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Original Article

Role of Reservoir Fisheries in Achieving SDG 14 "Life below Water" and SDG 2 "Zero Hunger"

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Abstract

Reservoir *fisheries are an important part of the inland aquatic ecosystem. They play a vital role in promoting the sustainable development by supporting the SDG14 "life below water" and SDG-2" zero hunger". As artificial water bodies, reservoir serves as crucial aquatic ecosystem that not only enhance fish biodiversity but also promotes the surrounding communities they provide a source of income for people living nearby it and help to reduce poverty in local areas. Effective management and sustainable use of these fisheries resources not only improve food and nutrition security but also contribute to minimize the poverty and protect the resources in aquatic ecosystems for future generations. From an ecological point of view well-managed reservoir fisheries supports the SDG-14 "life below water" by protecting biodiversity, maintaining ecological balance and lowering the stress on overexploited freshwater and marine resources. The implementation of community based shared management models, habitat restoration, pollution reducing methods and environment friendly aquaculture practices collaborate-with international frameworks such as FAO Code of Conduct for Responsible fisheries contributes to long-term health of aquatic ecosystems.*

This study analyzes the environmental, socio-economic, and governance factors, highlighting combined strategies and best practices for long-term sustainable development. With the goal to achieve both the protection of aquatic ecosystems and food safety, reservoir fisheries can work with the integrated technological advancement, legal support, and the active community participation. This approach will ensure log-term support for the global sustainable development goals.

Keywords: *reservoir fisheries, sustainable development goals, sdg-14, sdg-2, biodiversity conservation*

Introduction

The 21st century faces the dual challenges of ensuring food security for a huge population and the protection and maintenance of natural environmental systems. The united nation's sustainable development goals (SDG) was established by the United Nations and adopted in 2015 offers a comprehensive framework for addressing these issues. There are a total of 17 sustainable development goals (SDGs), SDG-2 aims to reduce the hunger, achieve food security and improve nutrition, while the SDG-14 focuses on protection and environment friendly use of rivers, oceans, seas, and other aquatic resources in an environmentally friendly manner. Each of these goals can be greatly aided by aquaculture and fisheries systems particularly the reservoir and inland fisheries.

Reservoir fisheries contributes significantly to inland fisheries. Reservoirs are gaining recognition for their contribution to food security, ecological services, and livelihoods of many people. Reservoirs are artificial water bodies which is mainly created for purposes such as irrigation, drinking water supply, and flood control and hydroelectricity power generation. Over time these water reservoirs become productive aquatic habitats which support a variety of fish species. In countries such as like China, Brazil and India reservoir fisheries have emerged as important part of nation's fish production strategies and serving as a stable source of income and protein for many people living in villages, and its adjoining area's and in sub-urban regions. According to food and agricultural organization (FAO) inland fisheries contribute over 12% of the World's fish production, with a significant portion comes from the reservoirs based fisheries systems.

Reservoir fisheries contributes to worldwide food and nutrition security and achieving of the SDG-2 "zero hunger".

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Fish is regarded as one of the most cost-effective and nutritious sources of animal protein, which includes essential amino acids, fatty acids, minerals, and vitamins. Fish from reservoir offers an essential food component that helps in combating and reducing issues such as micronutrient deficiency and malnutrition, especially in places where other sources of animal protein are limited or costly. Apart from supplying food and nutrition, these reservoirs contribute significantly towards enhancing rural livelihoods and providing employment opportunities for fishermen, processors, transporters and traders, which directly supporting the fight against poverty and promoting socio-economic development. Community-driven stocking and culture- based fisheries initiatives in reservoirs fisheries have further increased income generation opportunities providing a sustainable model for economic empowerment in underprivileged communities.

From an environmental perspective, SDG-14 "life below water" which emphasizes the conservation the sustainable use of aquatic ecosystems, can be significantly supported through the management and development of reservoir fisheries. When the reservoirs are maintained, they help to conserve aquatic life and reduce fishing pressure on overexploited natural water bodies such as lakes and coastal waters etc. sustainable practices such as using local or compatible species of fishes, water quality testing, restoring habitat, balanced harvesting contributes in maintaining the environmental balance. Additionally, reservoir can serve as the protection against environmental damage caused by the unsustainable fishing in riverine and marine environments. The long-term sustainability of reservoir ecosystems and the promotion of responsible fishing methods have been successfully achieved through the community based fisheries management practices which involves local and regional community members in decision-making.

