similar to many other Eastern European countries, Romania faces the challenge of rapid increases in internet access so that its benefits increase not only to urban areas but also to rural households, for whom access has traditionally been limited.

While the digital divide is reducing, it still needs attention if Romania is to exploit the full potential of digital technologies in agriculture and elsewhere.

ACKNOWLEDGEMENTS

The present research is part of the Project ADER 22.1.1. The design of technical-economic models for the analysis of the resilience and sustainability capacity of the agricultural sector and the optimization of production processes, of the Research Institute for Agricultural Economics and Rural Development (ICEADR Bucharest).

REFERENCES

[1]Barabanova, Y., Krzysztofowicz, M., 2023, Digital transition: long-term implications for EU farmers and rural communities. doi:10.2760/093463

[2]Chițea, L. F., 2023, Strategic National Plan 2023-2027 - opportunities or constraints for sustainable agriculture in Romania? Scientific papers "Agrarian Economy and Rural Development – Trends and Challenges", Vol. 14, Issue 2023: 157-164.

[3]Cofas, E. 2023, the role of Big data in digitalizing information. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 23(3), 185-196.

[4]Eurostat database, 2024, Digitalisation in Europe – 2024 edition, https://ec.europa.eu/eurostat/web/interactive-publications/digitalisation-2024, Accessed on August 5, 2024.

[5]Evagelos, D. L., Charatsari, C., De Rosa, M., 2021, Digitalization of agriculture: A way to solve the food problem or a trolley dilemma? Technology in Society. Volume 67. 101744. https://doi.org/10.1016/j.techsoc.2021.101744.

[6]Goel, R.K., Yadav, C.S., Vishnoi, S., Rastogi, R., 2021, Smart agriculture – Urgent need of the day in developing countries. Sustainable Computing: Informatics and Systems. Vol. 30. 100512. https://doi.org/10.1016/j.suscom.2021.100512.

[7]Ilie (Marin), N., Toderasc, S.A., Oprea, I.A., 2023, Digitizing Romanian agriculture, an opportunity for sustainable development. Annals of the „Constantin Brâncuși" University of Târgu Jiu, Economy Series, Issue 3/2023: 229-240.

[8]Ionitescu, S., Popescu, A., Gudanescu, N.L., Cristea, A., 2023, Digitalization and agriculture - impact on human resources in the European Union and Romania. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 23(3), 361-372.

[9]Izvoranu, A.-M., 2021, The rural digital divide - recommendations from a scoping review. Scientific Papers "Agrarian Economy and Rural Development – Realities and perspectives for Romania", Vol. 12, Issue 2021: 251-260.

[10]Khanna, M., Atallah, S.S., Kar, S., Sharma, B., Wu, L., Yu, C., Chowdhary, G., Soman, C., Guan, K., 2022, Digital transformation for a sustainable agriculture in the United States: Opportunities and challenges. Agricultural Economics, Journal of the International Association of Agricultural Economists. https://doi.org/10.1111/agec.12733: 924-937

[11]Markovits, P.S., 2024, Digital Transformation of Agriculture in Romania: A Change Management Perspective. Ovidius University Annals Economic Sciences Series XXIII(2):282-291 Doi:10.61801/OUAESS.2023.2.35: 282-291

[12]Meghișan-Toma, G. M., Nicula, V. C., 2020, Possible Use of ICT in Agriculture for a Sustainable Development. 6th BASIQ International Conference on New Trends in Sustainable Business and Consumption, 1287-1295.

[13]Podaru, A.M., Rahoveanu, A.T., 2021, Analysis of the impact of the allocation of European funds on rural development in Romania. SHS Web of Conferences. The 3rd International Conference on Resources Economics and Bioeconomy in Competitive Societies (RebCos'20) under the title Environmental Challenges, Innovative Technologies and Rural Areas in Digital Era. Vol. 95. 01016.

[14]Puie, F., 2020, The role of European funds in developing and sustaining rural entrepreneurship in Romania. Proceedings of the International Conference on Business Excellence, 14, 134 - 148. https://doi.org/10.2478/picbe-2020-0014.

[15]Rodino, S., Buțu, M., Buțu, A., Lazăr, C., Ciornei, L., Simion, P., 2023, Challenges of Digital Transformation in Agriculture from Romania. Romanian Agricultural Research. Issue 40, p. 713. https://doi.org/10.59665/rar4066: 713-721.

[16]Trendov, N. M., Varas, S., Zeng, M., 2019, Digital Technologies in Agriculture and Rural Areas. Rome: Food and Agriculture Organization of the United Nations.

[17]Zheleva, V., Delcheva, E., 2023, Digitalization of agriculture in Bulgaria. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 23(2), 725-894.