# Regenerative Agriculture – Where Is the World Going?

Mahmood Ahmad
Water, Energy and Food Nexus (WEFnex) Knowledge Hub
RIZQ/YUNUS
Bangkok, Thailand
mahmood4404@gmail.com

Bhetwal Puja
Water, Energy and Food Nexus (WEFnex) Knowledge Hub
RIZQ/YUNUS
Bangkok, Thailand
bhetwalpuja2@gmail.com

***Abstract*—The increasing impacts of climate change, such as more frequent heatwaves, natural disasters, and rising sea levels, are severely affecting regions around the glob. This paper examines the potential of Regenerative Agriculture (RA) to address these challenges through sustainable land management practices. Techniques like improved soil and crop management, farm diversification, low-carbon livestock integration, and agroforestry contribute to enhanced soil health, better water retention, increased carbon sequestration, and reduced dependency on synthetic inputs. RA offers innovative technologies, practices, and policy tools to transform agriculture into a more resilient, profitable, and competitive system in the face of climate change. Additionally, the under-explored potential of blue carbon is addressed. The study reviews successful global implementations, such as India's resource conservation technologies, China's water-use efficiency projects, and the African Union's emission reduction initiatives. Regenerative practices, including crop management, farm diversification, livestock integration, and agroforestry, demonstrate benefits like improved soil structure and reduced erosion in countries such as New Zealand, Australia, and the United States. Furthermore, the paper emphasizes the importance of incorporating Regenerative Agriculture into national agricultural policies, backed by financial incentives, technical support, and data science for accurate climate predictions and farm management. Adaptation strategies include adopting new crop varieties, adjusting cultivation schedules, and implementing soil conservation measures. Mitigation efforts focus on promoting renewable energy, agroforestry, and carbon markets to ensure fair participation and effective outcomes. The long-term co-benefits of regenerative practices highlight the need for risk management strategies that include social protection for smallholder farmers. Overall, Regenerative Agriculture is presented as a comprehensive solution for addressing climate challenges, building resilience, and promoting sustainable livelihoods through global collaboration and policy support.**

***Keywords-Regenerative Agriculture; Climate Change; Agricultural Policies.***

## I. INTRODUCTION

Over the past 40-50 years, environmental degradation and poor soil health have been significant concerns, now worsened by climate change. This has led to more frequent and severe floods, landslides, and droughts. Global temperatures have risen since 2018, with 2023 marking the hottest year on record. The resulting climate impacts—intensified heatwaves, natural disasters, and rising sea levels—have severely affected human health, increasing the spread of diseases, causing heat stress, and worsening other health issues. Sub-Saharan Africa is widely recognized as the most climate-vulnerable region globally due to its exposure to rising temperatures, sea level rise, and unpredictable rainfall patterns. These shifts are increasing the frequency and intensity of natural disasters, profoundly altering regional geographies [1]. Climate change could lead to a 17% Gross Domestic Product (GDP) drop across Asia and the Pacific region by 2070 under a high-end emissions scenario, which could rise to 41% of GDP by the end of the century. The projected climate effects of sea level rise and labor productivity losses will be the most damaging - with lower-income economies and the region's poorest set to be the hardest hit [2]. These underline the urgent need for a shift toward more sustainable agricultural practices. These practices must focus on reviving soil, producing more and better-quality food with less water, and contributing to climate change mitigation.