Although reservoir fisheries have huge potential, they face various challenges that limit their ability to contribute to SDG-14 "life below water" and SDG-2 "zero hunger". The primary threats which include introduction of invasive species, eutrophication, water contamination, overfishing and completion for water resources from industries and agriculture. Variations in water levels, which affects spawning seasons, rises the risk of fish diseases, and climate change makes it even more critical. Effective management of reservoir fisheries is affected in many developing countries due to the weak institutional framework, insufficient policy support, and limited access to advanced technologies. It requires integrated management practices which involve scientific studies, policy implementation, and active community participation is essential to address these problems.

Reservoir fisheries are key nexus in sustainable development, interlinking environmental conservation with socio-economic progress. They offers lessons on how natural resources is related to human development goals. By assuring the supply of healthy, nutritious food, supporting rural livelihoods, and protecting the aquatic ecosystems, reservoirs effectively tackle the primary goals of SDG-2 "Zero Hunger" and SDG-14 "Life below Water". The success of these initiatives relies on integrated governance frameworks that involve researchers, policymakers, legislators, local communities & fishermen. By examining at their environmental and governance aspects, as well as socio-economic factors, this paper explores the multifaceted role of reservoir fisheries in achieving the SDG-2 and SDG-14. additionally it highlights the challenges, potential approaches and effective methods for enhancing the contribution of reservoir fisheries to the global sustainable development agenda. Reservoir fisheries have the chances to become a foundation for inclusive and sustainable growth in the coming decades by linking the gap between food security and the conservation of aquatic ecosystems.

2. Reservoir Fisheries: Definition and Importance

2.1 Definition: -

Reservoir fisheries are often referred to as the rearing or capture of fish in man-made or artificial freshwater bodies created by the construction of barrages or dams. These freshwater bodies are home to diverse fish populations and aquatic ecosystems.

2.2 Regional and worldwide importance

2.2.1. Global importance:-

According to the FAO it is estimated that the inland fisheries contribute approximately about 12% of the total global fish production. Reservoir fisheries play a significant role in inland productivity, particularly in countries with widespread of reservoir networks. As the worldwide demand for fish increases and marine resources become overexploited, reservoir fisheries are emerging as an alternative options of fish protein.

2.2.2 Africa and Asia

The importance of reservoir fisheries is clear in continents such as Africa and Asia, where they contribute significantly to both food security and as a source of income. In Asian countries like India, China, Shri Lanka and Bangladesh as well as African countries such as Nigeria and Ghana, reservoir fisheries play a crucial role in national fisheries strategies. By supplying the fish to the

local markets, they help address the nutritional deficiencies, particularly among the low-income populations. In many of these areas fish from reservoirs often serve as the primarily and affordable source of animal protein makes it essential for reducing conditions such as malnutrition.

2.2.3 Livelihood support

Worldwide, millions of fishermen depend directly or indirectly on reservoir fisheries for their income and livelihoods. In addition to fishing, there are many other advantages which goes beyond self-employment, such as processing, marketing, transportation, and equipment's manufacturing etc. Reservoir fisheries often serve as a lifeline for families who rely on farming by providing an additional source of income during the agricultural off-seasons. Additionally community based fisheries in reservoirs, where local cooperative societies or organizations control and harvest the fishes which not only increase the earnings but it also strengthen the social connections and improve resource management.

3. Contribution of Reservoir Fisheries to SDG 2: Zero Hunger

3.1 Safety of food and nutrition:-

Reservoir fisheries supplies cheap and high quality of animal protein and other essential nutrients like omega-3 fatty acids, zinc and iron etc. Reservoir fisheries which is vital nutritional component for the people who have low income and are landlocked supports them tackle malnutrition and nutrition deficiencies.

3.2. Job creation and generation of income:-

Aquaculture and fishing generate employment both directly as well as indirectly in areas such as marketing, transportation, and processing. Women also plays an important role in post-harvest operations, which helps them to increase their income and supports gender equality.

