BIBLIOMETRIC ANALYSIS OF REGENERATIVE, ORGANIC, AND ECOLOGICAL FARMING PRACTICES: IMPLICATIONS FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT IN MOLDOVA

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Abstract: *The study explores the regenerative agriculture paradigms based on a literature re-view sourced from the Web of Science database. Moldova's climate change and soil erosion underline the need for a sustainable agriculture and new farming solutions. These solutions include a paradigm shift towards circularity in agricultural practices. The purpose of this study is to explore publication trends in Moldova and interconnections within the global academic discourse on regenerative agriculture. A total of 138 articles published were analysed using bibliometric tools. The findings reveal an in-crease in scholarity interest over past years, particularly ecological agriculture that remains most extensively researched theme in Moldova. Keywords analysis and co-occurrence analysis highlights emerging themes such as biodiversity, sustainable food systems or sustainable farming. The bibliometric mapping clarifies landscape and evolution of regenerative agriculture and future directions for interdisciplinary re-search, while bibliometric co-occurrence of 3 notions is applied and further will serve for policy decisions within the country and evidence-based research planning. Through this research it is underscored the importance to embrace regenerative agriculture practices to address environmental challenges and promote sustainable development in Moldova. The article was developed within the framework of Subprogram 030101 „Strengthening the resilience, competitiveness, and sustainability of the economy of the Republic of Moldova in the context of the accession process to the European Union", institutional funding.*

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JEL Classification*: Q01, Q10, Q56, O13.*

1. Introduction

It is well-known that farming method of regenerative agriculture works to establish sustainable agricultural ecosystems through its innovative practices. The approach of regenerative agriculture (RA) exceeds traditional sustainable practices due to soil health increase involvement along with biodiversity and ecosystem services promotion. The RA principles are based on reducing soil disturbance and keeping soil coverage intact while farming systems are integrated into livestock operations. These agricultural practices show promises to resolve environmental issues affecting soil health and water availability and climate change effects. The definition of regenerative agriculture remains undefined today while its long-term effects on agricultural practices remain unclear despite increasing interest in the subject reflected in WoS literature. The world is increasingly adopting this practice because sustainable food systems and climate change mitigation need it. To succeed with the implementation of regenerative agriculture it needs to run ongoing research together with policy support and stakeholder collaboration. This will ensure the achievement of all advantages that it can bring.

The aim of this research was to explore publication trends in Moldova and interconnections within the global academic discourse on regenerative agriculture. Additionally, the research aims to provide a bridge for further interdisciplinary research. The significance of this research lies into mapping the intellectual landscape, support evidence-based decision making in sustainable agriculture in Moldova.

2. Literature review

The purpose of regenerative agriculture is to protect and restore agricultural systems. This approach aims to boost soil health, biodiversity, water cycles, and ecosystem services in agriculture.