Regenerative Agriculture or Climate-Smart Agriculture (CSA) has gained considerable global traction as a response to these challenges. Supported by organizations like FAO, the World Bank, and CGIAR, proposing a set of innovative practices and technologies, underpinned by well-conceived policies and regulations [3]. In Pakistan, several initiatives supported by international donors are promoting regenerative agriculture. For example, USAID is focusing on developing a low-carbon livestock sector, while the Asian Development Bank (ADB) is promoting sustainable rice farming through the Sustainable Rice Platform. Additionally, Better Cotton Pakistan has signed a Memorandum of Understanding (MoU) with the All Pakistan Textile Mill Association's (APTMA) Cotton Foundation (ACF) to enhance sustainable cotton production. These efforts collectively reflect a growing interest in advancing regenerative agricultural practices in the country. In India, modern rice and wheat varieties have saved approximately 39 and 37 million hectares of land, respectively, while zero-till agriculture saved Rs.100 crores in 2002-03 alone [4]. Brazil's ABC (Agriculture, Biodiversity, and Climate) program promotes integrated crop-livestock-forestry systems, reducing emissions by 20%. New Zealand's "Pastoral Greenhouse Gas Research Consortium" supports similar initiatives. The study provides a global review of Regenerative Agriculture as a panacea for emerging issues highlighted by climate change.

 **ISBN: 978-1-68558-323-1** 

## II. REGENERATIVE AGRICULTURE AND ITS BUILDING BLOCKS

Regenerative Agriculture is grounded in core principles like minimizing soil disturbance, maximizing cover crops and crop diversity, keeping living roots year-round, and integrating livestock, as illustrated in Figure 1. These practices, elaborated further in the sections below, essentially enhance soil health and biodiversity, leading to better water retention, reduced irrigation needs, and increased carbon sequestration. These benefits contribute to climate resilience and reduce the energy-intensive processes associated with conventional agriculture.

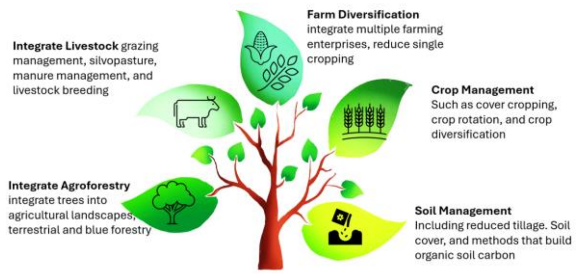


Figure 1. Building block of Regenerative Agriculture.

### A. *Soil Management*

A cornerstone of Regenerative Agriculture is soil management, encompassing practices like no-till or reduced tillage, the use of organic amendments, and methods for building organic soil carbon [5]. These approaches collectively improve soil structure and sustainability. Globally, several countries have successfully implemented regenerative practices. For instance, New Zealand has applied these methods to over 1 million hectares [6], focusing on soil health and biodiversity, which has significantly boosted agricultural productivity and environmental outcomes. In Australia, conservation agriculture covers over 40% of agricultural land, achieving notable reductions in soil erosion and increased carbon sequestration [7]. In Africa, regenerative practices vary across regions based on local needs and priorities. In Kenya, conservation agriculture practices, such as minimum tillage and cover cropping, have improved soil fertility, reduced erosion, and helped farmers adapt to climate change, enhancing food security [8]. In Ghana and Niger, practices like intercropping, crop rotation, and the use of organic manure have seen adoption rates exceed 80%. However, challenges such as the perceived inappropriateness of certain technologies [9], lack of information dissemination, limited technical ability, and prominent levels of illiteracy among farmers hinder widespread adoption.

Effective soil management and precise nutrient application are crucial to maximizing agricultural productivity and minimizing environmental impact. When poorly managed, soil and nutrient inputs—whether organic or inorganic—can contribute to greenhouse gas emissions and heighten diffuse pollution risks, impacting surrounding water quality. Conversely, a single teaspoon of healthy soil holds billions of bacteria, kilometers of fungal networks, and thousands of microscopic organisms, all contributing to a resilient ecosystem [10].

