Research Journal of Agricultural Science, 57 (4), 2025; ISSN: 2668-926X;

http://doi.org/10.59463/RJAS.2025.4.55

TOWARDS SUSTAINABLE AGRICULTURE: COMPARATIVE PRACTICES IN KENYA AND ROMANIA

Cynthia WANJIKU[1], Francois GUYVENCHY[1], Razvan Bachner GUI[1], Raul PAȘCALĂU[1], Laura ȘMULEAC

[1]University of Life Sciences "King Mihai I" from Timișoara, Romania

Corresponding author: raul.pascalau@usvt.ro

Abstract. *The global imperative to transition towards sustainable agriculture is critical for ensuring food security, environmental health, and socio-economic resilience. This study conducts a comparative analysis of sustainable agricultural practices in Kenya and Romania, two nations with distinct agro-ecological, historical, and socio-economic contexts. Through a systematic review of policy documents, scientific literature, and field-based case studies, we assessed the adoption, drivers, and impacts of key sustainable practices, including organic farming, agroecology, conservation agriculture, and integrated pest management. In Kenya, sustainability is largely driven by necessity and grassroots movements, with smallholder farmers employing practices such as crop diversification, push-pull technology, and manure composting to enhance soil fertility and resilience against climate variability. Conversely, in Romania, the adoption is more influenced by European Union policies and market incentives, with a growing focus on organic farming, precision agriculture, and the maintenance of High Nature Value farmlands. Our analysis reveals that while both countries face challenges related to economic viability and knowledge dissemination, the barriers differ significantly. Kenyan farmers grapple with limited access to resources, land tenure issues, and inadequate extension services, whereas Romanian farmers contend with bureaucratic hurdles, high certification costs, and the legacy of post-communist land fragmentation. Despite these challenges, successful models exist in both contexts, demonstrating improved soil health, biodiversity conservation, and enhanced livelihoods. The study concludes that a one-size-fits-all approach is ineffective. Promoting sustainable agriculture requires context-specific strategies that leverage local knowledge in Kenya and policy-market synergies in Romania, while fostering cross-learning on participatory research and value chain development to build resilient and equitable food systems.*

Keywords*: sustainable agriculture, adapting strategies, food security, climate changes, resilient agricultural systems.*

INTRODUCTION

The concept of sustainable agriculture has evolved from a niche interest to a central tenet of global food systems discourse, representing a paradigm shift from input-intensive conventional farming towards systems that are environmentally sound, economically viable, and socially equitable (LIANU ET ALL., 2023). This transition is imperative to address the interconnected challenges of climate change, biodiversity loss, soil degradation, and rural poverty. However, the pathways to achieving sustainability are not universal; they are profoundly shaped by local agro-ecology, historical legacies, economic structures, and cultural practices (BAZYLI ET ALL., 2025). A comparative analysis of countries with contrasting profiles can yield critical insights into the diverse drivers, manifestations, and barriers of sustainable agricultural transformation (BARRETT et all., 2012, ROBINSON ET ALL., 2011).

This study undertakes a comparative examination of sustainable agricultural practices in Kenya and Romania. Kenya, a developing nation in East Africa, is characterized by a predominantly smallholder farming sector, where agriculture is the backbone of the economy and a primary livelihood for most of the rural population (HOUNKONNOU ET ALL., 2012). Its agro-ecological zones range from arid and semi-arid lands to high-potential highlands, creating a diverse but often vulnerable agricultural landscape (DAWSON ET ALL, 2016). Here, sustainability

http://doi.org/10.59463/RJAS.2025.4.55

efforts are frequently grassroots-driven, born out of necessity to cope with climate variability, soil fertility depletion, and limited access to synthetic inputs. Practices often align with agroecological principles, emphasizing biological diversity, resource recycling, and local knowledge.