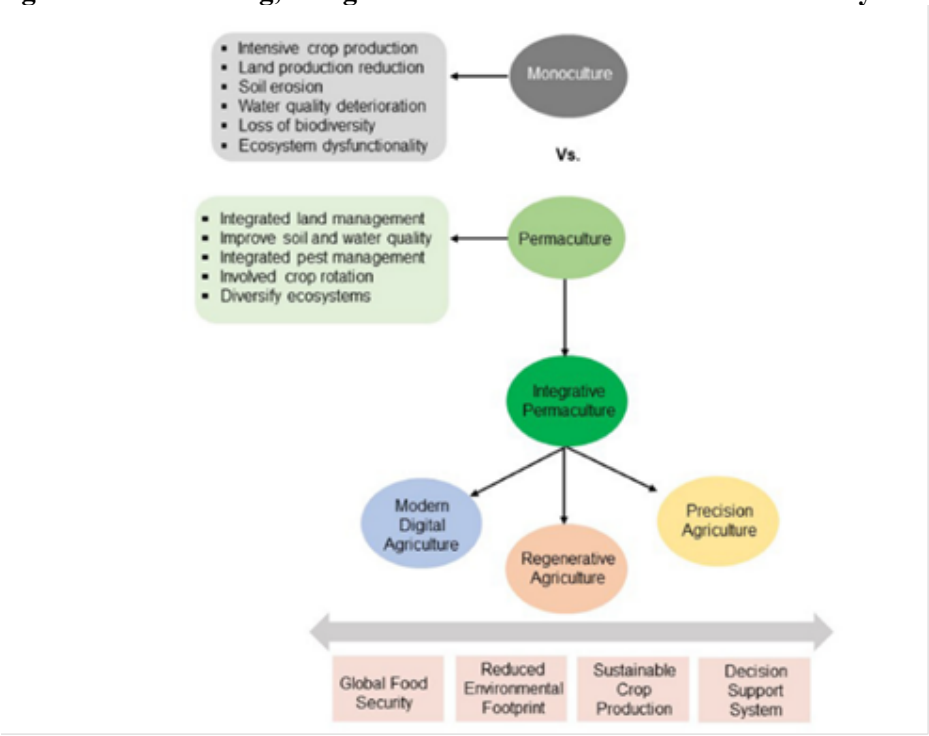
The global food system emits roughly 25% of annual anthropogenic greenhouse gases, causes a third of terrestrial acidification, and is responsible for most eutrophication of surface waters (Poore, J.; Nemecek, T., 2018). Continuing current practices such as using synthetic pesticides, artificial fertilizers, fossil fuels, and producing food waste may exceed the planet's carrying capacity (Campbell, B.M.; Beare, D.J.et al., 2017). The main challenge is to produce safe and nutritious food within this limit for a growing population. The main challenge is to produce safe and nutritious food within this limit for a growing population (Willett, W.; Rockström, J.; et. Al., 2019). Recent studies have shown that these environmental impacts persist, and as the global population continues to grow, the sustainability of conventional agricultural practices remains a major concern (Sher, A.; Li, H.; Ullah A., 2024; Wiltshire, S.; Beckage, B., 2023). According to Bradford, R., Smith, J. Lee, K. (2023), reducing environmental footprints through regenerative practices is critical for ensuring long-term food security. Referring to an analysis of 2024 it is mentioned that transitioning to sustainable farming practices is essential to mitigate climate change and maintain biodiversity (Sher, A.; Li, H.; Ullah, A. et.al., 2024).

The 4 most important policies in circular economy such as the EU Circular Economy Action Plan (EC, 2015), the Paris Climate Agreement (UN, 2015), and the Common Agricultural Policy (EC, 2019) and the European Green Deal (EC, 2025) recognize this importance. The notion of "regenerative agriculture" has gained popularity since 2010 and has surpassed other approaches such as organic farming, agroecology or conservation agriculture, but still there is a significant lack of consensus on its definition. Rodale's attempts to define it have been met with extensive disagreements among various practitioners. This challenge is not unique; similar definitional fragmentation was observed in conservation agriculture, particularly in Sub-Saharan Africa, where conflicting objectives among researchers, NGOs, and smallholder farmers limited their coherence and scalability (Giller, K.E. Witter, E., 2009). Schreefel et al. (2020) state that regenerative agriculture lacks a specific definition of soil health and biodiversity while different actors in the food system understand it differently. Soil conservation stands as the starting point for regenerative agriculture according to their proposed definition which aims to regenerate ecosystem services. According to Newton et al. (2020) the concept of regenerative agriculture remains undefined in legal and regulatory frameworks as well as common language usage. According to their suggestion, regenerative agriculture could take the form of production practices such as using cover crops integrating livestock and reducing or eliminating tillage and desired outcomes that include improving soil health and sequestering carbon and increasing biodiversity or both aspects.

The farmer-led organization Groundswell defines five fundamental principles for sustainable agriculture which include minimizing soil disturbance and maintaining constant soil cover and ensuring continuous presence of living roots and promoting diverse crop species and reintegrating grazing animals into crop systems. The five core principles of

regenerative agriculture include minimizing soil disturbance to protect soil structure and microbial ecosystems and maintaining soil coverage to prevent erosion and conserve moisture and increase organic matter (The Groundswell, 2025). The three principles of crop rotation include diversification to enhance plant biodiversity and soil health (McLennon, E.; Dari, B., 2021). The advantages of regenerative agriculture are major, encompassing improved soil fertility, increased biodiversity, reduced soil erosion, and enhanced carbon sequestration. Long-term benefits include greater resilience to drought and extreme weather, leading to stable crop yields and aiding in climate change mitigation. Studies (McLennon, E.; Dari, B., 2021) indicate that permaculture supports resilient and productive ecosystems and has evolved gradually instead of being introduced as a new concept (Figure 1).

