



UNIVERSITY OF LIFE SCIENCES "KING MIHAI I" FROM
TIMISOARA
"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH
IN APPLIED LIFE SCIENCES"

13-14 November 2025



CIRCULAR ECONOMY IN ROMANIAN AGRICULTURE: COMPARATIVE INSIGHTS FROM THE EUROPEAN UNION

RUSU ANDREI*¹, MARTIN ANAMARIA ROXANA¹, IANCU TIBERIU¹,
ADAMOV TABITA CORNELIA¹

¹ University of Life Sciences "King Mihai I of Romania" from Timisoara, Faculty of Management and Rural Tourism, Romania

Abstract: This study examines the integration of circular economy principles in Romanian agriculture, assessing resource efficiency and comparing national progress with EU trends. Using data from Eurostat, the European Environment Agency (EEA) and the National Institute of Statistics, key indicators such as circular material use rate, waste generation, recycling, biomass utilisation and organic farming were analysed. The results indicate that Romania's potential for circularity remains underused, with one of the lowest material reuse rates in the EU. Structural barriers such as limited investment, low innovation and weak waste management slow the transition. Nevertheless, EU initiatives such as the Green Deal and the Farm to Fork Strategy provide strong support for accelerating sustainable and resilient rural development.

• Introduction

The circular economy represents a core pillar of the EU's sustainable development strategy, aiming to increase resource efficiency, reduce waste and minimise environmental impact. Within the framework of the European Green Deal and the Circular Economy Action Plan (2020), agriculture plays a key role in advancing circularity. In Romania, the agricultural sector remains highly resource-intensive, with limited adoption of practices such as nutrient recycling, biomass utilisation and organic farming. This study explores how circular principles are integrated into Romanian agriculture, highlighting challenges, progress and alignment with the EU's sustainability objectives.

• Material and method

The study employs a comparative analysis of official data (Eurostat, EEA, FiBL, MADR, 2010–2023) to assess the implementation of circular economy principles in Romanian agriculture compared with the EU average. Key indicators such as Circular Material Use Rate, Waste Generation, Recycling Rate, Biomass Utilisation and Organic Farming Area were analysed using descriptive and comparative methods to identify main trends and progress toward sustainability.

