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Review Article

Exploring the Potential of Regenerative Agriculture for Climate Mitigation, Resource Efficiency and Sustainability

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Abstract

Regenerative Agriculture (RA) represents a significant approach toward sustainable and eco-friendly practices, provides environmental, economic, and social benefits. The objective of the review is to evaluate research trends and gaps, conduct a SWOT analysis, and explore the potential of regenerative agriculture in areas like energy conservation, food security, ecosystem services, soil health, circular agriculture, and climate-smart, resilient farming practices. This review emphasizes the holistic approach of Regenerative Agriculture, SWOT analysis reveals that RA offers significant benefits of environmental sustainability and several opportunities like carbon market and food security. Despite multiple benefits, bibliometric analysis showed that research on RA is limited, with a notable increase in publications only emerging in recent years. RA contributes to better sustainable practices compared to other agricultural systems. RA efforts to mitigate climate change by reducing the carbon footprint, enhancing climate adaptability, improving soil health, and providing ecosystem services. It also addresses challenges such as biodiversity loss, food waste, and food security. Furthermore, integrating RA presents economic and ecological opportunities, such as carbon credits and a circular economy. This approach increases resource efficiency, minimizes agricultural waste, and promotes nature-based solutions with potential for energy conservation and healthier ecosystems. Based on our findings, we recommend that research should focus on developing carbon credit schemes from RA, enhancing farmer's awareness of RA's economic and environmental benefits, and modifying RA to improve on circular economy principles for sustainability.

Keywords

Climate Resilience Agriculture, Natural Based Solution, Circular Agriculture, Sustainable Agriculture

1. Introduction

Climate change and population growth are two major problems of particular interest for all countries [1]. Due to the severe impacts of climate change, and agriculture being one of the most vulnerable sectors, there are risks to agriculture from loss of biodiversity, which in turn affects ecosystems and productivity in agriculture. Agriculture, in compliance with ever-increasing population and climate constraints, exerts enhanced pressure on biodiversity and ecosystems, thereby making the degradation of ecosystems profound [2]. As the global human population expands, agriculture is vital for food

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security worldwide. However, conventional agricultural techniques have already harmed soils and nutrients due to their use in farming, leading to increased susceptibility to diseases, droughts, and climate change [3]. In response, industrial agriculture has improved overall productivity; however, it carries a significant burden, such as high energy consumption, bulk resource depletion, and continentwide soil quality deterioration [4].

On the other hand, farmers widely use synthetic fertilizers and pesticides to enhance crop yields without considering environmental consequences [5]. This unsustainable approach has underlined the need for more sustainable agricultural practices promoting biodiversity, which will be critical for food production and quality in the future, especially in the climate change context [5, 6]. As one of the more promising farming models, the RA model practice has been introduced alongside other sustainable initiatives [7].

Conventional farming practices generate several resource and environmental problems, which have recently been addressed by regenerative farming. Regenerative farming works towards improving the native ecosystem and environment ~~better~~ so that the necessary inputs can be secured for crop production. In this way, more crops can be produced using less energy input [8]. Recycling agricultural processes such as composting, green manuring, Cover crops and mulching are used to restore degraded soils. It enhances ecosystem services such as water quality, vegetation, and land productivity through elevated biological processes [7-9]. Recently, the focus has been on RA being an appropriate response to climate change. It is an environmentally friendly agricultural practice that aims to improve soils, sequester carbon in soil, and enhance the soil carbon stock while reducing greenhouse gases emitted from agricultural soils [10, 11]. The principles governing pool RA fit well into the organic farming concept, which endeavors to sustain and enhance soil organic matter. More critically, RA does not have synthetic inputs, particularly pesticides, herbicides, and fertilizers, which are detrimental to the soil ecosystems [12]. Regenerative agriculture is very important for food production and managing ecosystem services and the environment more broadly [13, 14]. In addition, it helps raise the earnings of the people residing in rural areas and increases the productivity of pastures through controlled grazing [15]. Agricultural productivity, ecosystem services enhancement, and environmental benefits are among the numerous advantages of RA [13, 14]. Although it aims to reduce dependence on purchased inputs, rehabilitate natural resources, and enhance resilience in the farming systems, it also resonates with the United Nations Sustainable Development Goal 2, which aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. This target seeks to enable all individuals, especially the most disadvantaged, to have enough healthy food by 2030 [16].

