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Impact of sustainable development on rural communities

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Abstract

The fundamental requirement for rural community life quality enhancement consists of sustainable development which protects both nature and social equity alongside environmental preservation. The research document evaluates multiple dimensions of sustainable development approaches that affect rural territories through studies of economic results alongside social changes and environmental outcomes. The research design applies description to analyze how these development components affect rural communities. Sustainable practices lead to improved livelihoods and food security benefits and environmental stability through resource preservation measures alongside environmental protection. Development initiatives that include training programs combined with participatory governance activities along with agroforestry systems and renewable energy solutions lead rural societies toward sustainable social growth while giving them power to actively engage in development. Numerous advancements have been made yet multiple essential difficulties persist because infrastructure needs improvement and governance is weak while human settlements and facilities remain susceptible to climatic changes and public institutions do not have enough ability to function effectively. The study highlights the need for joint work between farmers together with decision-makers and policymakers and NGO organizations and private sector stakeholders to address these challenges. This research demonstrates sustainable development serves as an essential tool which rural communities can use to attain sustainability with environmental sustainability aspects. The use of innovative and participatory and integrated methods enables rural communities to support worldwide Sustainable Development Goals attainment and create a lasting future of balance and prosperity.

Keyword: Sustainable, dimensions, rural, effect, education

Introduction

Every nation around the world follows sustainable development as their universal approach to solve multiple social environmental and economic challenges they experience today. According to Brundtland in his 1987^[7] report development represents a way to fulfill current needs while preserving the capability of future populations to fulfill their own needs without sacrifice. Sustainable development emphasizes a comprehensive and integrated approach to growth and seeks balance in all its dimensions (Brundtland, 1987)^[7]. Sustainable development is a model that aims to balance various needs, taking into account the environmental, social and economic constraints facing society. This requires adopting responsible environmental practices that contribute to the protection and restoration of natural resources (Sahoo & Goswami, 2024)^[24].

While its principles are universally applicable, rural communities have unique vulnerabilities and opportunities that make sustainable development both necessary and challenging for these areas. Rural areas depend on their own resources for their livelihoods, such as agriculture, livestock, or fisheries. These resources play a fundamental and central role in the economies of these areas. Any disruption to these resources exposes them to degradation and negatively affects them (Pretty, 2008)^[23]. Returning to sustainable development goals, we find that community sustainability is one of its goals (Sdg, 2019)^[26]. Education, renewable energy, and environmental agricultural practices are among the sustainable development initiatives. Through its diverse programs the United Nations focuses on mitigating the unstable factors which emerge across different communities including rural areas and affect each population uniquely.

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United Nations works to improve resilience and inclusiveness as well as sustain long-term economic stability (United Nations, 2015) ^[29].

The expanding amount of research on sustainable development produces minimal clarity about its effects on rural communities specifically. Research focuses mainly on urban settings which overlooks rural areas for investigation (Ketola, *et al.*, 2024) ^[12]. Different social issues challenge rural communities because these areas usually have insufficient infrastructure together with cultural diversity and weak governance systems that negatively affect sustainable policy outcomes. The research aims to understand how sustainable development creates diverse effects on rural communities through evaluations of empowerment alongside economic function and social integration as well as environmental sustainability. The research paper targets an expanded comprehension of sustainability development methods for enhancing both rural area ecological stability and resident well-being by examining environmental and social elements. The research sets out to determine how sustainable development influences rural communities through its economic and social and environmental aspects.