Figure 1. Objectives for Sustainable Agriculture through Permaculture and Regenerative Farming, using Modern Tools for Global Food Security



Source: [21]

Figure 1 shows how diverse agronomic practices work together to improve soil health alongside biodiversity and ecosystem services. The set of practices includes minimizing soil disturbance and maintaining soil. The diagram shows how these practices have the potential to deliver better soil fertility and reduce erosion and increase carbon sequestration. Studies show that using no-till with cover crops boosts soil carbon storage more than either practice alone (Wiltshire, S.; Beckage, B., 2023). The agricultural approach that includes all these elements works to solve environmental problems while strengthening both productivity and resilience of agroecosystems. The practice of regenerative agriculture presents solutions which address environmental concerns and economic problems in farming. Soil health together with biodiversity and carbon sequestration improves when farmers use practices that

include maintaining soil cover and minimizing soil disturbance and integrating livestock into their operations. However, the widespread adoption of these practices faces economic and policy barriers.

It is to be mentioned that recent research indicates that the initial expenses involved in transitioning to regenerative agriculture may be challenging for many farmers, even though there are potential long-term environmental advantages (Sher, A., Li, H., 2024). There is also limited empirical data regarding the profitability of regenerative agriculture, which affects its uptake in both developed and developing areas. The definition varies, and further studies are required to assess its effect on soil organic carbon and sustainability. Ongoing discussions highlight the need for policy frameworks that facilitate regenerative practices and address the economic obstacles encountered by farmers during adoption (Wiltshire, S.; Beckage, B., 2023).

3. Materials and Methods

The topic of regenerative agriculture has attracted increased scholarly attention in recent years, and a comprehensive bibliometric analysis is required to map the intellectual landscape and support evidence-based decision-making. Bibliometric analysis was chosen as it can provide a wide range of data and overview of main key topics related to regenerative agriculture. Additionally, to maximize access to relevant literature the Web of Science database has been explored for a more selective approach and analysis of literature focused on high-impact publications. Namely, a total number of 138 papers were found for the period 1990-2025 and they were processed using bibliometrix. Using several exclusion criteria such as non-peer reviewed documents, language, irrelevant topics, duplicates, non-article types, etc. papers were selected for a systemic review.

Following a systematic literature review, the collected information was organized according to relevant parameters to facilitate thorough analysis of the regenerative agriculture paradigm. The data collection covered research problems, research gaps and research methods, keywords, research samples, platform and samples, including filters. For data analysis have been collected and analysed research topics trends, descriptive analysis and thematic evolution, keywords and co-occurrence analysis for evidence-based research planning (see Table 1).

Table 1. Methodology

Data collection	
Research problem	Limited comparative understanding of how academic research has evolved across the paradigms of regenerative agriculture; the national research dynamics among these approaches remain underexplored in scientific litterature.
Research gap	Absence of systemic bibliometric comparision using a unified analytical framework
Research method	Integrative literature review
Key word	Regenerative agriculture, organic farming, ecological agriculture
Research sample	147 article
Research platform	Web of Science

Filters	Language, years, research area, SDG, type of document
Data analysis	
Research topics trends	Recent keywords and topics gaining attention
Descriptive analysis	Document types, language distribution, scientific production
Thematic evolution	Traked emergence and development of themes over times
Keywords and co-occurrence analysis	Identified major research themes, term evolution trends

By combining these methods, the study aims to offer a comprehensive understanding of research dynamics and thematic evolution within the regenerative agriculture field in Moldova, with a focus on multi-layered bibliometric approach, thereby supporting evidence-based decisions for future research.

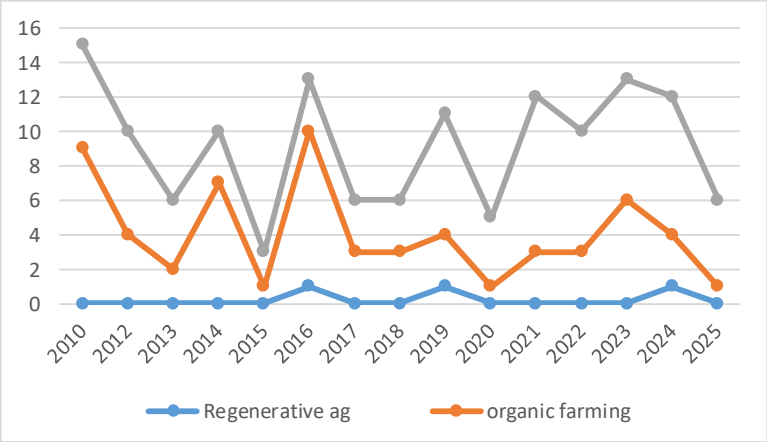
4. Results

This section outlines the evolution of variation coefficients using the previously described methodology. Quantitative analysis was conducted through bibliometric methods, which relate to info-metrics, scientometrics, and webometrics. The analysis involved identifying relevant literature in the field, using the Bibliometrix tool.