However, RA is diverse in its definitions and needs more attention to practical management approaches to progress toward the Sustainable Development Goals [17]. There are considerable benefits of RA, but farmers face challenges in its application. It is essential to provide a better context and framework for the benefits associated with RA [19]. They are embracing contextual relations such as more than human ethically oriented care (MTH EoC), which can be the new and productive approach to engaging with RA [20]. In addition, [21, 22] suggests that innovative governance, landscape approaches, and new technologies are adequate in sustainably increasing agricultural production, carbon sequestration, and environmental preservation, therefore causing no further harm. For example, the need for an exhaustive scoping review becomes apparent when looking into RA, its long-term viable energy-saving mechanisms, and the various possibilities that can be harnessed for sustainable, climate-friendly agriculture systems.

This review also aims to evaluate the exploration prospects of the current research patterns, including their relevance for greenhouse gas mitigation and the impact of energy utilization and conservation on soils and food security. It will also assess the ability of RA to provide ecosystem restoration and lowered energy requirements while seeking potential integrations with circular economy (CE) areas. Furthermore, the assessment will establish differences between the regenerative approaches and the current methods of agriculture, by indicating existing knowledge gaps, and recommending future research avenues. Ultimately, however, the goal is to contribute to the global movement of enhancing sustainable farming practices in line with climate concerns.

2. Materials and Methods

2.1. Data Acquisition

Data was downloaded from the Scopus database, which was accessed on September 5, 2024; Scopus is one of the most reliable online databases, contains over 2.4 billion documents from more than 7,000 international publishers that are SCI-indexed and 99% of the journals listed on the Web of Science also being indexed in Scopus [23]. To filter the documents, a keyword search was conducted using the Boolean logic "A" using the word"regenerative AND agriculture." 929 documents were found in the first search, which looked for these strings in any part of peer-reviewed literature (titles, abstracts, keywords). The search results, which included abstracts, keywords, bibliographic information, citation details, and other pertinent data, were obtained as a CSV file. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method was then employed to assess these publications [24]. Based on the following criteria, we eliminated a total of 339 papers consisting of duplicate files (08), unreverent data in abstracts, titles, and keywords that did not contain information about regenerative agriculture (331), and documents that were not in English (28). As a result, 590 papers, in all, were eventually obtained for further examination.

2.2. Data Analysis

A macro research and development review of regenerative agriculture was conducted in this study, following the work of [25]. We utilized a bibliometric tool developed in R programming to analyze relevant affiliations and publication trends. The study examined countries and authors' keywords using VoS Viewer, a program that creates knowledge maps from network data and visualizes bibliometric networks. This tool helps to construct networks of authors, institutions, countries, and keywords and facilitates the analysis of co-authorship and co-occurrence [26].

3. Results and Discussion

3.1. Bibliometric Analysis of Regenerative Agriculture

The first recorded publication on RA was in 1986, with only a few publications noted until 2015. However, there has been a significant increase in publications since 2016, with a maximum publication of 139 in 2024. This trend highlights the growing interest in the field of regenerative agriculture (Figure 1). A total of 85 countries have contributed to RA research, with the United States leading with 175 publications, followed by the United Kingdom (69), Australia (61), India (45), Brazil (29), Netherlands (29), Spain (27), Canada (26), Germany (26), and China (20) and other represented in network visualization (Figure 2). Maximum studies were affiliated with Wageningen University and Research, which had 30 documents. This was followed by the University of California with 25 documents, the University of Oxford with 21, Colorado State University with 17, and the University of Sheffield with 16. Other notable affiliations included Nanjing Agricultural University and the University of Campinas, each with 15 documents; the Institute of Applied Ecology and the University of Chinese Academy of Sciences, both with 14; and Iowa State University with 13 documents (Figure 3). The analysis of the author's keywords are presented in an overlay visualization (Figure 4), which includes a total of 1,824 keywords. The size of the words in the author keyword co-occurrence network indicates their frequency of appearance; more prominent words are more commonly used and more accessible to identify. The most frequently used keywords are "regenerative agriculture" (196 occurrences), followed by "sustainability" (44), "climate change" (41), "agroecology" (34), "biodiversity" (34), "soil health" (33), "agriculture" (32), "sustainable agriculture" (32), "ecosystem services" (21), and "carbon sequestration" (20). The findings indicate that earlier regenerative agriculture studies primarily focused on land use, biochar, sustainable agriculture, permaculture, agroecology, land degradation, holistic management, carbon farming, food security, and agroforestry. Over time, research has shifted toward more specific areas, including soil microbes, soil carbon sequestration, climate change, machine learning, conservation agriculture, resilience, precision agriculture, sustainable farming, bioeconomy, circular economy, and nature-based solutions.

