Chapter 6

Integrating Traditional Ecological Knowledge With Fuzzy Logic and Quantum Computing for Sustainable Agriculture in Tribal Areas of Tripura

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ABSTRACT

This chapter examines the relationship between fuzzy logic, quantum computing, and traditional ecological knowledge (   ) about sustainable agriculture in tribal environments, with a special emphasis on the northeast Indian state of Tripura. We suggest a hybrid decision-support framework that can handle the intricate, unpredictable, and dynamic character of agricultural decision-making in climate-vulnerable, culturally diverse regions by fusing traditional knowledge with state-

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of-the-art technologies. The theoretical underpinnings of fuzzy logic and quantum computing, their applicability to agriculture, their potential for collaboration, and a suggested model specifically designed for tribal societies are all covered in this chapter. We illustrate the viability and transformative potential of this integration via case studies, emphasizing how it can influence policy and strengthen the position of Indigenous people in Tripura.

1. INTRODUCTION

A possible method for making sustainable agricultural decisions is to combine 𝕋𝔼𝕂 with cutting-edge technology like fuzzy logic and quantum computing, particularly in tribal areas like Tripura that are both culturally diverse and vulnerable to climate change. To create resilient agricultural systems, this synthesis examines the importance of 𝕋𝔼𝕂, the possibilities of technology integration, and the difficulties and possibilities of bridging these fields. Because of its ecological and cultural Importance within Indigenous societies, 𝕋𝔼𝕂 is a deeply embedded system of environmental knowledge that drives adaptive management, biodiversity protection, and sustainable resource use (Haq et al., 2023; Sharma, 2017; Hosen et al., 2020; Wright, 2020; Finn et al, 2017; Katu Amina, 2025).

The use of 𝕋𝔼𝕂 helps to promote sustainable development in the long run, to ensure social-ecological resilience, and food security, particularly in areas where resources are scarce and regions are affected by climate change (Haq et al., 2023; Sharma, 2017; Hosen et al., 2020; Albuquerque et al., 2024; Finn et al., 2017). 𝕋𝔼𝕂 faces threats due to the modernization processes, the invasion of new ways of doing things, and table-turning socio-economic factors (Haq et al., 2023; Sharma, 2017; Katu Amina, 2025). When used together with research and scientifically informed policies as well as new technologies, 𝕋𝔼𝕂 can improve environmental management and support all stakeholders, such as Indigenous peoples and regulatory agencies (Abdullah and Khan, 2023; Albuquerque et al., 2024; Finn et al., 2017; Katu Amina, 2025).

There is a possibility to integrate 𝕋𝔼𝕂 with the use of computational tools to support adaptive management, species selection, and monitoring across restoration initiatives and agricultural systems (Haq et al., 2023; Sharma, 2017; Finn et al., 2017; Katu Amina, 2025). Computational tools provide a model for managing uncertainty and complexity in ecological and agricultural decision-making, which is similar to the context-specific and situation-free nature of 𝕋𝔼𝕂 (Haq et al., 2023; Sharma, 2017). This combined approach offers methods of novel solutions to intricate ecological issues, like optimization and modeling, which apply to the field of sustainable farming and ecosystem management (Woolnough et al., 2023). 𝕋𝔼𝕂 in combination with

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