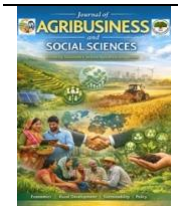

Journal of Agribusiness and Social Sciences (JASS)
ISSN: 3135-9604

https://journals.ageconfrontiers.com/jass

Mangrove Deforestation: A Threat to Coastal Agribusinesses and Blue Economies.

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A R T I C L E I N F O

Article History:
Received 07 May 2026
Accepted 10 July 2026
Available online 02 September 2026

Keywords:
Mangroves
Agribusinesses
Climate Change
Deforestation
Blue Economies

A B S T R A C T

Mangroves are among the most productive ecosystems on earth, providing a range of ecological, social, and economic benefits. Aside from maintaining biodiversity, they also play a vital role in supporting coastal agribusinesses and blue economies by sustaining fisheries, aquaculture, and eco-tourism, as well as value-added industries. Although having these benefits, global mangrove forests are undergoing rapid decline due to deforestation, largely driven by aquaculture expansion, land conversion for agriculture, and urban growth/industrial development, exacerbated by climate-driven pressures. Saltwater intrusion into farmland, deteriorating soil fertility, and increasing salinity are further complicating the operations of coastal agribusinesses. The consequences include lower yields in fisheries, increased storm vulnerability, and the loss of market opportunities (blue carbon credits & eco-certification). This review synthesizes the international literature on mangrove deforestation with a focus on implications for coastal agribusinesses. It explores the importance of mangroves in ecological and economic terms, identifies anthropogenic and climate-related drivers for deforestation, and assesses consequences for fisheries, aquaculture, agriculture, and livelihoods. Moreover, it evaluates policy frameworks and management tools, including community-based conservation, payment for ecosystem services (PES), eco-certification, and large-scale restoration. The results highlight that mangrove conservation is not only an environmental imperative but also an economic necessity. The health of mangrove forests is intrinsically linked to coastal agribusiness systems, which are major contributors to food security and to export-oriented blue economies. The actions to protect and restore mangroves are a dual investment in terms of both ecological resilience and agribusiness competitiveness. The review concludes with recommendations for incorporating natural capital assessment, policy innovation, and community involvement into mangrove management approaches to promote sustainable, resilient coastal development.

Introduction

Mangroves are halophytic woody plants that grow between land and sea in the intertidal zones of tropical and subtropical coasts. They are present in 123 countries and territories, with global coverage currently estimated at 14–15 million hectares (Singh et al., 2025). The world's largest continuous mangrove forests are in Asia (e.g., the Sundarbans of India and Bangladesh, and the Indus Delta in Pakistan), regionally followed by large expanses in Latin America (e.g., Ecuador, Brazil, and Mexico) and Africa (e.g., Nigeria and Mozambique). They account for less than 1% of the world's tropical forests but provide disproportionately large ecological and economic benefits (Zaman & Chowdhury, 2024; Kathiresan & Dagar, 2024; Kathiresan, 2021). Alongside the ecosystem services, the mangrove forests are pivotal to coastal sustainability as well. They serve as nursery grounds for fisheries, as several important fish, shrimp, and crab species use mangroves for breeding and juvenile development (Lovelock et al., 2025). They also provide sustainable protection against natural disasters and climate change mitigation through their complex neighboring systems, which help fortify shorelines, reduce wave impact, and provide natural barriers against storm surges, tsunamis, hurricanes, and cyclones (Aij et al., 2026). Thus, it also augments carbon sequestration and nutrient cycling, as it stores "blue carbon" in biomass and sediments, with a storage potential usually higher than that of tropical rainforests (Akram et al., 2023), determines nutrient flows, affects pollution loads, and contributes to the maintenance of water quality that is critical for aquaculture and coastal agriculture (Das et al., 2022). The ecological roles that mangroves play also have real economic value for agribusinesses and associated industries, such as fisheries and aquaculture, providing critical habitat for coastal fisheries and contributing billions to global seafood production each year (Guruge & Kuruppu, 2025). Mangrove-associated fisheries sustain millions of households across Southeast Asia. They prevent saltwater intrusion and protect farmlands. Crops such as rice, sugarcane, and vegetables are cultivated in deltaic areas (Schneider & Asch, 2020).