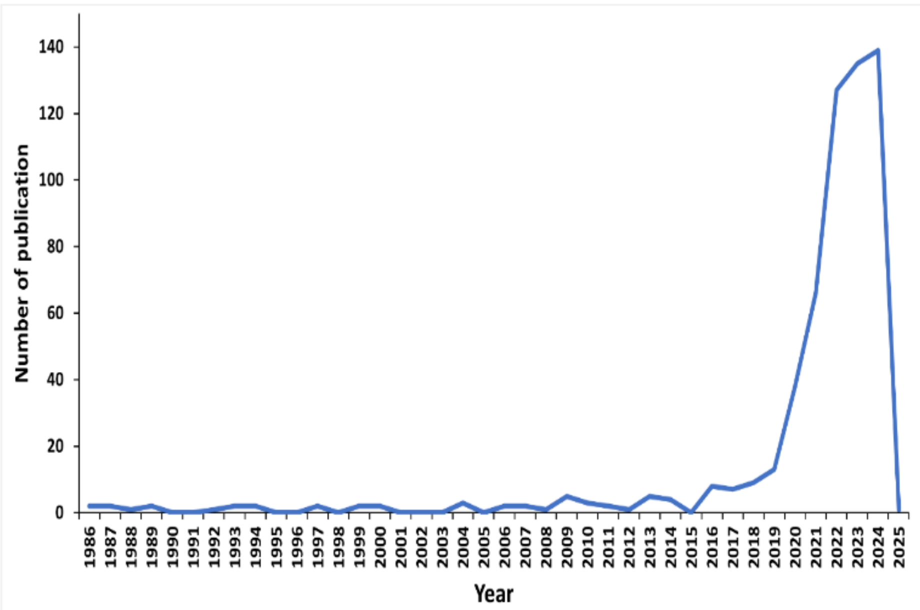

Figure 1. *Publication trends on regenerative agriculture.*

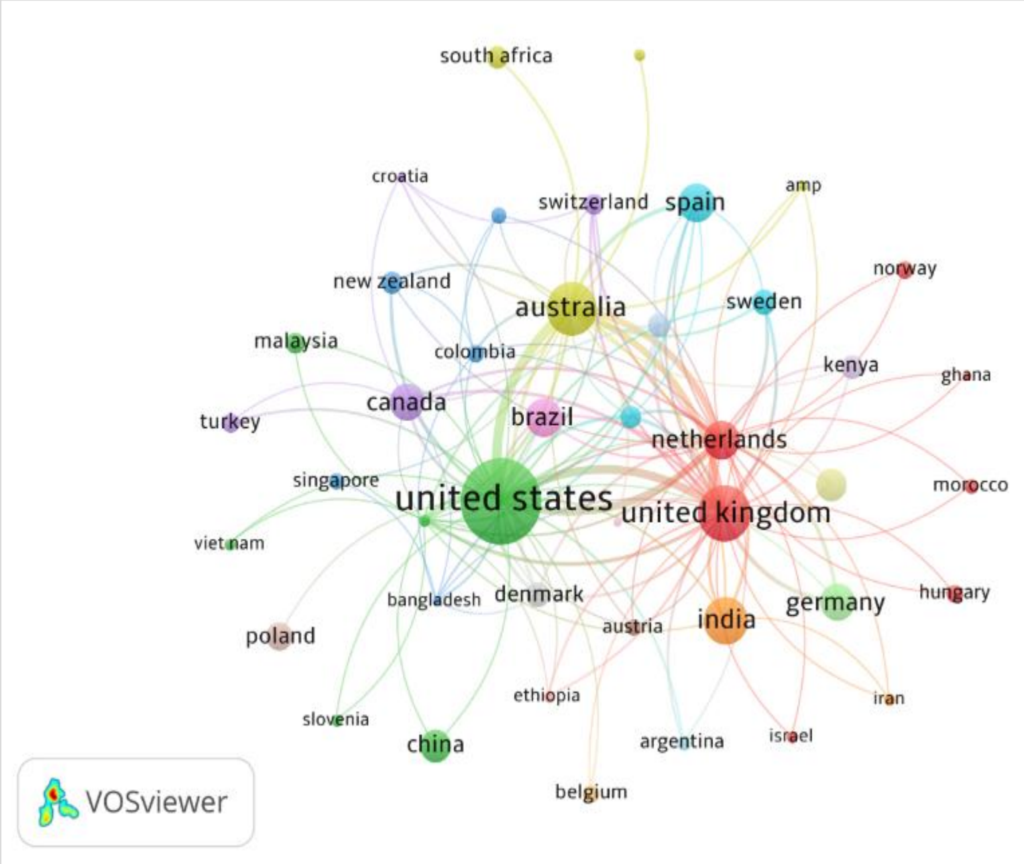

Figure 2. Countries based on the number of publications on regenerative agriculture.