The search was conducted in the title, abstract, and keywords fields using "regenerative agriculture," "organic farming," "ecological agriculture," and "Republic of Moldova." No exclusion criteria were used at this stage. Although the period considered was 1990–2025, only the last 15 years were analysed, yielding 138 papers.

The articles offer a nuanced perspective on how Moldova's scientific community studies and discusses the shift toward a circular economy, sharing insights and proposing future research directions. Based on annual appearances of articles, it can be stated that ecological agriculture has gained rising interest in recent years based on increasing number of published articles in this field; at the same time analysing linear trend, no significant increase over time has been registered, suggesting a large and irregular trend (Figure 2). This is explained by the fact that number of articles per year doesn’t follow a strong linear pattern; additionally, Moldova moves closer to EU integration and there is an increasing alignment with EU standards. Additionally, Moldova faces soil degradation and water pollution due to conventional farming and pesticide intensive use in rural areas. Ecological agricultures bring a sustainable alternative to farmers.

Figure 2. Annual appearances of articles, 2010-2025



Source: author's contribution

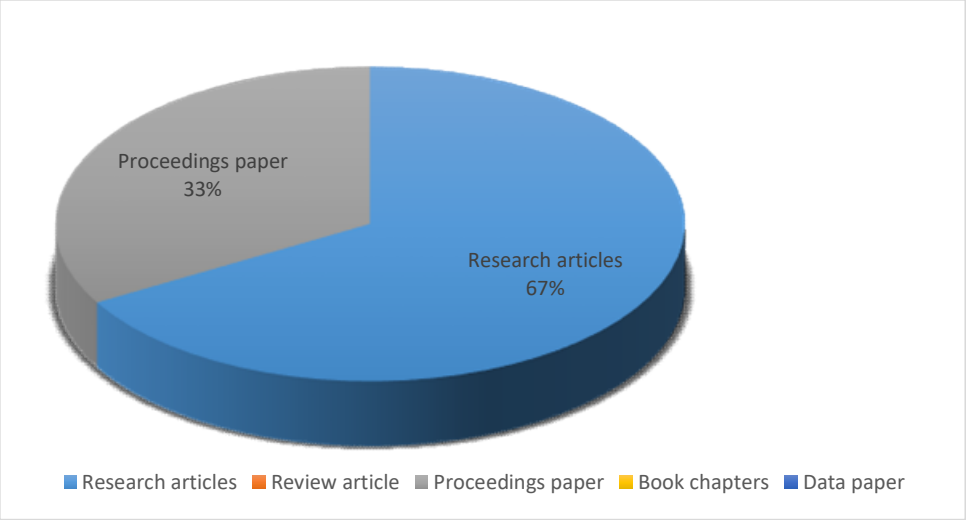
Based on the R^2 calculation for linear trend, to assess long-term changes, the following was determined:

Slope - 0,13 articles/ per year;
Intercept - -246, 2 theoretical starting value in the model;
R^2 – 0,02 or about 2% variation in the data.

The analysis shows no significant linear trend in the number of articles that were published over time (2010-2025). Low R^2 value indicates a small fraction of the variation, suggesting that other factors influence the publication rates over the time.

This analysis mainly relied on primary data from research articles from WoS database, while materials such as corrections, early access versions, and editorials were excluded at this stage based on the criteria. The findings indicate that this multidimensional and interdisciplinary field of research requires practical solutions adapted to Moldovan reality. Enhancing resource efficiency in regenerative agriculture requires combining multiple principles with technologies and sustainable practices.

Figure 3. Reviewed articles by type number of the document



Source: author's contribution

Applying exclusion criteria (corrections, early access versions, and editorials), a total number of 129 paper have been analysed further. The data suggest that the research environment focuses heavily on producing original articles and the low number of review articles indicate a gap in synthesizing existing literature, which could be a potential area of development. Book chapters, data paper, although low in number contribute to diversity in publication types across the time. Additionally, the primary language used was English.