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Mangrove-based ecotourism is a fantastic opportunity for coastal tourism industries, while aquaculture producers can capitalize on market demand for eco-labels tied to sustainable mangrove management (Aij et al., 2026). From a social perspective, livelihood security is ensured, as mangroves provide timber, charcoal, honey, and medicinal resources, thereby diversifying rural income streams (Aij et al., 2026; Guruge & Kuruppu, 2025). Mangroves are critically important, yet they face extreme threats. Global mangrove coverage has decreased from 1980 to 2020 (Bunting et al., 2022; Ragavan et al., 2020). The rate of loss has slowed in recent years, but it remains critical in regions undergoing rapid expansion of aquaculture and agriculture (Hagger et al., 2022). When it comes to global hotspots, Southeast Asia is at the top of the list and accounts for over half (~53%) of mangrove deforestation resulting from shrimp farming (Fan et al., 2024) or oil palm plantations. Urban and industrial pressures are leading drivers in South Asia, seen in the Indus Delta of Pakistan and the Sundarbans of India and Bangladesh (Masood et al., 2024).

This trend of deforestation has direct and indirect impacts on coastal agribusinesses and the blue economy, including decreases in fishery catches and aquaculture production due to habitat loss (Cazcarro et al., 2022), a decline in agricultural productivity due to saltwater intrusion and erosion (Hagger et al., 2022), the vulnerability of the infrastructure and supply chains due to climate-induced disasters (Mashwama & Phesa, 2025; Swarnokar et al., 2025) and the Potential loss of income from emerging markets such as blue carbon credits and eco-certified seafood (Swarnokar et al., 2025).

This review paper synthesizes the global literature on mangrove deforestation, particularly its implications for coastal agribusinesses and blue economies. The objectives are to:

1. To understand the ecological and economic importance of mangroves.
2. To identify anthropogenic and natural drivers of mangrove deforestation.
3. To evaluate the impacts of mangrove loss on fisheries, aquaculture, and agriculture.
4. To examine examples from other parts of the world through regional case studies.
5. To examine policy frameworks, management responses, and restoration mechanisms.
6. To suggest how to incorporate conservation in sustainable coastal agribusiness strategies.

Review of Literature

Mangroves Importance: Ecological and Economic

Biodiversity and Ecosystem Services

Mangroves are known worldwide as biodiversity hotspots. Over 120 fish, 200 birds, and numerous mammal and reptile species depend on them for habitat (Mallick et al., 2025). The distinctive structural complexity of mangrove roots provides shelter and feeding grounds for juvenile fish, shrimps, and crabs, many of which are highly commercialized species (Swarnokar et al., 2025; Tengku Hashim & Suratman, 2021). This biodiversity supports food security and livelihoods in coastal communities.

In addition to their role as habitats, mangroves provide a suite of ecosystem services: they trap sediment, recycle nutrients, and regulate hydrology. These services ensure ecological equilibrium and play a crucial role in supporting the productive landscapes and seascapes on which coastal agribusinesses and blue economies depend (Cinco-Castro et al., 2022).

Protection from coastal threats and climate regulation

Along the coast, Mangroves serve as a natural barrier. These dense root systems absorb wave energy, provide erosion control, and moderate storm surge impacts, protecting agricultural lands and aquaculture ponds from flooding (Temmerman et al., 2023). Coastal areas with intact mangrove forests experienced substantially less damage and mortality than cleared areas after the 2004 Indian Ocean tsunami (Kathiresan & Dagar, 2024; Kathiresan, 2021).

Moreover, mangroves play a crucial role in regulating the climate. They rank among the most carbon-dense forests, with average aboveground and soil carbon pools of 1,000 Mg C ha^{-1} (Kauffamn et al., 2020). Their capacity to sequester and store “blue carbon” renders them an essential component of global climate mitigation strategies, as well as providing new income sources for coastal agribusinesses through participation in carbon markets and payment for ecosystem services (Basheer Ahammed et al., 2025).

Fisheries and Aquaculture Support

Mangrove-fisheries productivity is a well-documented phenomenon. Numerous economically important fish and crustacean species utilize mangroves as nursery habitat before moving into offshore environments (Blaber et al., 2022). Direct and indirect contributions of mangroves to tropical commercial fish catches have been estimated at 30–80% in some locations (Ickowitz et al., 2023).