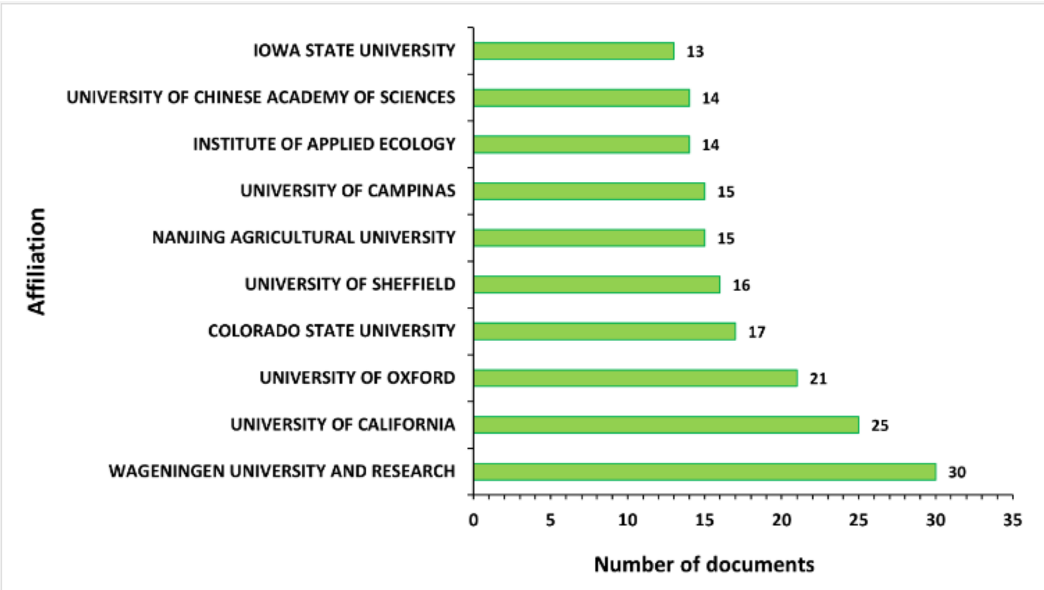

Figure 3. Top 10 Affiliations based on documents on regenerative agriculture.