3.3 Improving Agricultural Productivity:-

Integrated aquaculture systems, such as cage culture which enhances the bio-economics with the help of by-products of the agriculture such as feed and promoting water-use efficiency. This integration improve agricultural productivity while supporting the sustainable food production.

4. Contribution of Reservoir Fisheries to SDG 14:- "life below water"

4.1 Protection of Biodiversity:-

Despite being man-made artificial water bodies, reservoirs can support a wide variety of species of fishes. Their scientific management helps in conserving the local, native fish species and control invasive species populations, and maintain ecological equilibrium.

4.2. Management of Habitats and Pollution control:-

Regular water quality testing and habitat management are actively promoted by the reservoir fisheries. Sustainable aquaculture methods can be implemented to regulate waste discharge, reduce nutrient loading, and to prevent habitat destruction.

4.3. Climate adaption and resilience:-

Reservoirs act as climate stabilizers, support the aquatic life during droughts and seasonal flow variations. Fish species that are adapted to reservoir habitats show resistance to changes in temperature and water flow, which helps to maintain the environment stability for long term.

5. Challenges and limitations

5.1. Environmental challenges

Reservoir fisheries encounters various environmental challenges such as illegal fishing, overexploitation of aquatic resources, and the introduction of invasive fish species. Fluctuations in water levels, habitat destruction caused by pollution and sedimentation increasingly threatens the fish populations and overall vitality of the environment.

5.2 Economic and social Issues

Infrastructure, credit facilities and market access are still lacking in many areas. Due to their limited negotiating power and reduced benefits from fisheries value chains, small scale fishermen are often marginalized. Additionally institutional assistance for skill enhancement still remains insufficient.

5.3 Issues Related to Governance and Policy

Sustainable development is affected by fragmented governance and the absence of effective water-fisheries management strategies. Weak enforcement of fishing related policies and poor coordination between undermine the long term sustainability of resources.

6. Methods for improving reservoir fisheries to achieve SDG's

6.1. Management of sustainable Fisheries

Implementing scientific based strategies such as catch limits, equipment restrictions, and seasonal closures; encouraging the community based fisheries management (CBFM) to strengthen the local stewardship. Giving importance to local native fish species while managing the biodiversity to maintain ecological balance.

6.2. Technological Advancements

Using pen and cage culture methods to optimize space and increase output. Making use of digital technologies to assess fish stocks, strengthen the markets and ensure transparency throughout the supply chain. Enhancement of fishermen's capacity by focusing on training related to sustainable practices and business management skills.

6.3. Institutional and Policy Structures

Making of combined water and fisheries regulations that align with financial and environmental goals. Strengthening the legal rights and opportunities for the small scale fishermen's. Encouraging the public private partnerships (ppp) to promote the innovation, investment, and infrastructure development.

6.4. Assessment and Monitoring

Create quantifiable indicators to monitor the contributions towards the SDG-2"zero hunger" and SDG-14 "life below water". Implement the local residents in actively monitoring for ensuring the accountability and transparency. Encourage ongoing data collection and research in order to supports evidence based decision making.

Conclusion

Reservoir fisheries serve as vital link between food security and the protection of aquatic ecosystems, directly supporting the objectives of SDG-2(Zero Hunger) and SDG-14(Life Below Water). They provide cheap, nutrient rich food, create employment opportunities in rural areas and promoting the contribute to ecosystem stability through the protection of biodiversity and sustainable management of resources. Their multifunctional role makes them a crucial component of integrated water resources management and rural development strategies.

However, unlocking their full potential requires addressing socio-economic, ecological, and governance issues through collaborative policy making, strong scientific research, technological advancement and active participation of the community. Effective management practices supported by powerful institutional structures and inclusive governance are essential to ensure long-term benefits.

Enhancing the reservoir fisheries can serve as a foundation for eradicating hunger, strengthening the rural livelihoods and protecting aquatic biodiversity, and establishing them as essential components of sustainable development in the coming decades.

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The authors declare that there are no conflicts of interest regarding the publication of this paper.

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