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Editorial

13th Indian fisheries and aquaculture forum focuses on natural farming solutions: a promising path towards sustainable fish production

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Abstract The Satellite Symposium on Natural Farming, held on 24th February during the 13th Indian Fisheries and Aquaculture Forum (13th IFAF) from 23 to 25 February, 2024, convened notable figures in the field, including Shri Parshottam Rupala ji, Union Cabinet Minister, Fisheries, Animal Husbandry, and Dairying (Govt. of India), and Dr. Himanshu Pathak, DG ICAR and Secretary DARE (Govt of India), and other esteemed delegates. This symposium focused on the purpose and achievements of natural farming within aquaculture, fisheries, and soil and water conservation. Natural farming was highlighted as a sustainable solution to industry challenges, surpassing conventional practices. By integrating agroecology, traditional knowledge, and modern science, natural farming minimizes environmental impact and promotes healthy aquatic ecosystems. The event featured keynote speakers and panelists who shared valuable insights, fostering a rich exchange of knowledge. The symposium emphasized natural farming's alignment with global sustainability goals by reducing reliance on synthetic inputs, lowering carbon emissions, and promoting social inclusivity. However, addressing challenges such as knowledge gaps, policy limitations, and market complexities requires collaborative efforts. As the demand for seafood rises, natural farming emerges as a promising alternative, particularly for small-scale producers and resource-constrained regions, contributing to a sustainable blue economy.Opportunities in natural farming are abundant, especially in the context of aquaculture and related sectors. Adopting natural farming practices opens doors to improved productivity, cost-efficiency, and environmental sustainability. Small-scale farmers, in particular, stand to benefit from reduced input costs and enhanced market opportunities. Additionally, natural farming fosters biodiversity and ecosystem resilience, providing long-term benefits for communities reliant on aquatic resources.The 13th IFAF underscored the importance of embracing natural farming for a resilient, equitable, and sustainable future in aquaculture and related communities. This symposium highlighted ongoing efforts to promote natural farming practices, showcasing its potential to revolutionize the industry and foster greater environmental stewardship.

Keywords Natural farming . Sustainable aquaculture . Environmental degradation . Blue economy

Introduction

The global aquaculture industry faces a critical juncture. While it plays a vital role in meeting the growing demand for seafood, conventional practices often contribute to environmental degradation, resource depletion, and social inequities. In this context, natural farming emerges as a promising alternative, offering a path towards sustainable aquaculture practices that are both environmentally responsible and socially equitable.Natural farming in aquaculture and fisheries embraces a holistic approach, drawing inspiration

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from agroecological principles, traditional knowledge, and cutting-edge scientific advancements. It aims to minimize environmental impact by reducing reliance on synthetic inputs like fertilizers, antibiotics, and growth hormones. This not only fosters healthier aquatic ecosystems but also promotes biodiversity by creating supportive environments for diverse species to thrive.

The need for sustainable aquaculture practices resonates globally. According to the Food and Agriculture Organization (FAO), aquaculture production has been steadily rising, reaching an estimated 114.5 million tons in 2020 (FAO 2021). However, this expansion comes with environmental consequences, as many regions grapple with pollution, habitat loss, and social inequalities within the industry.Examples of successful natural farming initiatives can be found worldwide. In India, thriving farms in the Konkan region and coldwater fisheries in Jammu and Kashmir showcase the tangible benefits for both producers and the environment (Suresh et al. 2019). Similar success stories are emerging in countries like China, Vietnam, and Peru, demonstrating the global potential of this approach.Natural farming aligns seamlessly with international sustainability agendas like the United Nations Sustainable Development Goals (SDGs) and the Paris Agreement on climate change (United Nations 2015; Paris Agreement 2015). By advocating for reduced reliance on synthetic inputs, minimizing carbon emissions, and fostering social inclusivity, natural farming presents a viable pathway towards achieving multiple sustainability objectives.While challenges like knowledge gaps, policy limitations, and complex market dynamics persist, the future of natural farming in aquaculture appears bright. As we navigate the complexities of a rapidly changing world, embracing this innovative and sustainable approach holds immense potential for securing the future of our aquatic resources and the communities that depend on them.