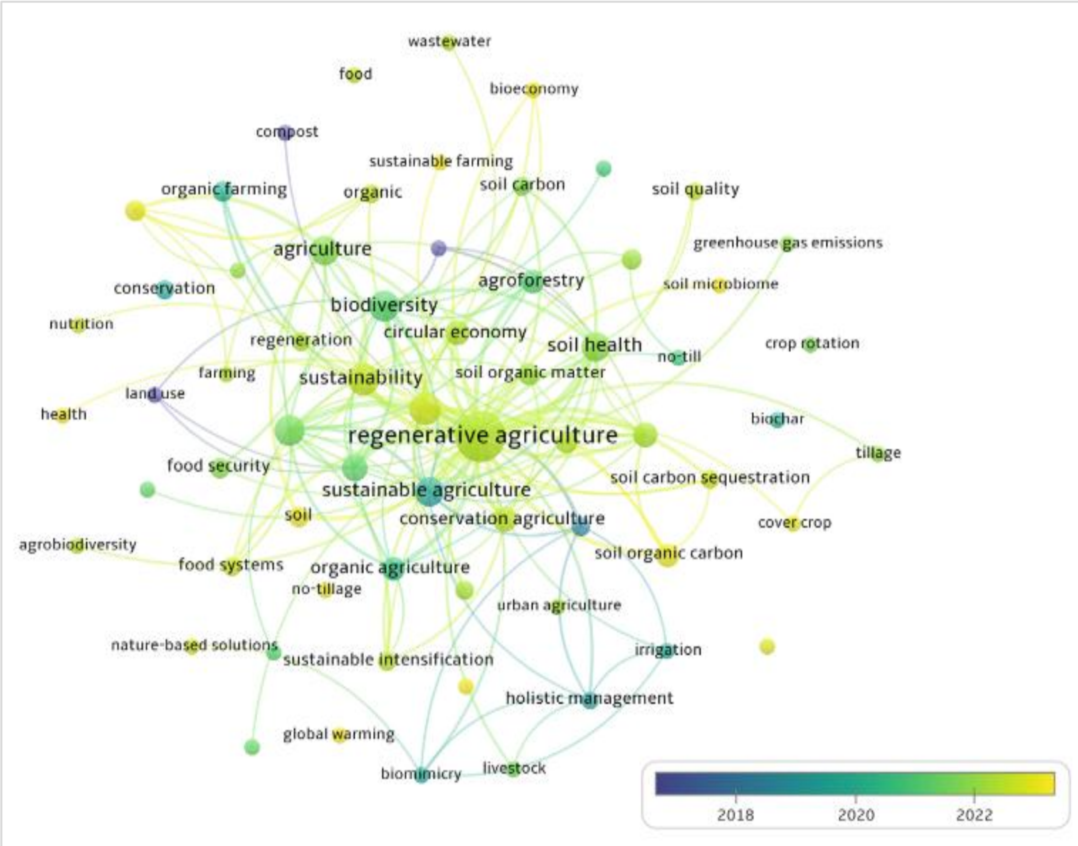

Figure 4. *Overlay visualization of author's keywords of regenerative agriculture.*

3.2. SWOT Analysis of Regenerative Agriculture

The SWOT analysis (Figure 5) points out and evaluates many essential features of RA; among its strengths, RA promises to allow Long-term sustainability, improve soil health and fertility, cut down on energy and chemical inputs, sequester carbon and other greenhouse pollutants, food security, promoting restoration of biodiversity, enhancing ecosystem services, and improving climate resilience of the agricultural systems. On the other hand, RA provides substantial opportunities, primarily through the carbon markets, where carbon credits may be earned for farmers when sequestering atmospheric carbon. This should create business opportunities and go hand in hand with the global initiative to fight against climate change. Farmers include renewable agriculture to respond to the rising demand of consumers for agricultural products that support sustainability. This trend creates new market opportunities for RA practitioners and advances in technology innovation, global interest, research, and collaboration. Regardless of the possible benefits, RA confronts various threats such as competition in international markets, legislative obstructions, resistance from traditional agribusiness, and land and resource constraints.

On the other hand, it has some weaknesses in that benefits take a long time to be put into effect, and there is a knowledge deficit in farming practices, there are difficulties in vertical integration for large-scale farmers, there is a limited market for regenerative products, as well as calls for farmer education and training. Although regenerative agriculture presents a viable and climate-friendly alternative to ordinary agriculture, its successful implementation requires addressing financial and educational constraints and overcoming threat factors such as climate change and the global market. Government approaches, wider opportunities to access carbon markets, and further development of RA practices must be increased to achieve the maximum gains from RA.

Figure 5. *SWOT of regenerative agriculture.*

3.3. Energy Conservation and Climate Mitigation

Climate change remains one of the most crucial issues among modern farmers, and the contemporary farming practice of RA is becoming increasingly popular. An essential feature of RA is its capacity to sequester soil organic carbon (SOC), which mitigates greenhouse gas (GHG) emissions and increases soil carbon content. It is a step towards more energy-efficient and climate-resilient agricultural systems. Sustainable and organic forms of agriculture, including conservation agriculture, are also of particular importance, as directly noted by [27], who also provide more advantages of RA over these agricultural practices. Global climate change makes it increasingly necessary to increase soil microbial diversity, and in this respect, RA helps to enhance soil health and improve carbon sequestration and control GHG emissions. With more focus and development, regenerative agriculture has gained new importance and proven helpful in carbon farming farms.

Regenerative agriculture, or RA, emphasizes using practices like manure application, biochar use, and organic inputs, which significantly lower GHG emissions compared to industrialized farming practices, which cause more carbon loss and energy usage [11]. This is known, although, in the short run, the emission of GHGs is higher with the use of fertilizers or manure. According to [28], emissions slowly stabilize in long-term regenerative practices, confirming their usefulness for long-term de-carbonization. Some techniques include cover cropping, no-till practice, and crop-animal integration, which aid the soil and even help reduce the use of synthetic fertilizers and pesticides that are costly and have a high energy requirement. There is a reduction in GHG emissions and enhanced carbon sequestration [29].

Moreover, when practiced with agroforestry and other forms of low-input farming, they also strengthen ecosystem functioning and sustainability.

Integrating this dual benefit of reducing energy use and improving carbon sequestration puts regenerative agriculture in harmony with broader climate change strategies. There is much promise of regenerative agriculture in developing carbon markets whereby farmers can assist in lessening the global carbon footprint. Farmers can integrate carbon farming techniques into their agricultural practices and earn carbon credits by capturing atmospheric carbon. This makes agriculture an essential industry in climate change strategies [30]. This, in turn, emphasizes the resilience of regenerative agriculture with social challenges to strengthen rural economies and foster sustainable development. China and regions of Southeast Asia have conducted research and documented evidence on how regenerative agriculture can be practiced anywhere in the world without a negative impact on carbon emissions [31]. The emerging interest in regenerative strategies in these parts of the world is seen as a strategy that would stimulate the growth of carbon markets, thus augmenting RA's role in combating climate change [32]. This worldwide trend affirms RA's ability to change the agricultural paradigm and create more climate-friendly sustainable agriculture systems. RA is a holistic approach critical in addressing climate change because of its capacity to reduce greenhouse gas emissions and sequester carbon. Its adoption as an international agricultural practice, especially related to carbon farming and carbon markets, opens a way towards a climate-resilient sustainable future.