Mangroves also help aquaculture by filtering water, cycling nutrients, and naturally controlling diseases. Integrated mangrove shrimp farming systems in Vietnam and Indonesia, for example, have been found to be more sustainable and resilient than intensive monoculture ponds (Ha Anh et al. ,2024). It shows that mangroves not only sustain wild fisheries but also give a competitive boost to aquaculture in global seafood markets.

Agricultural Productivity

Mangroves help protect agricultural productivity in deltaic and coastal plains by preventing salinity intrusion and soil erosion. Rice and sugarcane farmers in South Asia rely on freshwater flows protected by mangroves to maintain yields (Nawaz & Farooq, 2020). Mangroves regulate water balance and minimize the risk of soil salinization (Ha Anh et al. ,2024).

Moreover, mangrove products directly help rural agriculture. Leaves are utilized as fodder, wood as fuel for crop drying, and organic matter as soil fertilizer. For example, in regions like West Africa mangrove ash has been used as a potash source for crop production (Merkohasanaj et al., 2025; D'Amico et al., 2024).

Livelihood Diversity and Neighborhood Markets

Mangroves provide a lifeline against poverty for millions. They also yield non-timber products such as honey, medicinal plants, tannins, and thatching material (Aij et al., 2026; Guruge & Kuruppu, 2025). Moreover, mangrove ecotourism provides jobs and income in countries such as Thailand, Costa Rica, and the Philippines (Swangjang & Kornpiphat, 2021). They play a huge part in coastal economies. Guruge and Kuruppu (2025) estimated global values of USD 33,000 to USD 57,000 per hectare per year for mangrove ecosystem services. This translates directly into inputs for coastal agribusinesses (e.g., fisheries, wood products) and, indirectly, into services such as protection against natural disasters and climate change.

New Opportunities for Coastal Agribusinesses

As demand for sustainable and eco-certified products rises, mangroves offer coastal agribusinesses new avenues such as;

Eco-Certified Aquaculture: Certification schemes such as the Aquaculture Stewardship Council (ASC) incentivize mangrove-friendly shrimp farming by promoting greater market access and premium pricing (Malhotra., 2025).

Blue Carbon Credits: Coastal carbon markets are emerging, in which mangrove conservation and restoration projects issue tradable credits for agribusinesses to buy or benefit from (Li & Liu, 2025).

Sustainable Branding and Eco-Tourism: Mangrove-friendly agribusinesses can leverage their eco-credentials to boost brand image and draw environmentally minded travelers (Malhotra., 2025).

Drivers of Mangrove Deforestation

This is a diverse process, driven by anthropogenic activities and climatic/environmental pressures. This is important because these drivers need to be understood so that policies can be designed that will protect mangroves and balance the interests of coastal agribusinesses.

Anthropogenic Drivers

Transition in Coastal Fisheries

The single biggest cause of mangrove deforestation worldwide is the conversion of mangrove forests into aquaculture ponds, particularly for shrimp farming. Since the 1980s, Southeast Asia has seen large-scale mangrove destruction for intensive shrimp farming; Thailand, Indonesia and Vietnam have lost more than 30% of their total mangrove areas (Swangjang & Kornpiphat, 2021).

Although aquaculture also provides export revenues, converting mangroves can often lead to long-term drops in productivity due to over-nutrient loading of the water systems, disease outbreaks, and soil acidification (Blaber et al., 2022). Integrated mangrove aquaculture systems have emerged as alternatives but have been adapted only on a small scale (Malhotra., 2025).

Extensification: Agricultural Expansion and Reclamation

Mangroves are often displaced in South Asia and West Africa for rice paddies, coconut plantations, and oil palm cultivation (Bunting et al., 2022). In the coastal belt of Bangladesh, for instance, thousands of hectares of mangroves have been transformed into rice fields, exposing farmers to salinity intrusion and cyclones (Rahman & Uddin., 2021).

In Nigeria, mangrove deforestation is similarly driven by reclamation projects for farming and urban agriculture that undermine the very ecosystem services on which agriculture relies (Aransiola et al., 2024). This paradox illustrates the short-term economic rationale but also discloses the long-term ecological fragility of this type of land-use system.