### B. *Crop Management*

Regenerative Agriculture emphasizes diversified cropping systems, crop rotation, intercropping, agroforestry, cover cropping, organic amendments, and integrated pest management. These strategies improve soil structure, reduce pests and diseases, and promote ecological balance. The Sustainable Rice Platform (SRP), a global alliance, aligns with these principles by promoting sustainable practices in rice farming, improving smallholder livelihoods, and reducing environmental impacts. SRP's standards, which encourage resource efficiency and climate resilience, are now applied in over 20 countries in Figure 2. France, for example, promotes agroecology through diversified cropping systems and organic amendments, supported by the "4 per 1000" soil carbon sequestration program. China has implemented large-scale agroforestry programs to reduce soil erosion and enhance biodiversity, supporting sustainable land use and ecosystem health [11]. In Indonesia, crop rotation and intercropping have reduced soil degradation and increased crop yields across millions of hectares. Costa Rica has implemented agroforestry on over 20% of its agricultural land [12], enhancing biodiversity, water regulation, and carbon sequestration. In Mali, CSA technologies such as drought-tolerant crops, micro-dosing, organic manure, intercropping, contour farming, agroforestry, and climate information services keep soil fertility and improve resilience against climate change [13]. Despite these achievements, challenges remain in policy, fiscal support, and the adoption of greener technologies, with obstacles like unclear policy indicators and inadequate monitoring and evaluation systems.

### C. *Farm Diversification*

Farm and crop diversification are essential for enhancing ecological interactions, promoting biodiversity, and improving resilience within agricultural systems. Cuba has advanced Regenerative Agriculture by implementing polyculture and agroecological zones across millions of hectares, promoting biodiversity and stabilizing agricultural ecosystems. Kenya has adopted crop and farm diversification, integrating crops and livestock, which has improved food security and provided multiple income streams [14]. India’s "National Mission for Sustainable Agriculture" encourages crop diversification and organic amendments, enhancing soil health and productivity. Zero budget farming is also gaining ground through supportive government policies [15]. Despite these efforts, a study in West Africa (Ghana, Niger, and Mali) revealed that crop diversification has seen limited adoption compared to other practices [13]. The key strategies include crop diversification, farm diversification, agro ecological zones, poly cultures, and cover cropping. These practices reduce dependence on single crops, integrate multiple farming enterprises, and use ecological synergies for a more sustainable and resilient farming approach.

**Role of Sustainable Crop Platform in Promoting Regenerative Agriculture– case of Rice**

The Sustainable Rice Platform (SRP) is a global alliance of over 100 stakeholders from various sectors, working to transform the rice industry by improving smallholder livelihoods, reducing the social, environmental, and climate impacts of rice production, and ensuring a steady supply of sustainably produced rice. SRP promotes resource efficiency and climate resilience in rice farming, focusing on both on-farm practices and across the entire value chain. Through voluntary market transformation, SRP develops standards, indicators, and incentives to encourage widespread adoption of sustainable practices. In 2015, SRP introduced the first voluntary standards for sustainable rice farming, and SRP-Verified rice is now available in over 20 countries as detailed below


Figure 2. Sustainable Rice Platform.

### D. *Integrating Livestock*

Integrating livestock into agriculture through programs like zero or rotational grazing, which mimic natural systems, is crucial for enhancing ecosystem services. Global experiences show the potential of livestock integration in reducing agriculture's carbon footprint. New Zealand leads in this area, with over 1 million hectares focused on grazing management and soil health, promoting soil carbon sequestration and biodiversity [16]. Silvopasture systems provide shade and habitats, while the "Pastoral Greenhouse Gas Research Consortium" [17] reduces methane emissions by 10-20%. Europe's "Low Carbon Beef" project reduces beef production emissions by 15% through improved grazing, feed, and breeding practices [18]. In Pakistan, USAID, in coordination with the Government of Pakistan, the Global Dairy Platform, and other stakeholders, is engaging the Green Climate Fund (GCF) to initiate a large-scale methane emission reduction program in the dairy sector. Africa's "Livestock for Sustainable Development" aims to cut emissions by 30% through better feed quality and grazing management.

Small adjustments in livestock management can lead to substantial financial savings and a lower carbon footprint. For example, dairy farmer John Kerr, part of the Farming for a Better Climate initiative, saved £63,000 and reduced emissions by 6% over four years [19]. Key regenerative agriculture strategies include grazing management, silvopasture, agro-pastoralism, manure management, and selective livestock breeding.