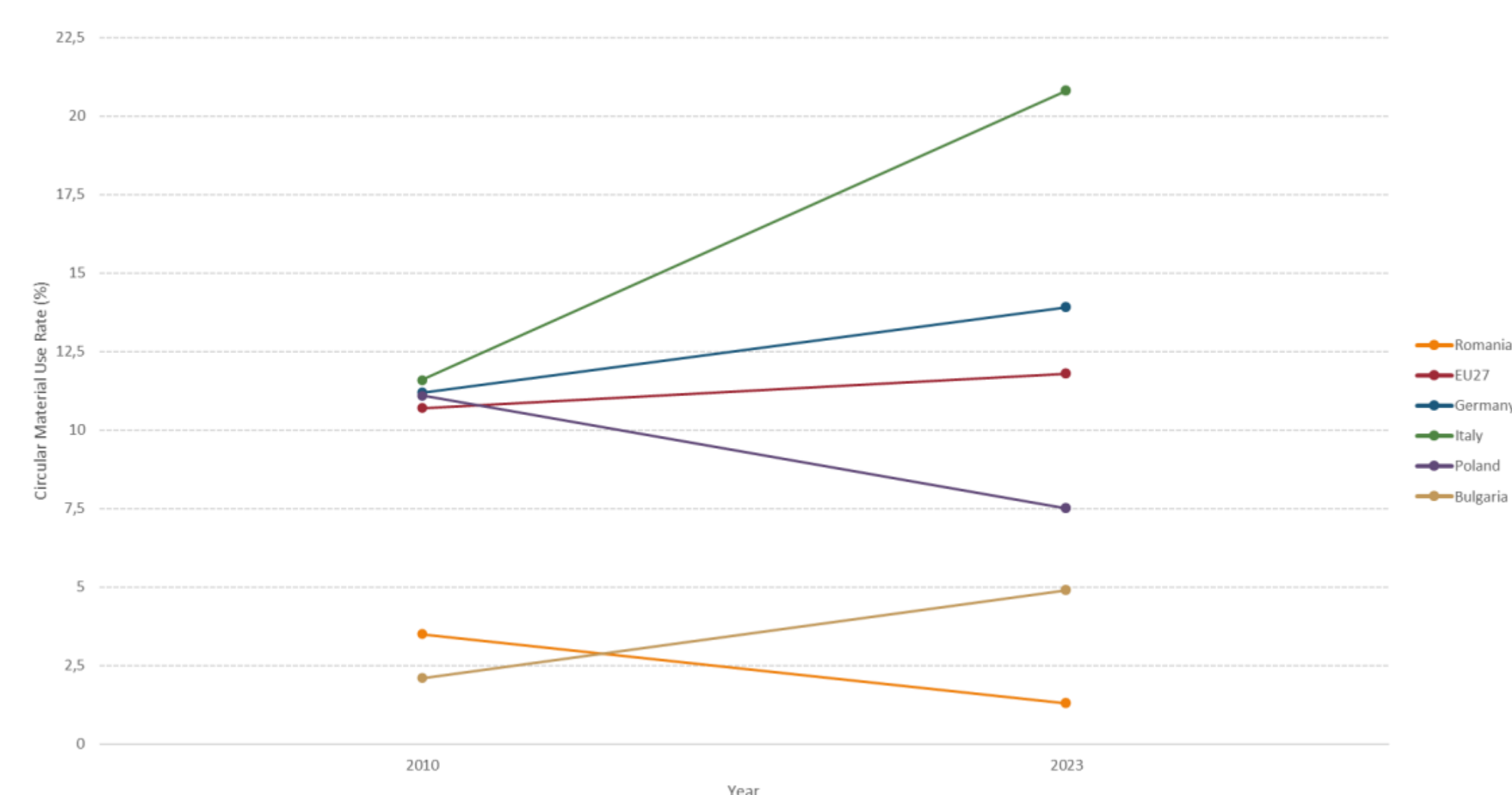


Figure 1. Evolution of the Circular Material Use Rate (2010–2023), Romania vs EU and selected countries