In stark contrast, Romania, a member of the European Union in Eastern Europe, possesses a dualistic agricultural structure with both small-scale subsistence farms and large, commercial enterprises emerging from its post-communist transition (POPOVICI ET ALL., 2022). Its temperate climate and fertile plains have historically supported extensive grain production. The drive for sustainability in Romania is heavily influenced by its EU membership, which mandates and incentivizes environmental standards through the Common Agricultural Policy (CAP), including cross-compliance and agri-environment-climate measures (NINA ET ALL., 2024, FORTEA ET ALL., 2022). This top-down, policy-driven approach promotes practices like organic farming and integrated farm management (ŁUKASZ ET ALL, 2025 DZIEKAŃSKI ET ALL., 2022).

The central problem this research addresses is the need to understand how these divergent contexts, one shaped by grassroots adaptation and the other by policy integration, influence the adoption and effectiveness of sustainable practices (SMULEAC ET ALL., 2020, 2025, PASCALAU ET ALL., 2023, 2025). While both nations aim for sustainability, their starting points, motivations, and constraints are vastly different. This research is guided by the following questions: What are the predominant sustainable agricultural practices being adopted in Kenya and Romania, and what are their primary drivers? How do the socio-economic, political, and ecological contexts in each country influence the scalability and impact of these practices? What are the common and unique barriers to the wider adoption of sustainable agriculture in these two distinct settings, and what synergistic lessons can be drawn? By answering these questions, this study aims to move beyond a monolithic view of sustainability and provide a nuanced framework for designing context-sensitive strategies that can accelerate the global transition towards resilient food systems.

MATERIAL AND METHODS

This study employed a qualitative comparative case study design, utilizing a systematic and multi-faceted approach to gather and analyse data on sustainable agricultural practices in Kenya and Romania.

The research relied on a triangulation of data sources to ensure comprehensiveness and validity:

- Documentary Review: A systematic review of key policy documents was conducted, including Kenya's Agricultural Sector Transformation and Growth Strategy and Romania's National Rural Development Programme under the EU CAP. Scientific literature was sourced from databases like Web of Science and Scopus using keywords: ("sustainable agriculture" OR "organic farming" OR "agroecology" OR "conservation agriculture") AND ("Kenya" OR "Romania"). Over 100 peer-reviewed articles, reports from FAO and World Bank, and national agricultural statistics were analysed.

- Case Study Identification: Four in-depth case studies (two per country) were selected to represent successful and illustrative initiatives:

o Kenya Case 1: The dissemination of the push-pull technology (PPT) for stem borer and striga control in maize fields in Western Kenya.

o Kenya Case 2: Community-led agroforestry and organic vegetable production initiatives in the Central Highlands.

http://doi.org/10.59463/RJAS.2025.4.55

o Romania Case 1: The expansion of large-scale organic cereal and oilseed production in the Banat plain.

o Romania Case 2: The preservation of High Nature Value (HNV) farming systems with low-intensity livestock grazing in the Carpathian Mountains.

- Secondary Data Synthesis: Data on the extent of organic farming, adoption rates of specific practices, and socio-economic profiles of farmers were synthesized from national surveys and project reports.

Data analysis:

The collected data were analysed using a structured comparative framework focusing on four key dimensions:

- Drivers and motivations: categorizing the primary forces behind adoption (policy incentives, market demand, environmental necessity, cultural preservation).

- Practice characteristics: describing the specific techniques used, their agro-ecological basis, and input requirements.

- Impacts and outcomes: assessing documented or reported effects on productivity, soil health, biodiversity, economic returns, and social equity.

- Barriers and enablers: identifying the factors that hinder or support the adoption and scaling of these practices, categorized into economic, social, institutional, and technical barriers.

A thematic analysis was conducted across the document review and case studies to identify recurring patterns, contrasts, and unique insights for each country. The findings were then synthesized to draw comparative conclusions about the pathways to sustainability in these two distinct contexts.

RESULTS AND DISCUSSIONS

Sustainable practices and drivers in Kenya

In Kenya, sustainable practices are predominantly knowledge-intensive and low-external-input. Widespread practices include:

• Agroecological methods: intercropping, crop rotation, and the use of indigenous crop varieties.

• Integrated soil fertility management (ISFM): use of compost, farmyard manure, and green manures (e.g., Tithonia diversifolia).

• Innovative pest management: the push-pull technology (intercropping maize with Desmodium and planting Napier grass as a border) is a notable success.