A summary was prepared highlighting the countries most actively engaged in research on these three concepts. Four countries—Moldova, Romania, Latvia, and Bulgaria—demonstrate significant interest in regenerative agriculture. In contrast, more than eight countries, including Moldova, Romania, Germany, Poland, Bulgaria, Greece, Norway, and Slovakia, are notably involved in organic farming initiatives. Highest indicators present for ecological agriculture with more than 10 countries, in the top is Moldova, Romania, Poland, England and France. Researchers worldwide show strong interest in these areas, especially in ecological agriculture.

Focusing on research topics, we have selected further 8 main relevant papers (mostly post-2015). By applying bibliometric co-word analysis will identify which topics dominate the field of regenerative agriculture, relationships between current concepts and topic evolution. This type of analysis further will serve for evidence-based research planning and policy decisions within the country.

The first relevant studies emerged in 2016 and increased after 2020. These publications cover several journals, with multiple contributions in regional journals and a few in international ones providing a mix of local and broader international engagement in this thematic area. Table 1 shows the most common WoS keywords related to agricultural research in Moldova. The notions as "organic practices" and "subsidies" appear very frequently revealing key policy and research interests; while notions "ecological agriculture," "crop rotation," and "sustainable agriculture" focus on land management and sustainability. Last notion "regenerative agriculture" is mainly referenced through related concepts in Moldovan studies.

Table 2. Top Occurring Keywords during 2010–2025 WOS dataset reflecting regenerative, organic and ecological agriculture

Keyword	Frequency in WoS
Organic farming	3
Subsidies	3
Ecological agriculture	2
Crop rotation	2
Sustainable agriculture	2
Total (WoS dataset)	22

Source: author's contribution

According to the WoS dataset, 22 keywords were identified and are presented in Table 2, listing those that were found in at least two journals. "Organic farming" and "ecological agriculture" represent very similar concepts used in the context to describe organic farming. Additional keywords such as "no-till," "climate change," and "quality of life" appeared in individual papers, indicating a range of topics examined in separate studies. Primary themes for ecological agriculture identified from the reviewed articles cover soil health and nutrient cycling, agroecology and biodiversity, crop management and weed control, climate change, fertilizers, resource efficiency, socioeconomic impact and innovation; while for regenerative agriculture, thematic clusters include soil regeneration, carbon sequestration, agroecological design, water management, socio-ecological resilience, and measurement and indicators; for the last notion organic farming, it covers soil fertility cluster, pest and disease control, yield, biodiversity, consumer behaviour, food quality and safety and environmental impact. So, the research tends to focus on soil health, ecosystem services in ecological agriculture, while input reduction and market dynamics refers to organic farming. Last, regenerative agriculture cover carbon sequestration and regenerative soil practices and climate resilience.

The time span of the analysed publications ranges from 2016 to 2024, with most papers published in the early 2020s. Research themes cover both practical agronomic techniques and broader socio-economic or policy issues. The journals comprised the following Moldovan publications:

- multiple Moldovan case studies on organic and/or ecological agriculture;
- study on adoption of sustainable practices in Moldova;
- article on transitioning to conservation agriculture systems;
- sustainable agriculture advancements to quality of life in Moldova.

The academic literature in this field in Moldova is limited. This is explained by the fact that Moldova's sustainable agriculture sector is still developing. The increased frequency of publications after 2018 suggests growing academic and practical interest, driven by policy shifts and global trends in sustainable farming. State support measures such as subsidies along with alignment with EU standards have been reflected in these publications.

Additionally, to understand the relationships among the prevalent concepts, we constructed a keyword co-occurrence network. At this stage, each node represents a keyword, and a link between two keywords indicates they co-occurred in the same publication. The thickness of edges corresponds to the number of co-occurrences and node size reflects the overall frequency of that keyword (Table 2). We applied a minimum frequency threshold to focus on meaningful connections – keywords appearing in at least 2 papers were emphasized

in the analysis, while less frequent terms are included as smaller nodes for context. Analysing such co-occurrence patterns we have identified research themes and presented the newly 5 formed clusters representing major topic areas (Table 3).