Literature Review

Research institutions, economists, sociologists as well as international organizations and national and regional governments have used sustainability as their foundation for rural development programs and policies since the previous twenty years. Its basic objective remains the same over time, which seeks to create an acceptable balance between economic, social, and natural capital, contributing to a sustainable improvement in living standards for present and future generations (Marsden & Murdoch, 2006) ^[14]. This indicates that the 1987 United Nations Declaration on the Development of Rural Areas includes managing the economy and improving living conditions while avoiding the depreciation of certain rural resources, including natural ecosystems, landscapes, and cultural assets (Camarero *et al.*, 2016) ^[8]. Nieto Masot and Gurría Gascón (2024) ^[22] defined rural sustainability as a continuous search for development mechanisms and strategies to maintain healthy rural communities, improve the human condition and make them compatible with economic, social, cultural, political, and environmental principles and respond to them, at least in the long term, to any demands in these dimensions (Nieto Masot & Gurría Gascón, 2024) ^[22]. In addition, the researcher Sirajuddin (2020) ^[28] explained that rural development seeks to eliminate poverty and hunger, improve living and health conditions, and focus on education and its quality. Rural development seeks to improve economic growth and agricultural conditions. Not to mention its role in promoting practices and activities that contribute to sustainability. This goal can be achieved by shifting from traditional methods to sustainable methods, replacing traditional systems with systems that preserve biodiversity, enhance soil fertility, and ensure that everyone has access to safe and healthy food. The rural environment offers a higher degree of natural diversity as well as healthier neighborhoods together with cultural practices and healthy traditions and traditional values and rich heritage according to Sirajuddin (2020) ^[28]. Rural territories exceed urban territories in multiple countries which results in a

degree of development neglect. Despite having most of the vital potential to achieve the concept of sustainability and its development, rural areas are largely neglected. The study conducted by Adamowicz and Zwolińska-Ligaj (2020) ^[2] aimed to achieve the smart village concept to contribute to sustainable development in rural Poland. This research concluded that achieving the principle of sustainability in rural areas requires a set of methods and strategies that enhance the concept of sustainability. In addition, it needs many theoretical and experimental studies at a larger level that contribute to the development process and its sustainability (Adamowicz & Zwolińska-Ligaj, 2020) ^[2]. Renewable energy is one of the methods through which countries seek to achieve sustainability, whether urban or rural. Renewable energy seeks to support rural economic and social development by increasing job opportunities, innovation, and local entrepreneurship. In addition to the transition to more innovative green industries, new revenues for landowners, farmers, and local authorities, and independence from traditional fuel imports, thus reducing and stabilizing energy bills (Clausen & Rudolph, 2020) ^[9]. Sindakis and Showkat (2024) ^[27] conducted a study about the role of the digital revolution in promoting sustainable development by addressing some critical gaps in technology adoption. How digital tools contribute to sustainable practices across key sectors such as agriculture, education, and healthcare, ensuring long-term social, economic, and environmental benefits. Farmers who receive digital innovations combined with eco-friendly farming technologies reduce their need to use environmentally damaging practices by reducing pesticide usage. The combined use of these technologies produces agricultural development alongside better crop quality which supports environmental sustainability. The research team emphasized digital technology integration into rural development frameworks because it creates a sustainable future with a sustainable environment (Sindakis & Showkat, 2024) ^[27]. Yu *et al.* (2024) ^[31] conducted research about the connections between rural development and educational practices and management methods. The research investigates both how rural development together with education and management practices advance to sustainable rural progress. The research demonstrates that education serves as a fundamental force for rural development because it gives communities essential capabilities which enable them to optimize their lifestyles and practice sustainability. Access barriers to quality education combined with inadequate infrastructure and social and cultural factors served as main obstacles primarily in rural areas that were not easily accessible. The study revealed that rural development requires permanent sustainability by uniting educational and managerial aspects. Researchers established multiple mechanisms as well as strategic approaches that connect education and management efforts to rural sustainable development goals. The research recommends building capabilities and integrating technology while needing government support as well as public-private collaboration (Yu *et al.*, 2024) ^[31].

Methodology

The study uses a descriptive methodology to review existing literature and earlier research related to sustainable rural development. The study utilized this research method to provide complete coverage of its objectives and questions

regarding sustainable development effects on rural communities regarding economic empowerment, social inclusion and environmental resilience.