Urbanization and Industrial Development

The mangrove forestation has been stressed over the years due to rapid coastal urbanization. Demand for housing, ports, and industrial estates has contributed to urban expansion in coastal cities such as Karachi (Pakistan), Jakarta (Indonesia), and Lagos (Nigeria), encroaching on mangrove habitats (Srivastava , 2020).

Oil extraction, shipping, and other industrial activities have also driven mangrove loss. Oil spills in the Niger Delta have, for instance, destroyed mangrove forests and caused substantial biodiversity losses on a livelihood scale (Aransiola et al., 2024).

Overexploitation of Mangrove Resources

Mangroves are also important to local communities for timber, fuelwood, charcoal, and tannins. Whereas subsistence harvesting is sustainable at small scales, commercial extraction has led to overharvesting and degradation in some places, such as Myanmar, India, and the Philippines (Srivastava , 2020).

In some cases, the agribusiness activities themselves rely on mangrove wood, such as smoking fish or drying crops. Without sustainable management, this creates a feedback loop in which agribusiness gains in the short term while undermining its ecological underpinnings (Bunting et al., 2022).

Shift in Climate and Environmental Pressures

Sea-Level Rise and Salinity Intrusion

Rising sea levels driven by climate change pose a long-term threat to mangroves. Mangroves can naturally restore land, but human development and agricultural land often obstruct this process, a phenomenon termed as coastal squeeze (Almeida et al., 2025; Ferreira et al., 2022).

In South Asia, salinity intrusion owing to sea-level rise and reduced freshwater flows has been a big driver of mangrove degradation, especially in the Sundarbans (Rahman & Uddin., 2021). The resulting soil salinization poses a risk to nearby farmlands, which, in turn, has direct effects on agribusiness productivity.

Cyclones, Storm Surges, and Extreme Weather Events

Mangroves are susceptible to physical destruction from cyclones and hurricanes. Cyclone Sidr (2007) in Bangladesh and Typhoon Haiyan (2013) in the Philippines destroyed mangrove forests (Malhotra., 2025).

Mangroves serve as natural buffers against storms, but repeated extreme weather events can mask their ability to regenerate. That cascades across fisheries, aquaculture ponds, and agricultural systems that rely on mangrove protective services.

Hydrological Alterations

The increased upstream dam construction and river irrigation diverted water, leading to reduced freshwater inflow and decreased sediment/nutrient availability in many mangrove ecosystems. For example, the Indus Delta in Pakistan has experienced a drastic reduction in mangrove cover due to decreased freshwater discharge from the Indus River and increased salinity (Rahman & Uddin., 2021).

Pollution and Eutrophication

Agricultural runoff, pesticides, and industrial effluents become pollutants that invade mangroves and contribute to their degradation. Eutrophication is caused by nutrient loading (Aniebone et al., 2024), and heavy metals/oil spills lead to long-term soil and water toxicity. These effects reduce mangrove resilience and, in turn, harm the productivity of coastal agribusiness systems.

Regional Case Studies

Southeast Asia

With more than 35% of global mangrove coverage, Southeast Asia has also experienced the highest rates of deforestation linked to aquaculture and oil palm plantations (Rahman et al., 2025). In Indonesia, shrimp farming was responsible for over 40% of mangrove deforestation from 1980 to 2005 (Ahmadzai et al., 2022).

South Asia

The Sundarbans in Bangladesh and India are also under pressure from agricultural expansion, shrimp farming, and upstream hydrological changes. In Pakistan's Indus Delta, approximately 95 percent of mangrove forests have been degraded from an area of 600,000 ha in 1950 to less than 100,000 ha today (Rahman & Uddin., 2021). The loss directly threatens rice farming and fisheries in Sindh province.

Africa

Mangroves are also cleared for rice farming and fuelwood in West Africa, notably in Nigeria and Senegal. Oil spills across (albeit disproportionately within) the Niger Delta have complex interlinkages that exacerbated deforestation, resulting in massive declines of fisheries and agribusiness livelihoods (Aransiola et al., 2024).