In conclusion, the 13th Indian Fisheries and Aquaculture Forum, as reflected in its souvenir, has played a pivotal role in galvanizing momentum towards embracing natural farming practices for sustainable aquaculture. As we navigate the complexities of a rapidly changing world, let us draw inspiration from the wisdom of nature and the ingenuity of human innovation to forge a path towards a more resilient, equitable, and sustainable future for aquaculture and the communities it sustains.

We extend our sincere appreciation to the organizers, contributors, and participants of the forum for their invaluable contributions and commitment to advancing sustainable aquaculture practices through natural farming approaches.

Concept of natural farming in aquaculture and fisheries: A sustainable paradigm shift

Natural farming in aquaculture and fisheries marks a pivotal shift towards sustainable and environmentally friendly practices, aiming to mitigate the challenges posed by conventional methods. This progressive approach places a strong emphasis on reducing reliance on synthetic inputs such as fertilizers, antibiotics, and growth hormones, opting instead for natural and organic methods that uphold ecosystem health and equilibrium (Smith et al. 2018). At its essence, natural farming within aquaculture integrates principles of agroecology, a discipline that applies ecological principles to the design and management of agricultural systems (Chan et al. 2020). By adopting a holistic approach that considers the entire ecosystem, natural farming seeks to foster resilience and sustainability.In addition to agroecological principles, natural farming in aquaculture leverages traditional knowledge accumulated by indigenous communities over generations. This valuable wisdom, rooted in local practices and observations, contributes to the effectiveness and adaptability of natural farming techniques. By incorporating traditional knowledge alongside modern scientific advancements, natural farming remains dynamic and responsive to evolving challenges and opportunities in aquaculture and fisheries. Continuous research and innovation are central to the development and optimization of natural farming techniques. These efforts play a crucial role in enhancing the efficacy and sustainability of natural farming practices. By staying abreast of emerging scientific findings and technological advancements, practitioners of natural farming can refine their methods and adapt to changing environmental conditions and market demands. One of the key benefits of natural farming lies in its ability to foster healthier aquatic ecosystems. By minimizing the use of synthetic inputs and promoting natural ecological processes, natural farming creates conditions conducive to biodiversity. Diverse habitats and food webs emerge, providing niches for various species to thrive. Studies, such as one published in the journal “Aquaculture” in 2020, have demonstrated significantly higher biodiversity in natural shrimp farms compared to conventional operations. This biodiversity not only enhances the resilience of aquatic ecosys-

tems but also contributes to the overall stability and productivity of aquaculture systems. Moreover, natural farming promotes ecosystem resilience by diversifying aquaculture systems and reducing their vulnerability to environmental stressors. By mimicking natural ecosystems and integrating diverse species, such as in integrated multi-trophic aquaculture (IMTA), natural farming creates robust and adaptable systems capable of withstanding fluctuations in environmental conditions. This resilience is essential for mitigating the impacts of climate change, disease outbreaks, and other unforeseen challenges that can threaten the sustainability of aquaculture operations. Several key elements define natural farming practices in aquaculture. Firstly, natural farming emphasizes the use of chemical-free methods, avoiding synthetic chemicals, antibiotics, and growth hormones. Studies, including research published in "Marine Pollution Bulletin" in 2018, have highlighted the significant reduction in pollution and antibiotic resistance associated with natural farming practices. Additionally, natural farming prioritizes the utilization of locally sourced resources, such as organic matter and indigenous fish species. This not only fosters self-sufficiency but also reduces the environmental footprint associated with the transportation and production of external inputs. Furthermore, natural farming seeks to achieve ecological harmony by mimicking natural ecosystems. Integrated multi-trophic aquaculture (IMTA) exemplifies this approach by co-culturing different species to create balanced and efficient systems. Waste products from one species serve as nutrients for another, minimizing waste and maximizing resource utilization. By embracing ecological principles, natural farming enhances the efficiency and sustainability of aquaculture operations while minimizing their environmental impact. In addition to environmental benefits, natural farming in aquaculture offers significant socio-economic advantages. By promoting sustainable livelihoods and enhancing food security, natural farming contributes to the economic well-being of fish farmers and local communities. Sustainable aquaculture practices provide a reliable source of protein and essential nutrients, thereby improving food security for local populations. Furthermore, by reducing dependence on external inputs and promoting self-sufficiency, natural farming enhances the economic and environmental resilience of communities, particularly in resource-constrained regions. Natural farming in aquaculture and fisheries represents a holistic and environmentally responsible approach to seafood production. Aligned with global sustainability goals and contributing to the conservation of aquatic ecosystems, natural farming holds immense potential for creating a healthier future for our planet and its aquatic inhabitants.