Results and Discussion

Economic Impact

Sustainable development activates rural economic transformation through growth promotion that maintains environmental sustainability. The economic growth of rural areas through sustainable development focuses on upgrading living standards by boosting productivity as well as poverty reduction efforts with sustainable resource protection for long-term use. People gain various income opportunities through sustainable development programs that focus on agriculture and renewable energy sectors. The strategy uses sustainable operations which lead rural families to secure better economic stability. Rural landowners benefit from renewable energy development of solar power combined with wind turbines and biomass systems that boost their operations while protecting natural resources. The implementation of solar and wind power carries a dual advantage of creating new positions for maintenance personnel and project operators in addition to the existing positions accessible to non-farm workers. Renewable energy initiatives enable rural family budgets to get cheaper by decreasing energy expenses thus creating more money for essential costs (Benedek *et al.*, 2018; Clausen & Rudolph, 2020) ^[6, 9].

Multiple sustainable farming methods like crop rotation and agroforestry and organic farming offer a combined solution which both boosts agricultural yield and keeps soils productive along with minimizing use of synthetic agricultural inputs. These combined impacts increase rural farmers' income while protecting their properties against economic dangers arising from climate change. According to Pretty (2008) ^[23] agroecological methods throughout different developing nations yielded more crops by 79% and decreased operational expenses.

Marketing is a criterion for raising the rural economy and improving living conditions. Sustainable development initiatives make efforts to connect rural producers to markets, enabling them to earn higher incomes through better pricing and reducing waste. Social media platforms have played a role in this. They facilitate agricultural product marketing through the best possible pricing model by eliminating intermediary service providers (Sindakis & Showkat, 2024) ^[27]. The development of employment opportunities as a result of e-commerce efforts helps decrease poverty statistics (Karine, 2021) ^[11].

Sustainable development actively supports entrepreneurship through the promotion of businesses which protect the environment and operate out of communities. The initiatives create twofold benefits for rural populations because they lead to self-supporting revenue streams and maintain environmental preservation and incorporate social initiatives. Rural communities use local resources together with traditional skills to develop sustainable products which they market to the public. The training and microfinance assistance and marketing platforms provided by sustainable development initiatives allow wider audience reach for these products according to Esteves *et al.* (2021) ^[10] and Bardhan & Bhattacharya (2022) ^[5]. Through SD initiatives the

establishment of cooperatives and collective businesses receives encouragement to support social entrepreneurship. The Laikipia County rural community research has validated the beneficial outcomes of community development cooperative initiatives. Sustainable development finds promotion through these initiatives according to Mukhovi *et al.* (2024) ^[16]. Rural areas experience multiple economic outcomes that have significant effects because of SD. Economic growth becomes sustainable when poverty gets alleviated and environmental degradation stops through tactic combinations which establish equal treatment and create novel market prospects. The programs offer funding which lets communities gain financial freedom to sustain natural resources and cultural heritage through supporting business development based on environmental principles.

Social Impact

Rural communities experience deep sustainable development effects through social equality programs which create active community inclusion and deliver better living standards. Social sustainability depends fundamentally on these impacts to achieve its goals for equality and community participation as well as welfare quality. Sustainable development initiatives often prioritize education as a key driver of social progress, one of the SDGs (Sustainable Development Goals). Improving access to quality education in rural areas promotes skills development, literacy, and awareness of sustainable practices, thus empowering individuals to contribute positively to their communities. In addition, various initiatives, such as adult literacy and literacy, help foster collaboration and collective engagement towards quality education and a more conscious society (Akintolu & Uleanya, 2021) ^[3]. India, for example, aims to teach rural students basic reading, writing, and numeracy to at least 200 million rural children (Muralidharan, & Singh, 2021) ^[18].

In addition to education, improving livelihoods, whether at the rural or urban levels, is one of the goals that the United Nations seeks to achieve. Sustainable livelihoods are a comprehensive tool designed to analyze the interaction between resources, strategies and institutional contexts that affect the livelihoods of individuals and communities, especially in rural areas. It also emphasizes the integration of environmental, economic and social dimensions to achieve sustainable development. Social sustainability requires human support and financial resources to achieve sustainable livelihoods according to Natarajan *et al.* (2022) ^[20].