3.4. Soil Sustainability

RA integrates approaches that help address the critical challenges of soil, such as soil degradation, soil fertility, and soil productivity. According to [33], RA undertakes management practices to sustain soil quality and improve the entire ecosystem's health. Improving soil organic carbon (SOC) is used in RA and promotes carbon capture, improves soil tilth, expands soil fertility, increases water capacity, and decreases the drought and flood risk [34, 35]. RA integrates principles of conservation tillage, crop rotation, and other organic farming practices to promote vital soil ecosystems [36]. Permaculture, as described by [37], assists in enhancing soil health through organic inclusions, increased microbial growth, and nutrient cycling. Increased microbial biomass and diverse fungal communities expand the potential of the soil to sequester carbon in the long term, thus further promoting sustainable farming practices. Such activities are critical in restoring already damaged soils and maintaining the productivity and resilience of agriculture in the future. The principles of RA focus on reducing the disturbances of the soil and increasing the diversity of species [38]. All these approaches can improve soil health and decrease dependence on chemical inputs such as fertilizers and herbicides, which align with sustainable and organic farming objectives. As reported by [39], besides producing the topsoil, RA also increases the water-holding capacity and the diversity of microbes and their nutrients necessary for a robust and high-yielding agricultural system. Apart from enhancing the health of the soil, RA also has dormant and significant prospects in carbon sequestration, especially in soils with high carbon sequestration potential that are intensively managed [40]. RA, through stable carbon retention, can address climatic challenges by incorporating the focus on long-term carbon storage in soils. Also, using insect frass-based fertilizers, biochar, or phosphorus biofertilizers within the systems of RA is said to reduce conventional mineral fertilizers, increase soil microorganisms, and sustainably promote land productivity [41, 42]. Regenerative farming benefits from organic matter such as worm compost and other biofertilizers, contributing to soil microbial diversity and improving overall farming system by promoting carbon and nitrogen balance [43, 44].

Additionally, even though using biochar does not necessarily help raise plants directly, it has the potential to sequester carbon in agricultural soils, a measure that, in turn, contributes to lower emissions [41]. Their study [45] further illustrated that regenerative practices enhance the soil's water storage and infiltration ability, reducing flooding hazards and improving climate adaptive capacity. RA is one of the most essential strategies employed to enhance soil health and accelerate carbon sequestration, all in a bid to increase agriculture's sustainability.

3.5. Food Security

In the agri-food sector, there is an estimated loss of food, amounting to thirty percent to eighty percent of the total yield, signifying poor performance in the industry. The losses highlight the accountability the agro-food sector has to shoulder in tackling such losses while also striving to complement the FAO sustainable development goals. The sector, likewise, has to conform to international efforts to address the mounting effects of climate change due to global ecological changes that are on the rise [46]. One of the critical answers to these challenges is regenerative agriculture, which has promising prospects in the changing paradigms of food production and processing systems. Overall, RA practices provide food security and improved health and security through sustainable practices [47]. There is worldwide acknowledgment of RA in the context of sustainable food transition systems [48]. The growing popularity of RA can be attributed to its ability to satisfy the rising food demands across the globe while minimizing the adverse effects associated with conventional agricultural practices. Unlike traditional practices where the environment is usually left worse off, RA aims to rehabilitate ecosystem functions. It encourages soil regeneration, which facilitates carbon capture and storage, as well as biodiversity, contributing to resilience building in farming systems [49]. This resilience is essential for mitigating climate change and other anthropogenic pressures to support agriculture in the long run [50]. Besides, RA has been demonstrated to have excellent prospects for improving food security, especially when integrated with other sustainable practices. Crop diversification, organic input use, and enhanced land stewardship are examples of such practices. They improve food security at the household level and more robust agricultural systems [51]. In addition, RA enhances nutritional security by integrating more organic and natural inputs to increase crops' nutritional content [52].

Applying the RA technique in agri-food systems offers a holistic approach to several problems, such as food wastage. RA can resolve food supply issues in the world by providing sustainable, resilient, and innovative ways of enhancing food production without compromising people's ecosystem and social well-being.