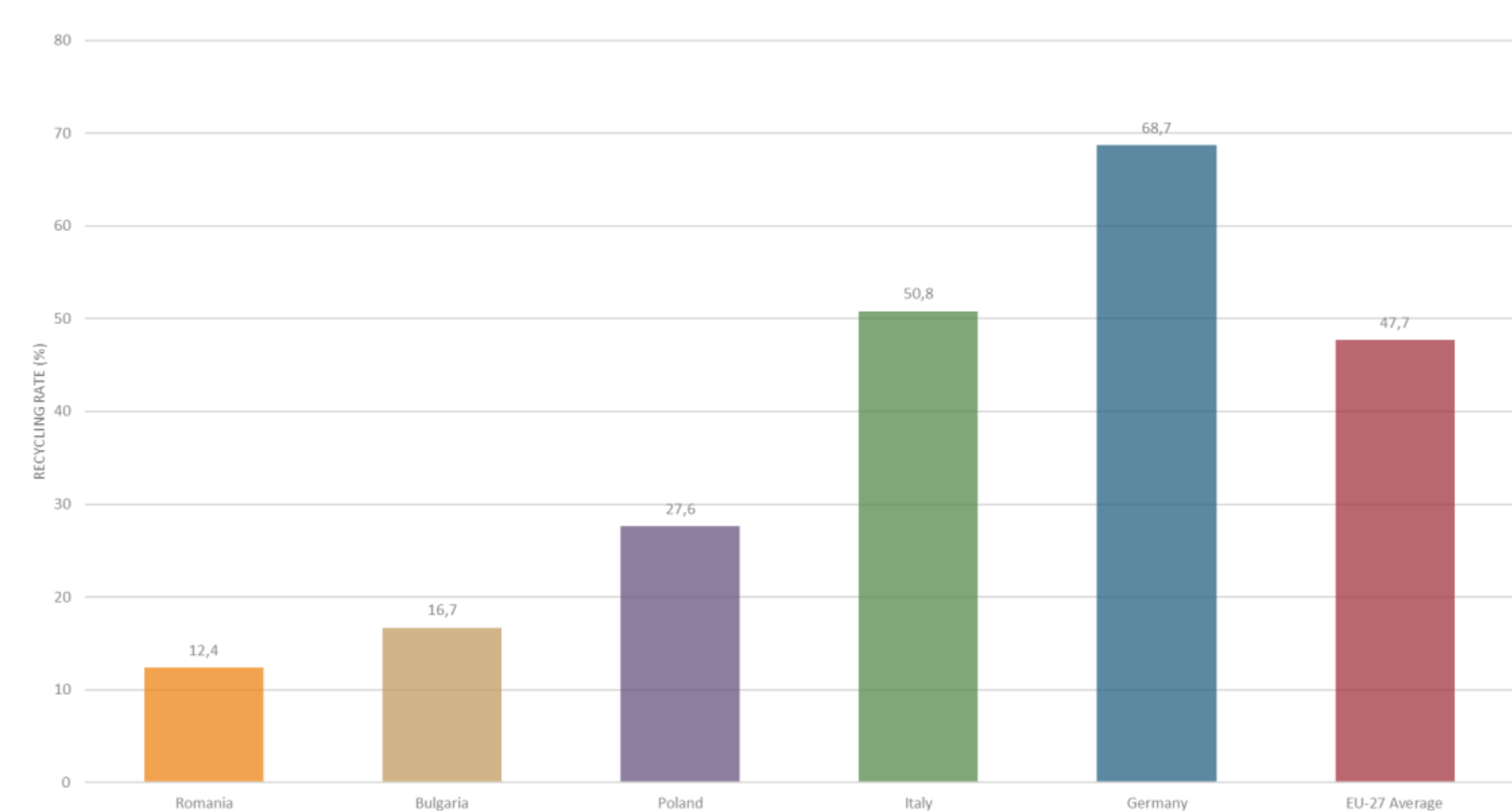


Figure 2. Recycling Rate of Municipal Waste (% of total generated, 2023), Romania vs EU and selected countries

• Results and discussions

The comparative analysis reveals Romania's slow progress toward circularity compared with the EU average. In 2023, the Circular Material Use Rate reached only 1.3%, far below the EU average of 11.8%, indicating limited reintegration of secondary materials. Resource productivity remains low (≈ 0.4 EUR/kg vs. 2.1 EUR/kg EU), while the material footprint (≈ 30 t/capita) is double the EU mean, confirming high dependence on virgin resources.

Although Romania generates less municipal waste (305 kg/capita) than the EU average (511 kg/capita), its recycling rate is among the lowest (12.4% vs. 47.7% EU). Over 70% of waste is still landfilled, highlighting inadequate infrastructure and delayed policy implementation. Packaging waste recycling also lags (37.3% vs. 67.5% EU).

In agriculture, the share of organic farming increased from 1.3% to 5.5% (2010–2023), yet remains below the EU-27 average (10.6%). Biomass continues to dominate Romania's renewable energy mix ($\approx 90\%$), but is mostly used in raw form, with limited biogas or composting facilities.

Agricultural GHG emissions declined by 13.5% (2005–2022), outperforming the EU average reduction of 5.4%, but projections suggest potential increases by 2030 without new mitigation measures. Strengthening investments in recycling, biogas infrastructure and eco-schemes could accelerate Romania's transition toward a circular and climate-resilient agricultural model.

