

Digital Twins based System in Smart Farming

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Abstract

In this paper we present a smart farming system that combines several aspects which are fish farming, aquaculture, duckweed cultivation, and crop production in order to enhance the food quality, reduce costs, and increase income. The proposed system uses a digital twin technology that represents the virtual model connected to real sensors to monitor and control the system in real time.

In comparison to Azolla, duckweed is characterized as an aquatic plant that grows quickly, is high in protein, is easier to grow, and is more versatile. It can be used as a natural crop fertilizer and is fed to cows, fish, and poultry. Duckweed plants irrigated by using the wastewater used in fish basins that allow creating a circular system that recycles nutrients and decreases pollution.

Temperature, nutrient levels, and water quality are all measured by sensors by integrating AI algorithms the system can early detect the problem, fertilization optimization such as NPK, and plant growth prediction. Farmers can model various scenarios and improve their decision making with the help of the digital twin.

Particularly in arid or rural areas, this integrated system provides an adequate and environmentally responsible smart agriculture solution by using simple technology and local resources to increase sustainability, productivity, and animal health.

Index Terms

Digital Twins; Smart Farming; Sensors; Internet of Things