3.6. Restoration of the Ecosystem

Biodiversity is the diversity of the life forms that have inhabited the earth and, has vanished in recent decades as industrial agriculture has become one of the industries through which mankind harnesses the environment. The excessive resource extraction from the land and the associated practices of conventional agriculture cause land and water resources to become degraded, biodiversity to dwindle, and resilience to natural disasters and climate change to deteriorate [53]. RA offers a new hope for the loss of biodiversity. It increases and develops natural habitats as it encourages eco-friendly farming practices. The large-scale implementation of RA in agricultural croplands has shown it to enhance the welfare of the ecosystem and, therefore, provide beneficial outputs to agriculture [54, 55]. This inverse correlation between agriculture and the ecosystem's well-being makes RA a valid option for improving biodiversity. Also, the RA approach significantly overlaps with NBS, where responsive land-use planning and management interventions that enhance farming sustainability and resilience are promoted. Such a system increases productivity, repairs, and maintains ecosystems [56, 57]. It has been reported that regenerative interventions can revive degraded areas, conserve the ecosystem, and enhance the resilience of food systems [58]. RA offers a transformative solution to the biodiversity crisis driven by conventional agriculture. By combining conservation and sustainable agriculture, RA promotes healthy ecosystems and increases the adaptive capacity of agricultural systems to cope with adverse environmental circumstances.

3.7. Ecosystem Resilience

Sustainable development is an complicated farm ecosystems, complexity and the problems of the frail members within their agricultural communities [35]. Following this, progressive agroecology RA appeared as a viable solution and became popular for improving agrobiodiversity, ecosystem health, and resilience towards environmental stressors [59]. This approach offers practitioners the necessary knowledge and techniques to improve the agroecosystem's long-term productivity with minimum adverse impacts on the environment due to industrial agriculture [60]. A fundamental component of RA is its focus on improving soil microbiota, particularly Bacillus species, which facilitate plant health and nutrients. Research has revealed that regenerative measures can successfully manage and enhance the population of Bacillus spp. This, in turn, leads to better soil conditions an increase in crop yield and acts as a biological control against pests and diseases [61]. Moreover, [62] emphasizes that RA has the potential to reduce plant diseases and illustrates how this system, in turn, enhances the health of farms. Weeds have been managed in most caffeinated farms using herbicides as they are easy to use and affordable. However, as the negative impacts of herbicides on health and the environment become more apparent, there is a demand for veritable practices. Such practices exist in RA, which encourage measures that lessen dependence on herbicides. These include minimization of soil tillage, incorporating cover crops, and applying mineral nitrogen fertilizer at required levels. These methods not only assist in controlling weed activities but also help enhance the sustainability of ecosystems [63, 64]. Agroforestry systems have been integrated with RA, expressing the promise of controlling pest and weed infestation. Coupled with agroforestry, RA practices shift the crop latent habitats of pests to restore balance in the ecosystem. This minimizes using chemicals such as herbicides and pesticides, which brings healthier crops and fewer chemical inputs [65]. From these studies, it can be concluded and also noted that RA, in its diversities, has the potential to be used as an integrated approach to sustainable, productive, and environmentally friendly agriculture. RA is a holistic way of enhancing agrobiodiversity, soil health, and ecosystem resilience. Using this method, farmers can achieve sustainable productivity while reducing harmful chemicals, which promotes a better and more sustained agricultural system.

3.8. Circular Agriculture

The importance of managing agricultural and livestock waste in an eco-friendly way cannot be downplayed owing to its severity in concern with environmental pollution, especially air pollution and global warming. This occurs through burning cleanup during transportation and physical disposal of solid waste on fields [66]. In response to these developments, it appears necessary to embrace more sophisticated agricultural design principles that assist in energy savings and promote eco-friendly approaches in agriculture [32]. The application of the circular economy is another recommended alternative. This strategic approach seeks to manage waste, improve resource use, and safeguard the environment.

The application of the circular economy is especially crucial in agriculture since it helps protect land resources, develop effective water retention measures, and strengthen the regional capacity to deal with climate change [67]. RA has provided a sustainable model within the framework of circular economy, addressing the excessive agricultural waste generated during primary production processes [68]. Adopting agricultural waste in production cycles creates new prospects for circular economies and seems to serve as a solution for waste management and creating more sustainable food systems [69]. However, growing interest in regenerative agriculture provides an opportunity to develop nutrition-sensitive agricultural systems compatible with the Sustainable Development Goals (SDGs) and can help build sustainable futures. In addition, the Latin American and Caribbean (LAC) region, which is the largest net food exporter in the world, is strategically placed to revolutionize food systems further through circular economy and bioeconomy strategies. These strategies can minimize waste, improve production, and employ biological resources in an environmentally friendly manner [70]. As reported by [31], Sustainable development in present generation is moving on a different trajectory. China is committed to the principles of the circular economy and the ambitious goal of carbon-emission neutrality. The intersection of the circular economy with concepts of RA has the potential to increase the efficiency of the world economy and provide excellent opportunities for growth in various sectors. Such practices as incorporation of residues, mulching, and crop-livestock integration, all of which are enabled by RA, are also consonant with circular economy principles.