Latin America

In Ecuador and Mexico, for example, large-scale shrimp farming has displaced mangroves since the 1980s. Urban expansion in Brazil, as in Argentina, has outcompeted mangroves with the urban ecosystem and diminished fisheries that support local agribusiness chains (Aranha et al., 2025).

These drivers of mangrove deforestation reflect a common paradox, the sectors that most benefit from mangroves, fisheries, aquaculture, and agriculture, are also among their primary destroyers. It creates a perverse economic and ecological "resource trap" in which intermediate revenues destructively kill the future competitiveness of coastal agribusinesses.

Impact of Mangrove Depletion on Coastal Farming Enterprises

The degradation of these ecosystems threatens the backbone of coastal agribusinesses and exposes them more to risk, low productivity, and sustainability problems over time. Its impact lies in several ways.

Impacts on Fisheries

Mangroves are nursery habitat, feeding grounds and breeding areas for many commercially important species. Their loss interrupts the life cycles of fish, shrimp and crabs, which in turn reduces fisheries yields. Large studies in the Philippines, India, and Ecuador have shown that degraded mangrove areas can reduce local fish catches by 50–80% compared to intact mangrove systems (Bhowmick et al., 2022). The Oil spills and mangrove destruction in Nigeria's Niger Delta have drastically reduced fishery productivity, with dire impacts on coastal livelihoods (Aransiola et al., 2024). The Falling fishery productivity compels countries to rely on imported seafood, which threatens the competitiveness of local agribusinesses (Samy-kamal, 2025). For small-scale fishers, the loss of mangroves poses not only an ecological threat but also a direct threat to household income, food security, and cultural traditions related to fishing.

Impacts on Aquaculture

Aquaculture initially grows at the expense of mangroves, and this tends to be self-defeating. This is especially true in shrimp farms established on reclaimed mangrove land, where disease outbreaks often occur because poor water quality can stagnate without surrounding natural filtration (Malhotra., 2025). For example, shrimp farming in Thailand and Vietnam has taken significant economic hits due to white spot syndrome and other viral diseases. In intensive shrimp ponds, high yields are usually achieved within the first 3–5 years, but then drop sharply due to acid sulfate soils and salinization (Islam et al., 2023). Therefore, mangrove destruction is damaging to the long-term sustainability and profitability of aquaculture operations themselves.

Impacts on Agriculture

Agriculture in coastal areas is especially susceptible to mangrove loss, as mangroves prevent the continual encroachment of seawater. Their removal enables saltwater to infiltrate inland aquifers and soils, decreasing agricultural productivity (Aniebone et al., 2024). In Bangladesh, for instance, rice yields have decreased in areas cleared of mangroves due to soil salinization and waterlogging (Ahmed & Ambinakudige, 2023). The absence of mangroves to stabilize shorelines leaves farmlands vulnerable to erosion, storm surges, and cyclones. In the Indus Delta (Pakistan), mangrove loss has made crops such as rice, sugarcane, and vegetables (Akram et al., 2023) vulnerable to floods. The Farmers dealing with salinization and erosion are often forced to use costly soil amendments, salt-tolerant crops, or freshwater pumping, all of which increase production costs and reduce competitiveness.

The implications for livelihoods and rural economies

Mangrove-dwelling societies rely on several non-timber products, including honey, tannins, fodder, medicine plants, and timber. Deforestation diminishes these income flows, aggravating poverty and livelihood vulnerability (Elisha & Felix, 2021). Millions of people globally are employed in mangrove-based fisheries and aquaculture. Their decline directly translates into job losses and the abandonment of coastal villages. The Coastal communities without mangrove protection incur higher losses during cyclones, floods and tsunamis (Ihinegbu et al., 2023). The 2004 tsunami demonstrated how villages behind intact mangroves in India incurred fewer casualties than those behind cleared coastlines. The Mangroves are deeply rooted in people's traditional practices, culture, and religion. Their removal chips away at intangible heritage and community identity.

Effects on Coastal Infrastructure and Supply Chains

Mangrove ecosystems safeguard not only natural capital but also infrastructure vital for agribusiness supply chains. The Ports, storage facilities, and processing plants along the coasts are more vulnerable to storms and erosion without mangroves. The roads, cold storage, and shipping facilities around them have incurred higher maintenance costs and a greater risk of flooding. Insurance and financial risks are expanding, with businesses operating on mangrove-degraded coastlines paying higher premiums and experiencing diminished access to credit due to climate vulnerabilities (Guruge & Kuruppu, 2025).