### E. *Promoting Forestry - Terrestrial and Blue Forestry*

Both terrestrial and blue forestry play critical roles in climate change mitigation through carbon sequestration. Agroforestry integrates trees into agricultural landscapes, providing shade, improving microclimates, enhancing soil health, and creating habitats for beneficial organisms. This approach boosts ecosystem services like pollination and pest control while sequestering carbon in both trees and soils. Terrestrial forests absorb approximately 2.4 billion metric tons of CO2-equivalent annually through tree growth, soil carbon accumulation, and wood production. However, forest-related activities release about 1.3 billion metric tons of CO2-equivalent each year, resulting in a net positive carbon balance of 1.1 billion metric tons annually [21].

Brazil's agroforestry and regenerative agriculture projects focus on soil conservation and biodiversity, restoring degraded lands, and creating sustainable agricultural systems [22]. The Brazil Investment Plan (BIP) is an initiative endorsed by the Forest Investment Program Subcommittee to support Brazil's Nationally Determined Contribution (NDC) commitments, focusing on sustainable land use and improved forest management in the Cerrado Biome. The plan aims to reduce GreenHouse Gas (GHG) emissions and enhance carbon sequestration through environmental conservation, restoration practices, and the adoption of low-carbon emission agricultural methods.

The BIP employs an Integrated Landscape Management (ILM) approach to balance human needs with biodiversity, emphasizing long-term sustainability and the efficient use of land. Key strategies include recovery of degraded pastureland; integrated crop-livestock-forestry systems; no-tillage farming; biological nitrogen fixation; cultivated commercial forests and treatment of animal waste [23]. The project has significantly increased the adoption of sustainable practices, providing extensive technical assistance and training to thousands of producers. It has also led to the restoration of substantial land areas and increased the adoption of low-carbon technologies. Notably, the project has encouraged economic returns, promoting wider adoption among rural producers.

Coastal ecosystems, including mangroves, tidal marshes, and seagrass meadows, are equally crucial for climate change adaptation. These ecosystems protect against storms, prevent erosion, regulate water quality, and provide habitats for fisheries and endangered species, contributing to food security for coastal communities. Despite their importance, coastal ecosystems are among the most threatened globally, with 340,000 to 980,000 hectares lost annually. If current trends continue, up to 40% more could disappear within the next century, turning them from carbon sinks into major

TABLE 1. COMMON FRAMEWORK OF ADAPTATION STRATEGIES [25].

| Adaptation Drivers | Farm Production Practices | Productivity | Adaptation | Mitigation |
|---|---|---|---|---|
| Soil Management | • No till<br>• Use organic amendments<br>• Building soil organic | Improves soil fertility and productivity | Reduces deep percolation of fertilizers and subsequent water pollution and eutrophication. | Lowers the production and emission of methane and other gases from irrigated rice ecosystems |
| Crop Management | • Adopt new crop varieties;<br>• SRI, DRI and AWD in rice<br>• intercropping, organic amendments<br>• Pest management | Increases productivity through improved soil quality and water availability. | In-situ soil moisture conservation by water retention. Prevents erosion. | Promotes carbon sinks through increased accumulation of dry matter. |
| Farm Diversification | • Crop diversification,<br>• Farm diversification<br>• Agroecological zones and cover crops | Intercropping with legume may bring new income- or covering cost (sugarcane or others). | Reduces temperature in tree canopy, which can increase crop productivity and quality. By introducing fruit and/or woody trees (as a diversification strategy), it can contribute to increased resilience. | Contributes to carbon sequestration in the system, especially when woody species are introduced in agroforestry systems. |
| Integrating Livestock | • Zero Grazing<br>• Rotational Grazing<br>• Fodder banks<br>• Manure composting | Enhances resilience Increases milk and meat production. | Reduces heat stress through shading, increasing the efficient use of pastures and other natural resources. | Increases digestibility of feeds and reduces GHG emissions such as methane ($CH_4$). |
| Agro Forestry | • Terrestrial forestry<br>• Integrate; provide shade, improves soil health, create habitat | Enhance farm productivity and diversify income | Reduces water runoff and soil erosion. Produces sticks for beans, fodder, and fuel wood at farm level. | Maintains or improves soil carbon stocks and soil organic matter content. Can also promote carbon capture if using woody species. |
| Agroforestry – Blue Carbon | Mangroves, tidal marshes, and seagrass meadows | Enhance productivity | Enhance carbon stock Produce Biochar | High-efficiency carbon sequestration |