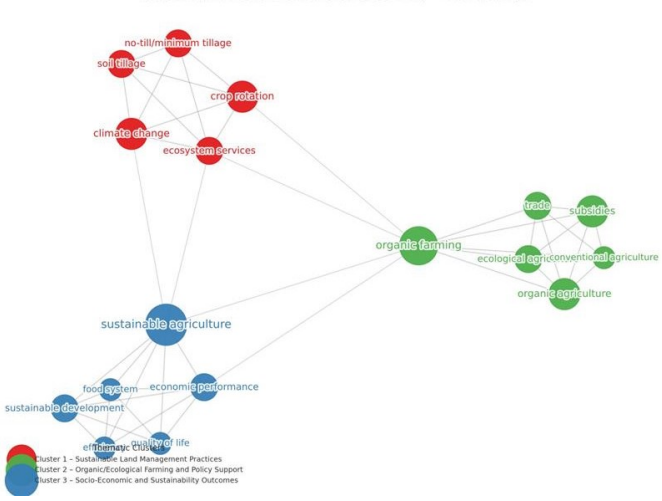
Table 3. Newly formed clusters representing major topic areas in the field of regenerative agriculture

Cluster's name	Description
Sustainable Land Management Practices	Identified keywords are related to conservation agriculture and agro-ecological practices: "crop rotation," "no-till," "soil tillage," "climate change," and "ecosystem services." This cluster highlights the agronomic and environmental aspects of regenerative agriculture. In the network, these keywords form a tightly knit group, reflecting that papers discussing tillage and rotations often also reference soil/ecosystem outcomes and climate resilience.
Organic/Ecological Farming and Policy Support	Keywords related to organic and ecological agriculture systems, along with the economic/policy factors influencing them. Key nodes here are "organic farming", "ecological agriculture," "subsidies," "trade," and "conventional agriculture." Many papers simultaneously address both the evolution of organic or ecological farming in Moldova and the related policy measures or market influences, as these topics often appear together. For instance, several studies evaluate the role of government subsidies in expanding organic agriculture and transitioning farmers away from conventional practices. The co-occurrence of "subsidies" with "organic/ecological agriculture" in multiple papers underscores that financial support is a critical theme for this community. Additionally, "trade" appears in this cluster, reflecting Moldova's interest in organic exports and market development. This thematic cluster spotlights how to promote sustainable farming systems through policy (subsidies, standards) and economic incentives, as well as challenges in competing with or converting from conventional agriculture.
Socio-Economic and Sustainability Outcomes	The terms such as "sustainable agriculture," "sustainable development," "quality of life," "economic performance," "efficiency," and "food system" present how sustainable/regenerative practices contribute to rural development goals or farmer livelihoods. This cluster suggests examination of economic viability and social impact of adopting regenerative or organic practices.

It's worth noting that these clusters are interconnected. There is considerable overlap between environmental, economic, and social facets of sustainable agriculture in Moldova's context. For example, "sustainable agriculture" as a term appears in multiple clusters, emphasizing integrated approaches. In same way, "organic farming" (Cluster 2) is

conceptually linked to soil health practices (Cluster 1) as part of regenerative approaches, something also seen in global analyses where organic and regenerative practices often converge around improving soil and ecosystem functions.

Figure 4. The keywords co-occurrence network based on occurrences of keywords within the analysed articles



Note: Edges link keywords that co-occurred in the same publications. Edge thickness reflects the number of co-occurrences (thicker = stronger association).

Figure 4 presents keyword co-occurrence network for analysed publications from WoS database by. listing every keyword and its total occurrence, including the number of co-occurrences between every pair of keywords. The map presents main thematic areas (clusters) interconnected by shared keywords. This structure presents how research in Moldova integrates agronomic innovations, policy measures, and socio-economic impacts into a broader vision of sustainable agriculture.

Analysing the development of themes over time it can be stated that indexed publications in WoS reveal that organic and ecological agriculture are well established themes in Moldova starting with 2000, while RA remains still scarcely addressed.

Table 4. Growth over time of WoS established themes in Moldova related to regenerative agriculture

Themes	Expansion	Decline
Organic agriculture	Expansion from 2003-2012 explained by state subsidies and supportive policies in the country Adoption of laws	Decline from 2009-2016 due to reduced subsidies Weak certification systems, limited technical capacity
Ecological agriculture	Dynamic development in the last couple of years due to market demand and adopted life style	-
Regenerative agriculture	Expansion from 2000-2025 but with modest levels of research	Less represented in publications

This pattern of growth observed in Republic of Moldova suggests that regenerative agriculture has potential for future growth. Organic and ecological agriculture are more frequently featured in WoS publications, which reflects a trend seen across the European continent specifically in Eastern Europe.