Loss of Emerging Economic Opportunities

Deforestation is also blocking opportunities for economic diversification associated with mangrove protection. The mangroves are among the most carbon-dense ecosystems on Earth. When burned, their destruction releases substantial amounts of greenhouse gases; therefore, the loss also deprives countries of lucrative opportunities for carbon credits (Vijayan et al., 2024). Those coastal agribusinesses might do better by participating in carbon offset schemes. The Mangroves have contributed to tourism in countries like Costa Rica and Thailand. Faced with deforestation, this sector crumbles under the blow. Agribusiness firms that destroy mangroves could suffer reputational damage, while those that conserve them can build a more robust global brand (Lucey et al., 2025).

Policy Frameworks, Management Models and Solutions

Moreover, to protect mangroves effectively at the local and national levels, countries must incorporate policy frameworks, community engagement and market-based incentives. Considering the critical relationship between mangrove conservation and coastal agribusiness sustainability, policies should encompass both ecological preservation and economic viability.

International Policy Frameworks

Ramsar Convention on Wetlands

The Ramsar Convention (1971) is an apex international treaty for the conservation and sustainable use of wetlands, including mangroves (Rattan et al., 2021). The Ramsar Convention (2018) has more than 30 years of work when it comes to wetland conservation, with aim of conserving these ecosystems. by signing the first Declaration related to wetlands in 1971, which commits signatory countries such as Pakistan, India and Bangladesh towards designating Ramsar sites within their territories and the promotion of efficient practices along with their integration into national development strategies (Rattan et al., 2021).

Convention on Biological Diversity (CBD)

The CBD (2020) promotes the conservation of ecosystems, the sustainable use of their components, and the fair sharing of benefits. Mangroves are listed among the most important coastal biodiversity ecosystems, and parties to the CBD are urged to integrate mangrove forest conservation into national-level biodiversity strategies (Tsioumani, 2020).

Sustainable Development Goals (SDGs)

Mangrove conservation directly supports several SDGs:

1. SDG 13: Climate action through carbon sequestration
2. SDG 14: The life below water through fisheries and habitat protection
3. SDG 15: Life on land with biodiversity preservation
4. SDG 2 & 8: Food security and sustainable livelihoods for coastal communities

However, these international frameworks only offer guidance; it is down to nations to enforce them, and communities to take part.

National and Regional Policies

South Asia

In Bangladesh and India, the Coastal management policies have focused on integrating mangrove conservation with disaster risk reduction. Community-based afforestation in the Sundarbans is an example of a program that has successfully improved fisheries and safeguarded farmland (Sen et al., 2025). In Pakistan, the Indus Delta mangrove conservation projects promote afforestation, sustainable harvesting, and protection against illegal logging. The Freshwater diversion upstream is still a serious challenge (Ahmed et al. 2025).

Southeast Asia

Countries such as Indonesia, Thailand, and Vietnam have experimented with integrated mangrove–aquaculture systems. Conventions promoting eco-certified shrimp farming have been associated with increased environmental compliance and access to international markets (McSherry et al., 2023; Lai et al., 2022).

Africa

Focusing on co-management through policy with local communities, mangrove protection, and sustainable livelihood alternatives has been shown to be effective in Nigeria (Sam & Onyena, 2026) and Senegal (Phong et al., 2023).

Latin America

As such, Ecuador and Mexico have established marine protected areas (MPAs) and mangrove reserves to curb the expansion of aquaculture while simultaneously boosting ecotourism. By implementing these policies, partial restoration of mangrove cover has been achieved while sustaining economic activities (Mestanza-Ramón et al., 2023).