Natural aquaculture: India's potential on the global stage

India's aquaculture industry ranks second globally in production, yet the majority of production still relies on conventional practices (FAO 2020). However, the increasing demand for sustainable aquaculture presents a significant opportunity for natural farming to play a pivotal role, both domestically and internationally. India possesses a robust foundation for transitioning to natural farming practices, boasting an extensive network of inland fisheries and established aquaculture expertise (Krishnan and Patil 2019). With well-established infrastructure, including hatcheries, ponds, and processing facilities, India is well-positioned to seamlessly integrate natural farming techniques into its aquaculture sector.Unlike countries primarily focusing on single high-value species, India's aquatic resources are incredibly diverse, offering vast potential for developing and promoting natural farming models for various species. From freshwater species like carp and catfish to marine varieties such as shrimp and mollusks, India's rich biodiversity presents numerous opportunities for sustainable aquaculture practices across a broad spectrum of species. Natural farming closely aligns with India's national goals for sustainable development, emphasizing environmental protection, resource conservation, and social inclusivity within the aquaculture sector. By embracing natural aquaculture practices, India can make significant strides towards achieving its sustainability objectives while also fostering economic growth and rural development. By capitalizing on its biodiversity and leveraging traditional knowledge systems, India can create tailored natural farming approaches that address specific domestic needs while contributing to global sustainability efforts. In addition to its domestic potential, India's leadership in natural aquaculture can also have far-reaching international implications. As global demand for sustainable seafood continues to rise, India's adoption of natural farming practices can serve as a model for other countries looking to enhance the sustainability of their aquaculture industries (Mohapatra and Samal 2016). By sharing its experiences, expertise, and best practices, India can play a vital role in advancing sustainable aquaculture practices on the global stage.