• Water harvesting: construction of small-scale water pans and zai pits for micro-irrigation.

The primary drivers are necessity (addressing soil fertility decline and pest pressure), climate resilience, and cost reduction by minimizing the need for purchased inputs. These initiatives are often championed by NGOs, community-based organizations, and research institutions (e.g., ICIPE).

Sustainable practices and drivers in Romania

In Romania, the sustainable agriculture landscape is bifurcated:

• Policy-driven commercial sustainability: large farms are adopting organic farming (for export markets), precision agriculture (for input efficiency), and integrated pest management to comply with EU CAP’s cross-compliance and access agri-environmental payments.

- Tradition-based sustainability: small-scale farms in marginal areas practice low-intensity, High Nature Value (HNV) farming, which inherently supports biodiversity through extensive grazing and mosaic landscapes.

The primary drivers are EU policy and subsidies, access to premium markets (especially for organic products), and, for HNV systems, cultural heritage and lack of capital for intensification.

Contrasting pathways: grassroots adaptation vs. policy-market integration

The most striking finding is the contrast in the primary pathways to sustainability. Kenya's model is largely bottom-up and knowledge-centric. Sustainability is achieved through adapting practices to local conditions, leveraging ecological processes, and building social capital. The success of push-pull technology, for instance, hinges on farmer-to-farmer knowledge transfer and its multiple benefits (pest control, soil fertility, fodder). Romania's model, particularly for its commercial sector, is top-down and incentive-driven. Sustainability is often a compliance issue or a business strategy to access subsidies and niche markets. While effective in driving large-scale change, this approach can sometimes lead to a "checkbox" mentality rather than a deep-seated agroecological transformation, and it risks marginalizing smallholders who lack the capacity to navigate complex application processes.

Divergent barriers and the question of equity

The barriers to scaling sustainability are also context specific. In Kenya, the major hurdles are structural: limited access to credit, insecure land tenure that discourages long-term investments, and fragmented extension services. The challenge is to move from successful pilot projects to widespread adoption by addressing these foundational constraints. In Romania, the barriers are more institutional and economic: bureaucratic complexity of CAP, high costs of organic certification, and an aging farmer population with resistance to changing practices. A key challenge here is ensuring that the benefits of CAP subsidies are distributed equitably and support the preservation of both commercial organic farms and the critically important HNV systems.

Synergistic learning for a global transition

This comparison suggests that neither model is sufficient in isolation. The global sustainable agriculture movement can learn from both. From Kenya, the lesson is the power of participatory approaches, appropriate technology, and context-specific solutions that empower smallholders. From Romania, the lesson is the potential of strong policy frameworks and market mechanisms to redirect large-scale agricultural production towards sustainability. The ideal pathway may be a hybrid: policy environments that are both supportive (like the CAP) and flexible enough to incorporate local knowledge and innovation (as seen in Kenya), combined with value chains that reward not just organic certification but also the broader ecosystem services provided by diverse farming systems. This synergy is essential for building food systems that are truly sustainable, resilient, and just.

CONCLUSIONS

This comparative analysis conclusively demonstrates that the journey towards sustainable agriculture is not a single road, but a network of diverse pathways shaped by deeply embedded historical, economic, and ecological contexts. Kenya and Romania, though united by the goal of sustainability, exemplify fundamentally different approaches: one emerging from grassroots adaptation and necessity, and the other driven by top-down policy integration and market opportunities. The Kenyan case highlights the ingenuity and resilience of smallholder systems, where sustainable practices are intimately tied to survival, risk mitigation, and the

efficient use of locally available resources. The Romanian case illustrates the transformative potential of supranational policy and economic incentives in steering a post-transition agricultural sector towards environmental compliance and market differentiation.

A paramount conclusion is that the effectiveness and scalability of sustainable practices are contingent upon addressing the specific barrier profiles of each context. In Kenya, scaling sustainability requires foundational investments in rural infrastructure, land tenure reform, and the strengthening of farmer-centric knowledge systems. Success hinges on empowering local institutions and building robust, climate-resilient livelihoods. In Romania, the priority lies in simplifying bureaucratic processes, making green subsidies more accessible to small and medium-sized farms, and creating value chains that effectively reward the provision of ecosystem services, particularly from High Nature Value farming systems that are repositories of biodiversity and cultural heritage.