carbon sources [24]. Marine and coastal ecosystems sequester about 1.5 billion metric tons of CO2 annually, while coastal development activities contribute to 0.5 billion metric tons of CO2 emissions, resulting in a net removal of 1.0 billion metric tons annually.

Pakistan has a strategic advantage in tapping into the global carbon market, estimated at nearly a trillion dollars. By certifying carbon credits or offsets, the country can generate significant revenue by supporting projects that reduce emissions, such as forests and renewable energy. Experts suggest that Pakistan could generate between $2 billion and $5 billion from carbon markets by 2030 if effectively managed and developed. In Sindh province, Pakistan is advancing two major carbon credit projects: Delta Blue Carbon (DBC) 1 and 2, aiming to restore over 300,000 hectares of degraded mangroves in the Indus Delta. This project, with a potential to create $12 billion in carbon credits by 2075, involves partners like the Government of Sindh and the Climate, Community & Biodiversity Alliance. The initial phase has already seen the replanting of 86,409 hectares, issuing 3.1 million voluntary carbon credits. The project is expected to yield over 250 million blue carbon credit units over its 60-year lifespan, providing environmental and social benefits, including habitat protection for endangered species, and improved local livelihoods [24].

TABLE 2. COMMON FRAMEWORK FOR ADAPTING MITIGATION STRATEGIES GOING FORWARD

| Mitigation Drivers | Farm Production Practices | Productivity | Adaptation | Mitigation |
|---|---|---|---|---|
| Infrastructure – grey or blue | • Feeder roads<br>• Irrigation<br>• markets | Investments in climate resilient infrastructure may increase | Cope with short-term and long-term climate risks | Reduce GHG emissions. |
| Renewable energy | • Low cost-efficient technology | Enhances long term productivity | Better with local solution Water on demand | Efficient irrigation systems; weather information systems; Farm-level practices |
| Recycling of crop and livestock residues or waste | • Biogas plants run by crop and animal waste<br>• Energy or evasive crops | Enhance productivity and income through circular economy | Work as circular rather linear economy | Major force in methane reduction |
| Agro-Forestry and range management | • Install forestry structures (terraces, shelter belts, tree planting) | Livelihood diversification, high potential for income generation | Generated microclimates, water regulation, soil conservation | Increased carbon reserves and sequestration. |
| ICT-Based Weather Forecasting, Meteorological Information | • Farm based<br>• Community Based<br>• Private-public partnership | Adequate and timely weather information can help farmers take decision on timing and variety of crops increasing productivity | Better manage the negative impacts of weather-related risks in poor seasons while also taking greater advantage of average and better than average seasons. | By better matching the use of fertilizer and other production inputs with year-to-year climatic conditions |
| Policy Engagement | • Through national and regional strategies and with other actors, farmers, private, and civil society | Clear massage that enhancing productivity is central | Simple and clear raod map making key resources available | Prioritize low-cost mitigation options |
| Insurance Index – cover weather related risk | • Uses weather index Less administrative cost with lower premiums | take added risks and to invest in improved practices that increase productivity | explicitly designed to manage short term risks | Improved production practices which either enhance carbon sequestration or reduce greenhouse gas (GHG) emissions |
| Incentive policies | Regulations, Taxes, Caps and Carbon trading Carbon Credits and offsetting | Encourage farmers to reduce carbon footprints and enhance productivity | Incentive is created to adopt | Use as major tool to reduce carbon footprints |