Community-Based Management

Involving the community is key to achieving effective mangrove conservation. Studies suggest that involving local stakeholders and community-friendly initiatives improve plantation survival rates and reduce illegal logging. Key strategies, such as Participatory Mapping and Zoning, help residents identify zones for conservation, aquaculture, or sustainable extraction. The Training of communities on Sustainable Aquaculture, Agroforestry and Mangrove Monitoring for Conservation and Livelihoods appeared as a useful participatory approach (Mondal et al., 2022)

Market-Based and Economic Instruments

Blue Carbon Credits

Restoring mangroves can help create carbon credits, adding an economic incentive for conservation. So far, projects in Indonesia, the Philippines and Mexico have shown that coastal agribusinesses can reduce greenhouse gas emissions while improving their bottom line (Khatri-Chhetri et al., 2021).

Eco-Certification and Sustainable Branding

Eco-certification of aquaculture and fisheries encourages mangrove-friendly practices. Consumers pay premium prices for shrimp or fish that have not been produced by destroying mangroves (Hossain et al., 2024).

Ecosystem Services Payment (PES)

Payment for ecosystem services (PES) schemes incentivize landholders and communities to sustain various ecosystem services relevant to downstream agribusinesses, including coastal protection and water filtration (Sam & Onyena, 2026).

Conclusions and Implications

Mangrove ecosystems are crucial for coastal agribusiness and blue economies. They offer key services, including fisheries nurseries, coastal protection, carbon sequestration, water filtration and livelihoods. These services are particularly important to coastal agribusinesses, including fisheries, aquaculture, agriculture and eco-tourism.

Mangroves, however, are under enormous threat globally despite their importance. Overexploitation, agricultural conversion, aquaculture expansion, urbanization, and industrial development as anthropogenic activities have greatly accelerated deforestation. Climate change and other environmental pressures, such as sea-level rise, cyclones, salinity intrusion, and hydrological changes, compound these losses. The consequences are dire: declining fishery yields, lower aquaculture productivity, salinization and erosion of farmland, increased exposure to natural disasters, loss of non-timber products, and reduced opportunities in blue carbon

markets and eco-certified supply chains.

Coastal agribusinesses, which underpin food security and local economies, are particularly vulnerable to these risks. Conserving, restoring, and sustainably managing mangroves is thus both an ecological imperative and a strategic economic investment.

Recommendations

Drawing on global literature and regional case studies, the following strategies are recommended:

1. Strengthen Policy and Governance:

There is a need to implement mangrove protection laws at the national and regional levels, and to incorporate mangrove conservation into coastal land use, agribusiness planning, and national policies, aligning with international frameworks such as the Ramsar Convention, the CBD, and the SDGs.

2. Promote Community-Based Management:

An effective intervention will be to promote local community involvement in participatory mapping, zoning, and benefit-sharing through training on sustainable aquaculture and agriculture, mangrove monitoring. This will Promote the alternative livelihoods to make mangrove exploitation less appealing.

3. Adopt Market-Based Incentives:

Market-based incentives can be achieved by promoting eco-certification in fisheries and aquaculture, and by encouraging participation in blue carbon markets and PES systems to provide economic incentives for the conservation of mangrove habitats.

4. Implement Restoration and Rehabilitation Programs:

There is a need to rehabilitate degraded mangroves using native species and hydrological management. This restoration can be achieved by integrating agroforestry or aquaculture to maximize the integration of ecology and agribusiness. Tracking these restoration projects using remote sensing, GIS, and adaptive management frameworks will be very useful and effective.

5. Enhance Research and Knowledge Dissemination:

The Implementation of long-term studies to measure the effects of mangrove loss on fisheries, agriculture, and livelihoods is a dire need. To achieve this, the timely exchange of best practices in mangrove conservation and sustainable agribusiness practices will be pivotal. The awareness campaigns to highlight the relationship between mangrove health and agribusiness sustainability will also be very useful.

6. Build Climate Resilience:

Integrating mangroves into coastal disaster risk reduction will help design early warning systems and adaptive management plans for agribusinesses at risk of climate-related hazards.

Overall, the mangrove conservation is a two-way deal: Naturally safeguarding ecosystems and building economic resilience for coastal agribusinesses. A wide range of global experience indicates the most effective response combines policy enforcement, community engagement, market incentives, and technological innovation. Integrated management approaches, if adopted by coastal countries, can protect biodiversity while improving food security, optimizing climate-related risks, and ensuring livelihoods.

Ultimately, mangrove health will dictate the future viability of coastal agribusinesses, so conserving them is both an ecological and economic strategic imperative.

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