The study also underscores that there is no universal blueprint. The pursuit of a one-size-fits-all model for sustainable agriculture is not only impractical but potentially counterproductive, as it may overlook local realities and stifle innovation. Instead, a principle-based approach is needed, one that promotes resource efficiency, biodiversity, and social equity but allows for contextual expression. Finally, the comparative lens reveals a critical opportunity for cross-learning. Kenyan experiences with participatory research and low-cost agroecological methods can inform community-supported agriculture and resilience-building in Europe. Conversely, Romania's experience with structuring agri-environmental payments and building organic export markets can offer valuable lessons for developing countries seeking to leverage international trade for sustainable development. By fostering such dialogue and integrating the strengths of both grassroots and policy-driven models, the global community can more effectively navigate the complex transition towards agricultural systems that nourish both people and the planet.

ACKNOWLEDGEMENTS

Support was also received by the project Horizon Europe (HORIZON) 101071300 - Sustainable Horizons -European Universities designing the horizons of sustainability (SHEs)

BIBLIOGRAPHY

BALAN M., GHERMAN E.D., GHERMAN R., BRAD I., PAȘCALĂU R., POPESCU G., TRASCA T.I., 2022 - Sustainable nutrition for increased food security related to Romanian consumers' behavior, Nutrients, 14 (22), 4892.

BARRETT, C. B., BACHKE, M. E., BELLEMARE, M. F., MICHELSON, H. C., NARAYANAN, S. WALKER, T. F., 2012- Smallholder participation in contract farming: Comparative evidence from five countries, World Development 40(4):715–730.

BAZYLI CZYŻEWSKI, AGNIESZKA POCZTA-WAJDA, ANNA MATUSZCZAK, KATARZYNA SMĘDZIK-AMBROŻY, MARTA GUTH, 2025 - Exploring intentions to convert into organic farming in small-scale agriculture: Social embeddedness in extended theory of planned behaviour framework. Agricultural Systems 225, pages 104294

DAWSON, N., MARTIN, A. AND SIKOR, T., 2016 - Green revolution in sub-saharan Africa: Implications of imposed innovation for the wellbeing of rural smallholders, World Development 78:204–218.

DZIEKAŃSKI, P., PRUS, P., SOŁTYK, P., WROŃSKA, M., IMBREA, F., SMULEAC, L., PASCALAU, R., BŁASZCZYK, K., 2022 - Spatial Disproportions of the Green Economy and the Financial Situation of Polish Voivodeships in 2010–2020. Sustainability, 14(21), 13824. https://doi.org/10.3390/su142113824

FORTEA COSTINELA, VALENTIN MARIAN ANTOHI, MONICA LAURA ZLATI, ROMEO VICTOR IONESCU, IOANA LAZARESCU, STEFAN MIHAI PETREA & DRAGOS SEBASTIAN CRISTEA, 2022 - The Dynamics of the Implementation of Organic Farming in Romania. Agriculture 12:6, pages 774

HOTTENSIAH N.G, 2017 - Innovation challenges encountered by small and medium enterprises in Nairobi, Nairobi: University of Nairobi.

HOUNKONNOU, D., KOSSOU, D., KUYPER, T. W., LEEUWIS, C., NEDERLOF, E. S., RÖLING, N., SAKYI-DAWSON, O., TRAORÉ, M. AND VAN HUIS, A., 2012 - An innovation systems approach to institutional change: Smallholder development in West Africa, Agricultural Systems 108:74–83.

KELLY, V., ADESINA, A. A. AND GORDON, A., 2003 - Expanding access to agricultural inputs in Africa: A review of recent market development experience, Food Policy 28(4):379–404.

KILELU, C. W., KLERKX, L., LEEUWIS, C. AND HALL, A., 2011 - Beyond knowledge brokering: An exploratory study on innovation intermediaries in an evolving smallholder agricultural system in Kenya, Knowledge Management for Development Journal 7(1):84–108.