By 2030, the Sindh Forest Department plans to complete restoration on 450,000 hectares, offsetting an estimated 240 million metric tons of CO2 equivalent. However, to capitalize on the carbon market, Pakistan must ensure effective management, transparency, and equitable distribution of benefits. Challenges include establishing robust regulatory frameworks and transparent governance to ensure that revenues benefit local communities and enhance climate resilience. With the right strategies, Pakistan can leverage the global carbon market to foster sustainable development and climate adaptation [24].

## III. CREATING ENABLING ENVIRONMENTS FOR REGENERATIVE AGRICULTURE

Enabling environments for Regenerative Agriculture are the foundational conditions that promote and support the adoption of climate resilient technologies and practices. These environments encompass policies, institutional frameworks, stakeholder engagement, gender considerations, infrastructure, insurance mechanisms, and access to weather information and advisory services. By providing the necessary laws, regulations, and incentives, an enabling

 ISBN: 978-1-68558-323-1 

environment ensures that the shift towards RA is both effective and sustainable. It also strengthens institutional abilities at all levels and mitigates risks that might prevent farmers from adopting modern technologies and practices. Experience has proven that investing in these enabling environments is crucial for scaling up the implementation of RA.

For the adoption of Regenerative technologies or practices highlighted above to make economic sense, enhanced production with better quality must bring profits for the marketed produce, which is often not the case. It requires investments in the entire value chain. Farmers find it very exciting to know if they can reduce costs and increase yield and income, but they would like to see evidence. We suggest a well-designed study that lists prioritized technologies and practices and work out detailed cost-benefit analysis and then prepare small extension material to share the tradeoff. Farmers are more interested in economic outcomes.

Data science plays a key role in supporting RA by making critical information accessible, reducing waste, and offering advanced climate prediction models. These tools enable farmers to make informed decisions, optimize strategies for sustainability, and enhance farm resilience to changing weather patterns. Accurate climate predictions are particularly valuable for planning crop planting and managing daily operations, ensuring that farmers can better expect and mitigate climate-related risks. Advocacy for sufficient financial and technical resources at both national and sub-national levels is essential for effectively managing these risks, and Artificial Intelligence (AI) can further augment these efforts.

To comprehensively address the challenges of productivity, adaptation, and mitigation, RA must consider not only the technologies and practices involved but also the broader outcomes of these interventions. This requires evaluating the synergies and trade-offs among these three pillars and understanding their interactions within various socio-ecological systems. While the following sections provide a broader approach to RA interventions, it is essential that these strategies be designed and implemented in a region-specific and site-specific manner. Most of the proposed interventions offer dual benefits for both adaptation and mitigation, though the emphasis may vary, as elaborated in Tables 1 and 2.

## IV. Conclusions

The paper highlights the importance of planning and addressing challenges when adopting Regenerative Agriculture (RA) using Climate-Smart Agriculture (CSA) criteria to achieve sustainable productivity growth, enhance climate adaptation, and reduce greenhouse gas emissions. It may be noted that many of proposed climate-smart crop production practices generate co-benefits that require time to manifest themselves. Because of this, effective risk management strategies need to include social protection mechanisms for the small farmers.

Regenerative agriculture fosters sustainable farming through diverse cropping, organic amendments, and integrated pest management, all of which enhance soil health and biodiversity while reducing chemical dependency.

Effective soil management and precise nutrient use are foundational to sustainable agriculture, enhancing productivity while protecting the environment. Healthy soils support rich microbial diversity, which boosts resilience and nutrient cycling. Prioritizing these practices can reduce pollution risks and greenhouse gas emissions, contributing to long-term ecosystem health.