Additionally, Web of Science data shows that regenerative agriculture papers appear in 6 categories grouped, organic farming in 28, and ecological agriculture in 56. According to SDGs, related articles often address Zero Hunger, Good Health, Clean Water and Sanitation, Clean Energy, Responsible Consumption, Climate Action, Life Below Water, and Life on Land. For research areas, regenerative agriculture spans 4, organic farming 14, and ecological agriculture 40, including environmental sciences, ecology, agriculture, and geology.

5. Discussion

Results show that the research interest in Moldova is higher in ecological agriculture, based on annual appearances of articles published in this field in WoS. Looking at the yearly research trends since 2010, ecological agriculture has shown a consistent increase that continues in subsequent years. Relevant literature was reviewed and categorized by topic and perceptions of regenerative agriculture among researchers and practitioners to summarize scientific interest in the field. The authors found regenerative agriculture beneficial for addressing climate change alongside advanced technical knowledge. While there is no universally accepted definition, most researchers agree that its main objective is to improve soil condition [2,4,5]. In Republic of Moldova, traditional farming methods and high use of pesticide have led to severe soil degradation and water pollution, emphasizing the need for sustainable solutions. It worth mentions that ecological agriculture, can improve resource efficiency by using regenerative techniques and modern technologies. By adopting these practices, Moldova could not only protect its environment but also be closer to meeting EU integration goals.

Existing studies and research on RA in Moldova present that awareness and progress are increasing in this field and by advancing the sector it will relieve collaboration among various industries. To put these ideas into practice, it is still important to set firstly clear standards, secondly to engage with local participants, and third one is to tailor strategies to Moldova's unique context. It is to be mentioned that resource allocation is directly influenced by several variables that include geographical conditions, resource availability and environmental variables. To achieve desired outcomes, it is strongly needed the implementation of innovative management strategies, evidence-based policy frameworks and coordinated regional governance. Recent bibliometric analysis using the WoS database indicate that advances in regenerative agriculture in Moldova are primarily evaluated based on environmental metrics, particularly concerning soil health and biodiversity enhancement. Still exists a deficit in studies addressing long-term economic outcomes and social dimensions associated with regenerative practices. The prevailing agricultural paradigm in Republic of Moldova remains preponderant linear and oriented toward short term profitability that effects on long term development of regenerative practices. Achieving a circular and climate-resilient agricultural model requires the incorporation of ecological objectives into robust economic frameworks at both national and regional levels. Since economic structure of Moldovan agriculture is predominantly driven by growth and market profitability, we need to emphasize the critical need for the implementation of innovative practices to achieve ecological

sustainability and economic viability. By applying regenerative agriculture principles, it will rely on the establishment of new business models that support both environmental stewardship and financial returns.

Results from bibliometric analysis of 129 papers (using 4-word combinations) further reveal that highest concentrations of research on regenerative agriculture concentrates on environmental issues, with less studies addressing long-term economic gains or social well-being. Future research needs to focus and cover more comprehensive evaluations of profitability, productivity, resilience, and the broader socio and economic implications of regenerative practices in Moldova. Based on bibliometric assessment, analysis of the incorporation of recycled organic materials into regenerative agriculture in Moldova, reveals specific research priorities and at the same time outstanding gaps. Current publication data demonstrate a predominant focus on the environmental dimensions of regenerative practices, while the utilization and study of recycled organic remain relatively limited and unexplored in the Moldovan literature context. Bibliometric mapping suggests an emerging interest among Moldovan researchers in developing markets and regulatory frameworks for secondary organic resources. A strong interest at national level is paid for interdisciplinary collaboration and policies studies, as documented by co-authorship and citation network analyses. By advancing in deep research and fostering intersectoral cooperation, Moldova may enhance the integration of circularity principles and strengthen the adaptability of its agricultural systems, as evidenced by evolving trends in the scientific literature.