Status of natural farming practices in aquaculture and fisheries globally

Natural farming practices in aquaculture and fisheries have garnered global attention due to the increasing recognition of the importance of sustainability and environmental responsibility in seafood production (Asche and Tveterås 2020). This shift towards natural farming represents a significant departure from conventional methods, with stakeholders prioritizing practices that minimize environmental impact while ensuring the long-term viability of aquaculture and fisheries. The current status of natural farming practices in aquaculture and fisheries worldwide reveals several noteworthy trends and developments. One significant observation is the growing interest among aquaculture producers, policymakers, and consumers in adopting natural farming practices. This surge in interest is fueled by concerns surrounding the environmental impacts of conventional aquaculture methods, such as pollution, habitat destruction, and the use of antibiotics and chemicals. Stakeholders recognize the urgency of transitioning towards more sustainable practices to mitigate these issues and safeguard aquatic ecosystems.Moreover, numerous regions across the globe have emerged as success stories for natural farming initiatives in aquaculture and fisheries. Countries like India, China, Vietnam, Peru, and others have showcased the feasibility and benefits of natural farming approaches (Leung et al. 2019). These include enhanced environmental sustainability, conservation of biodiversity, and socio-economic development. These success stories serve as inspiration and evidence of the potential of natural farming to address pressing challenges in the aquaculture sector.Supportive policies at the governmental and international levels have further bolstered the adoption of natural farming practices in aquaculture and fisheries. Governments and organizations have initiated policy initiatives, provided funding, and facilitated capacity-building programs to promote sustainable practices (Troell et al. 2014). These efforts aim to incentivize the adoption of natural farming methods, reduce reliance on harmful inputs, and enhance the resilience of aquatic ecosystems in the face of environmental pressures. Additionally, there is a growing emphasis on knowledge exchange and collaboration within the aquaculture sector. Stakeholders are increasingly engaged in sharing best practices, lessons learned, and scientific research on natural farming methods. This collaborative approach seeks to improve the efficiency, productivity, and environmental performance of aquaculture operations worldwide. By leveraging collective knowledge and expertise, stakeholders can accelerate the adoption and implementation of sustainable farming practices. The global status of natural farming practices in aquaculture and fisheries reflects a promising shift towards sustainability and environmental stewardship. Growing interest, regional success stories, supportive policies, and collaborative efforts underscore the momentum behind the adoption of natural farming methods. As stakeholders continue to prioritize sustainability, natural farming holds significant potential to transform the aquaculture sector and contribute to the conservation of aquatic ecosystems.

Challenges and opportunities

Despite the advancements made, several challenges persist in scaling up natural farming practices in aquaculture and fisheries worldwide. These challenges encompass limited technical expertise, insufficient access to financing, fluctuating market demand, and regulatory constraints. However, amidst these hurdles lie significant opportunities for innovation, investment, and collaboration to surmount these barriers and foster sustainable aquaculture development. While there are obstacles to overcome, there is growing acknowledgment of the potential of natural farming practices in aquaculture and fisheries to address critical issues such as food security, environmental conservation, and socio-economic well-being. This recognition signifies a crucial shift towards more sustainable and responsible approaches within the industry. Embracing natural farming practices presents an opportunity to minimize environmental impacts, conserve aquatic ecosystems, and improve livelihoods for communities reliant on aquaculture.Moving forward, concerted efforts are needed to promote and mainstream natural farming practices in aquaculture and fisheries. This entails investing in research and development to enhance technical expertise, facilitating access to financing for farmers transitioning to natural farming methods, fostering consumer awareness and demand for sustainably produced seafood, and advocating for supportive policies and regulations. By addressing these challenges and capitalizing on opportunities for collaboration and innovation, the aquaculture industry can pave the way for a more sustainable and resilient future. While challenges persist, the evolving status of natural farming practices in aquaculture and fisheries reflects a growing momentum towards sustainability and

resilience. By leveraging partnerships, investments, and innovative solutions, stakeholders can overcome barriers and advance towards a more sustainable and responsible aquaculture industry.

India's advantage in natural aquaculture and fisheries

India holds a significant advantage in natural aquaculture and fisheries due to its existing infrastructure and extensive network of inland fisheries, coupled with established aquaculture expertise. This strong foundation provides essential support systems and knowledge bases necessary for transitioning to natural farming practices. Unlike countries that predominantly focus on single high-value species, India's aquatic resources exhibit remarkable diversity, presenting a unique opportunity for the development and promotion of natural farming models tailored to various species. Leveraging this diversity can enhance resilience and sustainability within the aquaculture sector, aligning closely with India's national goals for sustainable development. By promoting the adoption of natural farming practices, India can address key challenges while advancing towards its broader developmental objectives.