Standard Crop Platforms be promoted for strategic crops as they promote resource efficiency and climate resilience in farming, focusing on both on-farm practices and across the entire value chain. Through voluntary market transformation, SRP develops standards, indicators, and incentives to encourage widespread adoption of sustainable practices.

Small adjustments in livestock management can lead to substantial financial savings and a lower carbon footprint. Key regenerative agriculture strategies include grazing management, silvopasture, agro-pastoralism, manure management, and selective livestock breeding.

Both terrestrial and blue forestry are vital for carbon sequestration, helping to mitigate climate change by storing carbon in trees and soils. Agroforestry further enhances ecosystem services, improves soil health, and supports biodiversity. Initiatives like Brazil's Investment Plan illustrate the impact of sustainable land-use practices, fostering greenhouse gas reductions and economic returns through integrated crop-livestock-forestry systems and other low-carbon agricultural methods. These efforts demonstrate how balanced land management can address both human and environmental needs.

The study though provide broader approach to RA interventions, it is essential that these strategies be designed and implemented in a region-specific and site-specific manner. Most of the proposed interventions offer dual benefits for both adaptation and mitigation, though the emphasis may vary, as elaborated.

To encourage the adoption of Regenerative Agriculture (RA) practices, it is essential to provide financial incentives and access to soft loans, particularly for smallholders. Tailored financial strategies and social business models can enhance farmers' abilities to invest in sustainable technologies and practices, driving the transformation toward low-carbon agriculture.

Given the delayed benefits of regenerative practices, effective risk management strategies must include social protection mechanisms for vulnerable groups, particularly women and youth, to ensure they are not left behind in the transition.

Data science plays a key role in supporting RA by making critical information accessible, reducing waste, and offering advanced climate prediction models. These tools enable farmers to make informed decisions, optimize strategies for



 ISBN: 978-1-68558-323-1 

sustainability, and enhance farm resilience to changing weather patterns.

Policymakers should carefully prioritize investments by considering the economic and environmental trade-offs associated with different crops and production systems. Tailoring RA programs to regional advantages or site specific while considering farmers' experience, education, and risk tolerance is crucial for long-term success.

Legal and Institutional Support: Adoption of nature-based approaches in RA can be helped through supportive legal frameworks, economic incentives, capacity building, and effective communication strategies. Strong agricultural institutions and policies, along with improved infrastructure and market conditions, are vital for encouraging sustainable farming practices.

Global Collaboration and Continued Research: Scaling RA and integrating it into mainstream agriculture requires global collaboration, ongoing research, knowledge sharing, and supportive policies. Embracing RA is essential for building a resilient, sustainable food system for future generations.

## References


[1] IPCC, 2018; IMF, World Economic Outlook, October 2017, Chapter 3.

[2] FAO, "Climate-Smart" Agriculture Policies, Practices and Financing for Food Security, Adaptation and Mitigation. [Online] Available: https://www.fao.org/4/i1881e/i1881e00.html, 2010.

[3] Asian Development Bank, "Asia-Pacific Climate Report: Catalyzing Finance and Policy Solutions," ADB, 2024. https://www.adb.org/climate-report/editions/2024?gad_source=1&gbraid=0AAAAAoP-VcCXMAzGMDe2qh2Zk21wA1QnO&gclid=CjwKCAiAudG5BhAREiwAWMlSjKChjZSBO0naGvJcGFqVWwe11wQnZSU9z9vpbm6PGE6_iGMI4sdnhBoC8SEQAvD_BwE (accessed Nov. 14, 2024).

[4] V. Laxmi, O. Erenstein, and R. K. Gupta, "Impact of Zero Tillage in India's Rice-Wheat Systems," Impact Studies 56093, CIMMYT: International Maize and Wheat Improvement Center, 2007.

[5] FAO. (2020). Regenerative Agriculture: A Review of the Concept and Practices. FAO, Rome.

[6] Soil Health Institute, "Soil Health and Regenerative Agriculture", [Online] Available: https://soilhealthinstitute.org/our-strategy/, 2020.