SD works actively to extend health care services to sparsely populated locations and control disease transmission through its initiatives. Situation improvement wins through concentrated solutions to problems like insufficient infrastructure and monetary and staff deficits. Rural residents gain access to their necessary health care through sustainable initiatives. The initiatives establish equal healthcare delivery in deprived rural territories by connecting new technology to active healthcare personnel for training. Telemedicine platforms together with health-related applications and consultations represent key initiatives that function within Africa. Healthcare delivery has become more accessible because of these initiatives

primarily in rural and remote locations. Public authorities work together with healthcare providers and local populations to enhance healthcare accessibility as well as fulfill SDG targets (Ayo-Farai *et al.*, 2023) ^[4]. The combination of telemedicine platforms and vaccination and vaccine programs helps decrease the occurrence of infectious diseases.

The focus of sustainable development initiatives aims to bridge rural community health care gaps and education and livelihoods divisions through accessibility implementation and sustainable development Participating groups and government entities have established various efforts that produced improved results for infrastructure as well as both health and education standards in rural communities thus creating healthier and more sustainable rural settlements.

Environmental Impact

The approach of sustainable development focuses on rural environmental issues through conservation techniques that protect nature while maintaining ecological stability for sustainable communal development. Sustainable water resource management is essential for the long-term development of society, as water is a fundamental resource supporting human well-being and economic activities. It is critical in domestic use, agriculture, industry, commerce, and recreation. In SD, effective management ensures that water resources meet present needs without compromising the ability of future generations to access them. Developed nations have achieved progress through significant investments in water infrastructure, robust institutions, and sound governance. In contrast, many developing countries face inadequate infrastructure, weak institutions, and poor governance systems. As global water demand continues to rise, adopting sustainable management practices is imperative to balance ecological preservation with socio-economic growth and ensure the equitable distribution of this vital resource (Ngene *et al.*, 2021) ^[21].

SD emphasizes the responsible use and conservation of natural resources such as soil, water and agriculture. In rural areas, where communities rely heavily on these resources for agriculture and daily life, sustainable practices ensure the long-term availability of resources. Despite efforts, progress towards SDG 2 remains elusive for many countries less than a decade from the 2030 Agenda. Addressing this complexity requires transitioning to sustainable food and agricultural systems that prioritize long-term resilience and ecological balance. Sustainable agriculture, which includes diverse practices, principles and management systems, is essential to meet the demands of growing populations and solve land-related challenges. Innovative sustainability approaches, such as conservation, regenerative and organic agriculture, are pivotal in integrating healthy and sustainable food systems. These practices provide renewable benefits through short- and long-term solutions, addressing agricultural transformation's environmental, social and economic drivers (Mrabet, 2023; Mutengwa *et al.*, 2023) ^[15, 19]. Organic agriculture and its products are considered one of the key factors supporting a sustainable environment. The International Federation of Organic Agriculture Movements introduced the idea of Organic Agriculture 3.0 in 2013. This European Union standard for organic agriculture movements facilitates the widespread adoption of markets

and agricultural systems based on organic products. Which are truly sustainable and filled with a culture of innovation and continuous improvement towards best practices, transparent integrity, inclusive cooperation, comprehensive systems and real value pricing (Willer *et al.*, 2021; Leu, 2020) ^[13, 30].

To preserve the environment and reduce carbon emissions, countries seek to promote the use of renewable energy, especially in villages and remote villages. Sustainable development works to adopt renewable energy systems in rural areas, reducing dependence on fossil fuels and carbon emissions. The benefits of using renewable energy are evident in mitigating environmental damage and providing access to clean energy for rural households. In Bangladesh, for example, the Solar Home Energy Systems Program provided renewable energy to more than 4 million rural households, reducing the use of kerosene lamps and contributing to reducing greenhouse gas emissions (Saim & Khan, 2021) ^[25].

Biodiversity plays a role in maintaining environmental sustainability. Sustainable development initiatives in rural communities help in measures to conserve biodiversity. It is vital for ecosystem services such as pollution, pest control, and climate regulation. Saving biodiversity exists as a worldwide pressing concern. Tourism creates value for biodiversity while supporting wild conservation in the modern development world. The government of Nepal directs its focus toward sustainable development in tourism and biodiversity protection through national parks alongside protected areas and related policy contributions. Tourism increases biodiversity conservation when stakeholders work closely together with effective management and proper planning (Acharya, 2023) ^[1].