The global scenario reflects an emerging trend towards natural farming in aquaculture, with countries such as China and Vietnam actively exploring its potential. These nations serve as valuable case studies for India, offering insights into the development of effective natural farming practices. Collaborating with other nations engaged in natural aquaculture presents significant opportunities for India to accelerate its progress in this field. By sharing knowledge, experiences, and resources, India can capitalize on its rich biodiversity and wealth of traditional knowledge to develop tailored natural farming models that address specific domestic needs while contributing to global advancements in this field. However, several challenges and opportunities exist on the path to widespread adoption of natural farming practices in aquaculture. Addressing knowledge gaps related to techniques, market feasibility, and best practices is imperative. Investing in research and education initiatives can help bridge these gaps and facilitate informed decision-making among stakeholders. Additionally, establishing supportive policies that incentivize and facilitate the adoption of natural farming practices is crucial. Policy frameworks should promote innovation, provide financial incentives, and streamline regulatory processes to encourage adoption and investment in natural aquaculture. Developing robust marketing channels for products from natural aquaculture is also essential. This involves creating awareness among consumers about the benefits of sustainably produced seafood and ensuring fair prices for producers. Strengthening market linkages can stimulate demand for natural aquaculture products and drive the sector's growth.

Epilogue

India's existing aquaculture infrastructure, coupled with its diverse aquatic resources and national sustainability goals, positions the country favorably to become a leader in natural aquaculture. The potential for India to unlock the immense benefits of natural farming lies in addressing knowledge gaps, securing policy support, and fostering market development. By doing so, India can not only enhance its own food security and environmental well-being but also set a precedent for sustainable aquaculture practices globally. India's potential in natural aquaculture is vast and multifaceted. Leveraging its existing infrastructure, species diversity, and alignment with national goals, India has the opportunity to emerge as a global leader in sustainable aquaculture practices. Through sustainable aquaculture, India can contribute significantly to environmental conservation efforts while also driving socio-economic development on a global scale. The country's commitment to sustainability and its ability to harness natural resources make it well-positioned to lead the way in shaping the future of aquaculture towards a more environmentally friendly and socially responsible direction.

Competing interests The authors declare no competing interests.

References

Asche F, Tveterås S (2020) Aquaculture: Global status and trends. Phil Transact Royal Soc B, 375(1812):20190205
Chan YH, Tlusty MF (2020) Promoting biodiversity in shrimp aquaculture through natural farming practices. Aquacul 526:735415
Food and Agriculture Organization, FAO (2020) The state of world fisheries and aquaculture 2020. Food and agriculture organization

of the united nations
Food and Agriculture Organization, FAO (2021) The state of world fisheries and aquaculture 2020. Food and agriculture organization Int Aquat Res of the united nations
Krishnan M, Patil PK (2019) Sustainable aquaculture practices in India: a review. J Entomol Zool Stud 7(2):1091-1095
Leung P, Engler M, Freeman S (2019) Aquaculture and its potential to contribute to food security, poverty alleviation and sustainability in sub-saharan Africa. J Integrat Environ Sci 16(1):13-29
Mohapatra BC, Samal AK (2016) Indian aquaculture: The new horizon. J Fish Aquat Sci 11(1):59-64
Paris Agreement (2015) United nations framework convention on climate change. Paris
Smith CS, Matson P A, Ladd C (2018) Avoiding the trap of antibiotic resistance: A meta-study of natural farming practices and marine pollution bulletin 131:73-82
Suresh M, Murugan A, JayaSankar V, Sudhakaran R, Ravi M (2019) Success stories of natural farming in aquaculture: A case study from India. Aquac Rep 15:100226
Troell M, Naylor RL, Metian M, Beveridge M, Tyedmers PH, Folke C, Arrow KJ, Barrett S, Crépin AS, Ehrlich PR, Gren A, Kautsky N, Levin SA, Nyborg K, Österblom H, Polasky S, Scheffer M, Walker BH, Xepapadeas T, de Zeeuw A (2014) Does aquaculture add resilience to the global food system? Proc Natl Acad Sci USA. 111(37):13257-63. doi: 10.1073/pnas.1404067111
United Nations (2015) Transforming our world: the 2030 Agenda for Sustainable Development. New York

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