[7] Australian Government Department of Agriculture, Water and the Environment, Conservation agriculture in Australia, [Online] Available: https://www.dcceew.gov.au/, 2020.

[8] Kenya Agricultural and Livestock Research Organization, "Conservation agriculture in Kenya" [Online] Available: https://www.kalro.org/, 2020.

[9] W. Settle, Z. P. Bharucha, and E. Nkonya, "Foresight and African agriculture: innovations and policy opportunities" Academia.edu, 2015.

[10] SRDP, "Soils resources for farmers from Farm Advisory Service," FAS, May 16, 2024. https://www.fas.scot/crops-soils/soils/ (accessed Nov. 14, 2024).

[11] World Bank Group, "China - Green agricultural and rural revitalization program for results (Hubei and Hunan)", Washington, D.C.: World Bank Group, 2023.

[12] Costa Rican, Ministry of Agriculture, and livestock, [Online] Available: https://iwlearn.net/iw-projects/organizations/884

[13] I. Ouedraogo, M. Tigabu, P. Savadogo, H. Compaoré, P. C. Odén, and J. M. Ouadba, "Land cover change and its relationship with population dynamics in Burkina Faso, West Africa", Land Degradation & Development, 21(5), 453–462, 2010, https://doi.org/10.1002/ldr.981

[14] Ministry of Agriculture and Livestock Development, Kenya, Ministry of Agriculture, Livestock, Fisheries and Co-operatives, Nov. 21, 2023. [Online]. Available: https://kilimo.go.ke

[15] V. Annexe, "Policies and Action Plan for a Secure and Sustainable Agriculture The Principal Scientific Adviser to the Government of India," 2019. Accessed: Nov. 14, 2024. [Online]. Available: https://iari.res.in/files/Latest-News/ReportofPoliciesandAction_28052020.pdf

[16] New Zealand Government, "Government backs largest ever pastoral farming study on regenerative farming practices," The Beehive, Sep. 02, 2022. https://www.beehive.govt.nz/release/government-backs-largest-ever-pastoral-farming-study-regenerative-farming-practices.

[17] PGgRc - Pastoral Greenhouse Gas Research Consortium. Pggrc.co.nz. https://www.pggrc.co.nz/, 2022.

[18] ADB, 2024, Unveiling the future of low-carbon beef farming | AHDB. Ahdb.org.uk. https://ahdb.org.uk/events/unveiling-the-future-of-low-carbon-beef-farming#:~:text=The%20project%20focuses%20on%20the

[19] SRDP, "Optimising Livestock Productivity | Helping farmers in Scotland | Farm Advisory Service," FAS. [Online]. Available: https://www.fas.scot/environment/climate-change/optimising-livestock-productivity/

[20] R. Mungkung et al., "Measuring sustainability performance of rice cultivation in Thailand using Sustainable Rice Platform indicators," *Int. J. Agric. Sustain.*, vol. 20, no. 7, pp. 1278–1293, 2022. [Online]. Available: https://doi.org/10.1080/14735903.2022.2105008

[21] FAO, "Global Forest Resource Assessment", 2020. www.fao.org. https://www.fao.org/interactive/forest-resources-assessment/2020/en/

[22] World Bank, Promoting Agricultural Productivity through Climate Smart Practices in Brazil. World Bank, https://www.worldbank.org/en/results/2020/10/27/promoting-agricultural-productivity-through-climate-smart-practices-in-brazil, 2020.

[23] The Blue Carbon Initiative, "What is Blue Carbon?" The Blue Carbon Initiative, [Online] Available: https://www.thebluecarboninitiative.org/about-blue-carbon, 2019.

[24] DBC, Delta Blue Carbon, Oct. 4, 2015. [Online]. Available: https://deltabluecarbon.com/.

[25] CGIAR, [Online] Available: https://ccafs.cgiar.org/resources/publications/csa-country-profiles, (accessed Nov. 14, 2024).