As result of the analysis of sustainable and regenerative agriculture in Moldova's has been identified following important themes: 1. conservation and regenerative practices, 2. organic and ecological farming, and 3. sustainability and socio-economic impacts. Referring to the first theme, conservation and regenerative practices, it involves methods meant to maintain soil health and biodiversity; namely has been identified studies focused on measurement of changes in organic soil and nutrient cycling. The second theme covers organic and ecological farming. Research in this area refers to comparative analysis examining challenges associated with organic farming methods. The third theme, sustainability and socio-economic impacts, examines case studies through the lens of farm profitability, food security, labor dynamics and rural development, contributing to a clear picture of an overall understanding of the potential environmental and sustainable agriculture in Republic of Moldova. Referring to the transition to regenerative agriculture in Moldova involves moving from traditional linear methods to circular systems that aim to restore ecological functions. Progress in this area relies on sharing empirical knowledge about environmental, economic, and social aspects associated with regenerative practices.

To develop practices based on regenerative agriculture in Moldova, a multidisciplinary strategy is recommended that could combine agricultural science with environmental studies, economics, and rural sociology. At the local level, it is mandatory involvement of local key stakeholders, farming communities, government agencies to help tailor viable solutions. Effective practices are shaped, and the adoption of circular economy principles is promoted through regional cooperatives and public-private partnerships.

Interconnected issues of environmental sustainability, economic feasibility and social equity are addressed by the efforts to advance regenerative agriculture in Moldova. This involves informed decision-making with comprehensive monitoring and evaluation systems and customizing interventions. The development of regenerative agriculture at the national level depends a lot on improving scientific understanding and enhancing institutional

capabilities and fostering collaboration across sectors to combine agricultural practices with current research-based methods.

6. Conclusions

This study explored the regenerative agriculture paradigms based on a literature review retrieved from the Web of Science database. The study started with data analysis to explore publication trends and interconnections within the global academic discourse on regenerative agriculture. It was determined that this subject is still underexplored and lacks understanding or knowledge about this new emerging thematic area. Based on annual appearances of articles, it can be stated that ecological agriculture has gained a gradual rising interest in recent years based on an increasing number of published articles in this field; at the same time, no significant increase over time has been registered, suggesting a large and irregular trend.

Bibliometric analysis finds that research on regenerative agriculture has increased recently, with strong connections to soil health and climate change mitigation. Systematic reviews highlight the need for a widely accepted definition of regenerative agriculture and stress the value of integrating traditional knowledge with new technology. These reviews also show that Moldovan farmers are informed and dedicated to practicing regenerative agriculture.

A structured overview of how regenerative, organic, and ecological agriculture-related research in Moldova is organized are analysed through the lens of bibliometric co-word analysis. Despite the relatively small number of publications, the co-occurrence network highlights a cohesive structure of three interlinked themes: practical regenerative farming techniques, the policy/economic mechanisms to support such farming, and the overarching sustainability outcomes expected. This suggests that Moldova's research community recognizes that achieving regenerative agriculture is a multi-faceted endeavour – requiring changes in the field, in institutions and markets, and in evaluation metrics. Such insights are valuable for guiding future research and policy. At the same time, the clusters pointed out the strong focus on subsidies and organic farming indicating that more research could be directed. Moreover, as the global literature on regenerative agriculture grows, we expect more Moldovan studies to explicitly use that framework – possibly leading to new keywords (like "soil health", "carbon sequestration", etc.) gaining prominence, much as international research has identified soil carbon and agricultural biodiversity as key regenerative agriculture themes.

Substantial research over past years in RA in Moldova have been conducted by such countries as Moldova, Romania, Latvia and Bulgaria; while for organic farming it includes more than 8 European counties and the highest indicators presents for ecological agriculture with more than 10 countries, confirming that this topic is in trend and in the near future will obtain supplementary space for research purposes.

Next, the analysis focused on research topics, primary themes for ecological agriculture identified from the reviewed articles. The research tended to focus on soil health and ecosystem services in ecological agriculture, while input reduction and market dynamics referred to organic farming. Lastly, focusing on regenerative agriculture that covered carbon sequestration and regenerative soil practices and climate resilience. The analysed research papers fell into 6 to 56 different categories, showing significant links across various fields and

applications: by this supporting directly several SDGs linking farming with environmental restoration, climate resilience and well-being.

Lastly, following a comprehensive evaluation of existing literature on RA, several key findings were identified that revealed increasing scholarly attention indicating a growing interest with core themes cantered on soil health, biodiversity, water and carbon sequestration, by this offering a comprehensive understanding of research dynamics and thematic evolution within the regenerative agriculture field in Moldova, with a focus on multi-layered bibliometric approach, thereby supporting evidence-based decisions for future research.

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