Waste management along with pollution control advances stand as executive environmental sustainability components. Solid waste management has become a major challenge because industrial economies and cities achieved higher prosperity rates that stimulated waste generation and local authorities unable to effectively manage this waste effectively. The growth of urban areas has raised solid waste production rates in Asia and Africa at the same time that disposal techniques have proved insufficient to address the problem. The undisciplined actions of the public have produced inadequate policy execution and supervision thus creating inefficient developmental outcomes in various parts of the world. Consequently, many sustainable development initiatives seek to develop waste management systems and strategies and thermal treatment measures that help prevent environmental pollution and improve environmental sustainability in the long term (Munayi, 2023; Zhechen *et al.*, 2024) ^[17, 32].

Sustainable Development initiatives in rural regions create better environmental results by protecting natural resources at the same time they decrease environmental damage and make communities stronger for climate changes. The programs create economic stability for rural areas alongside preservation of environmental equilibrium which secures their development for numerous generations.

Challenges and Constraints

Achieving SD in general and rural communities in particular is vital to achieving social justice, economic growth, and

environmental conservation. Despite governmental and non-governmental efforts and initiatives that contribute to improving environmental sustainability, some challenges and constraints hinder their progress. Among these challenges are:

1. The inadequate provision of roads together with electricity systems and healthcare facilities plus educational institutions remains a common problem in rural territory. Lack of market access together with limited opportunities and basic services restricts economic development and makes available resources scarce while reducing life quality.
2. People living in poverty plus cases of income inequality prevent communities from obtaining necessary financial support they need for development programs. The reduced local economic capacity also limits community ability to guide their development initiatives.
3. Inadequate governance systems together with limited involvement from community members create difficulties for effective execution of multiple development initiatives and policy programs.
4. Natural resource exploitation along with deforestation causes ecosystem and livelihood sustainability issues because of soil degradation and water shortage problems.
5. The inability to deploy sustainable development initiatives together with insufficient educational possibilities and deficient environmental awareness prevents sustainable development.
6. The escalating occurrence of droughts together with floods and unpredictable atmospheric events both disturb agricultural activities and deplete water resources.

Recommendations

There are some recommendations and ways to address these challenges, including:

1. Creating roads and renewable energy networks as well as building healthcare centers and educational institutions will improve basic service accessibility.
2. Public and private entities need to collaborate for the successful mobilization of resources used in constructing infrastructure.
3. Small businesses and farmers must receive financial benefits which exist in conjunction with microfinance programs.
4. The rural economy requires development of job opportunities that suit its needs as well as training to prepare people for those opportunities.
5. Local governments should gain support from central governance structures to exercise regional authority in decision-making.
6. Natural resource preservation needs to be combined with sustainable farming practices while implementing tree replanting efforts and water preservation measures.
7. Education about sustainability should receive promotion while accessible educational centers must be created and sustainable subjects must be introduced in educational programs.
8. The organization should organize educational workshops alongside training programs to teach people

sustainable practices.

9. A program of climate adaptation needs to combine climate-smart farming systems with early warning systems that minimize the effects of climate change.
10. The implementation of crop varieties with drought resistance and water-saving equipment technologies should be developed as adaptive measures.

Conclusion

The achievement of global development aims along with solving urgent issues like poverty and education deficiencies and environmental destruction depends on sustainable development in rural areas. The manuscript demonstrates how sustainable approaches possess transformative power for creating improved economic and social and environmental impacts in rural areas. Rural sustainable development requires integrated interventions between different approaches combined with progressive methods as well as comprehensive participation of the population. The combination of infrastructure investment alongside educational growth and social empowerment next to environmental stewardship allows rural areas to develop resilience through sustainable practices that will create better life standards for both present and future population groups. Sustainable development provides essential foundation for enhanced rural life quality combined with enduring preservation of natural resources. Rural areas should use holistic approaches to establish innovative sustainability centers that generate a sustainable future available to everyone.

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