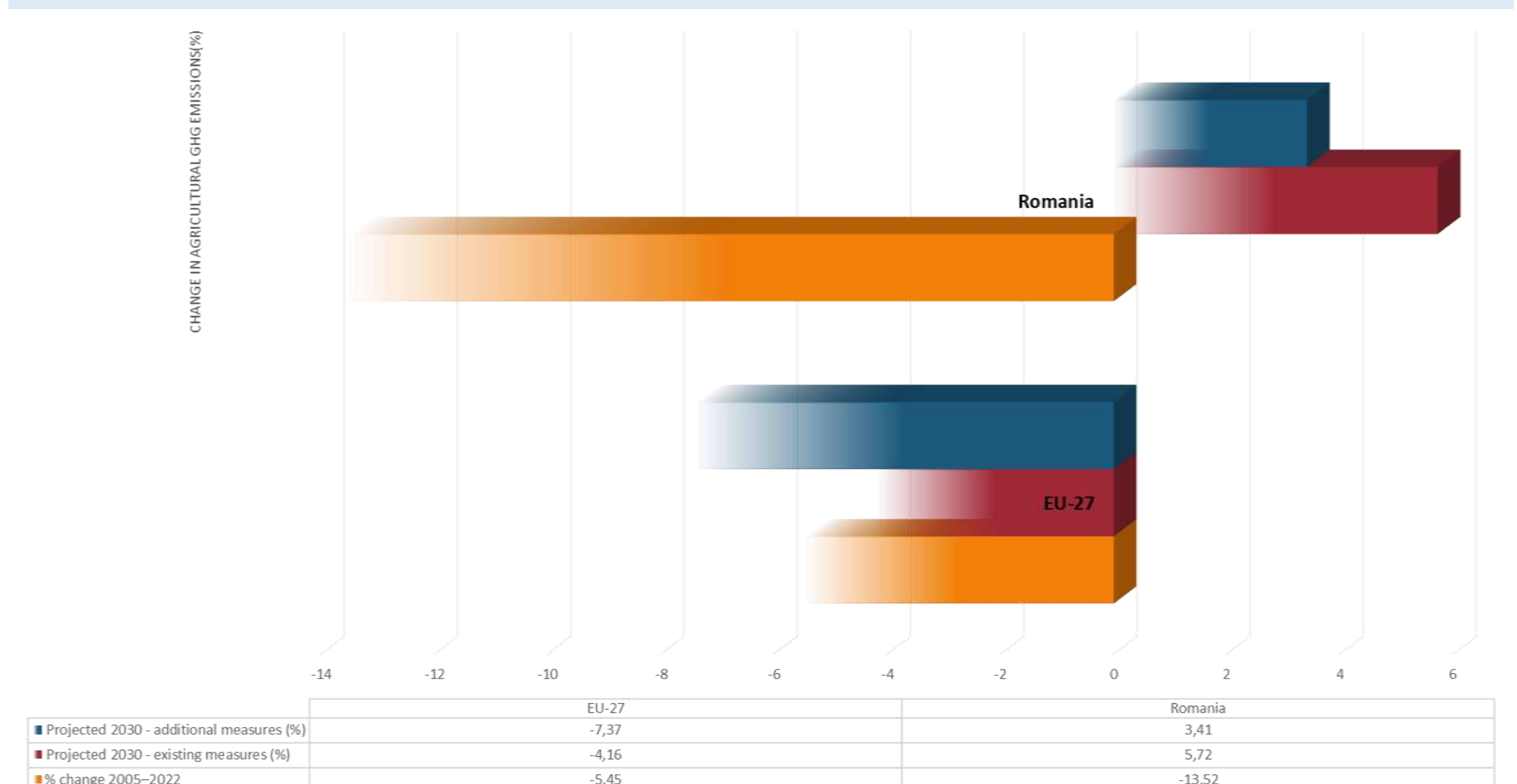


Figure 3. Agricultural GHG Emissions and Projections, Romania vs EU-27 (2005–2030)

• Conclusions

Romania's transition toward a circular agricultural model remains uneven. Despite progress in waste reduction, recycling and organic farming, the sector continues to face major structural and technological gaps compared with the EU average. The analysis confirms high resource intensity and limited material reuse, with low integration of circular practices across production chains. Strengthened investment in recycling infrastructure, renewable energy and organic production, together with supportive policies and stakeholder cooperation is essential to achieving a sustainable, climate-resilient agricultural system aligned with the European Green Deal.