4. Conclusions

A review of 339 research publications on regenerative agriculture was conducted using the Scopus database. This study represents a novel effort to employ bibliometrics and SWOT analysis for a comprehensive review of the literature on RA in the SCOPUS database. SWOT analysis reveals the potential of RA as a strength and opportunity to be sustainable in the environment. In the economic term, it provides the benefit of long-term sustainability and food security. Despite its advantages and opportunities, the publication trends represent the overall shortage of research in RA as the abundance of scientific research papers has increased since the last decade. However, keyword analysis highlights that the research related to RA was focused mainly on integrating advanced technologies and targeted solutions, such as bioeconomy, circular economy, and natural-based solutions, to enhance the resilience and sustainability of RA.

The study reveals that RA is a better alternative for climate-friendly sustainable agriculture systems that unlock the potential of the carbon market and improve soil health, food security, ecosystem services, ecosystem resilience, and circular agriculture based on principles of waste minimization and resource efficiency can help deliver the circular economy. Integrating regeneration agriculture into a circular economy model fundamentally increases the potential of energy conservation by turning agricultural waste into resources, improving energy use efficiency that will dramatically help to reduce carbon footprint and foster a nature-based solutions approach. Based on the current review, this study suggests a few future research directions for RA. (1) Determine the long-term carbon sequestration of regenerative techniques in different climatic and soil conditions to assist in carbon storage. (2) Evaluate the regenerative practices' economic viability, focusing on potential markets for carbon credits to support farmers in participating in carbon trading schemes. (3) Create and implement farmer and consumer education campaigns on the sustainable benefits of regenerative agriculture and evaluate the extent of these campaign's efforts on adoption. (4) Assess the capabilities of remote sensing technologies in enhancing energy efficiency in decision-making and resource management in regenerative systems. (5) Assessment of new technologies and methods to embed RA into the circular economy models for waste recycling and resource efficiency. This will assist in closing the loop for agriculture production systems and enhance sustainable development.

Abbreviations

RA	Regenerative Agriculture
GHG	Greenhouse Gas

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Author Contributions

Ashutosh Kumar: Supervision, Conceptualization, Data curation, Writing – original draft

Mukesh Pandey: Conceptualization, Funding acquisition, Writing – original draft

Aparna Srivastava: Formal Analysis, Visualization, Investigation

Prem Ranjan: Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

Ashutosh Kumar is a PhD scholar. at G. B. Pant National Institute of Himalayan Environment, India. His master's was completed at Forest Research Institute, India in 2022. He has interest in participating in international research collaboration research. He is currently being considered for the Society Award "YOUNG FELLOW AWARD" at the International Conference (RTAAAS-2024) in agricultural field.

Mukesh Pandey is an environmentalist and founder of Navchetna in Mirzapur. Since 2010, he has led a team of 196 people, planting 80 lakh trees for carbon credit projects and agroforestry. He actively advocates for water conservation and promotes green entrepreneurship among FPOs, farmers, and SHG members, making a significant impact through his work at Navchetna.

Aparna Srivastava is a social activist in the agricultural sector. She has worked with various communities and organizations, including ministries and funding agencies like Tata Institute of Social Sciences, Tech Mahindra Foundation, and Smile Foundation. She completed a certificate program from UN Women and conducted research on the socio-economic conditions of people in the Pakistan-Rajasthan border areas for the Ministry of Home Affairs, with her work submitted to the PMO. She is the founder of Guiding Souls Trust and Strategic Solutions.

Prem Ranjan holds a Ph.D. in Soil and Water Conservation Engineering from the North Eastern Regional Institute of Science and Technology, Arunachal Pradesh, under the guidance of Dr. Pankaj Kumar Pandey. He earned his M.Tech. in Soil and Water Engineering from CAEPHT, Sikkim (Central Agricultural University), and his B.Tech. in Agricultural Engineering from Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Maharashtra. He has collaborated internationally and attended numerous national and international conferences and hold patent.

Research Field

Ashutosh Kumar: Agroforestry, Ecology, carbon sequestration
Mukesh Pandey: Agriculture, agroforestry Aparna Srivastava: Agriculture
Prem Ranjan: Agricultural engineering, Soil and water, conservation