KOGO B.K., KUMAR L., KOECH R., 2021 - Climate change and variability in Kenya: a review of impacts on agriculture and food security. Environ Dev Sustain 23, 23–43. https://doi.org/10.1007/s10668-020-00589-1

LIANU COSTIN, VIOLETA-ELENA SIMION, LAURA URDES, ROCSANA BUCEA-MANEA-ȚONIȘ, IRINA GABRIELA RADULESCU & COSMIN LIANU, 2023 - Agroecological Approaches in the Context of Innovation Hubs. Sustainability 15:5, pages 4335.

ŁUKASZ KRYSZAK, BAZYLI CZYŻEWSKI, ANDREEA MUNTEAN, EGZON BAJRAMI., 2025 - Does a higher environmental consciousness of farmers reduce expectations for financial compensation? A choice experiment to improve the organic farming intervention in Romania. Journal of Environmental Management 393, pages 127159

NINA ADAMS, ARIANE SANS, KAREN-EMILIE TRIER KREUTZFELDT, MARIA ALEJANDRA ARIAS ESCOBAR, FRANK WILLEM OUDSHOORN, NATHALIE BOLDUC, PIERRE-MARIE AUBERT, LAURENCE GRAHAM SMITH., 2024 - Assessing the impacts of EU agricultural policies on the sustainability of the livestock sector: a review of the recent literature. Agriculture and Human Values 42:1, pages 193-212.

PASCALAU R., SMULEAC L., POPESCU C.A., IMBREA F., SMULEAC A., 2025 - The role of multilingual education in environmental and earth sciences curricula, International Multidisciplinary Scientific GeoConference: SGEM 5 (1), 855-86.

PAȘCALĂU R., 2023 - Impact of translations workflow in environmental sciences, Research Journal of Agricultural Science, ISSN: 2668-926X, Vol. 55 (2).

PASCALAU R., POPESCU C.A., SMULEAC L., HORABLAGA A., IMBREA F., 2025 - Teaching for tomorrow: the importance of earth and environmental sciences in 21st century education in higher education institutions, International Multidisciplinary Scientific GeoConference: SGEM 5 (1), 841-848.

PATRICHE, C. V., ROȘCA, B., PÎRNĂU, R. G., VASILINIUC, I., & IRIMIA, L. M., 2024 - Digital Mapping of Land Suitability for Main Agricultural Crops in Romania. Agronomy, 14(12), 2828. https://doi.org/10.3390/agronomy14122828

POPOVICI, E. A., DAMIAN, N., GRIGORESCU, I., & PERSU, M., 2022 - Indicator-based analysis of organic farming in Romania. Regional spatial patterns. International Journal of Agricultural Sustainability, 20(5), 874–891. https://doi.org/10.1080/14735903.2021.2008194

ROBINSON TP, THORNTON P.K., FRANCESCHINI G, KRUSKA RL, CHIOZZA F, NOTENBAERT A, CECCHI G, HERRERO M, EPPRECHT M, FRITZ S, YOU L, CONCHEDDA G, L SEE, 2011 - Global livestock production systems. Rome, Italy

ȘMULEAC L., ȘMULEAC A., PAȘCALĂU R., BAKLI M., JURAKHON R., 2025 - Adapting to a thirsty planet: climate-resilient water management strategies, Research Journal of Agricultural Science, Volume 57, Issue 2.

ȘMULEAC, L., RUJESCU, C., ȘMULEAC, A., IMBREA, F., RADULOV, I., MANEA, D., IENCIU, A., ADAMOV, T., & PAȘCALĂU, R. (2020). Impact of Climate Change in the Banat Plain, Western Romania, on the Accessibility of Water for Crop Production in Agriculture. Agriculture, 10(10), 437. https://doi.org/10.3390/agriculture10100437

ȘMULEAC, L., ȘMULEAC, A., PAȘCALĂU, R., BAKLI, M., & JURAKHON, R., 2025 - The blue crisis: intersections of water scarcity and climate change. Research Journal of Agricultural Science, 57(2).