IoT-based Smart Fish Farm

Problem Statement

Bangladesh is the 5th largest aquaculture-producing country in the world. Fish farms are the most extensive aquaculture production unit used in Bangladesh. The total production of fish was 7.54 (0.7 million) lakh tonnes in the 1983-84 fiscal year. In 33 years, the production has increased to 41.34 lakh tonnes in the 2016-17 fiscal year. Meaning, in this period, the total fish production has increased 5.5 times. In addition along with the production, the demand for aquaculture products is rising day by day. According to the Bangladesh Bureau of Statistics, the daily fish consumption amount of Bangladeshis has increased as well up to 62.58 grams from 60 grams. Active and proper fish farm management is essential to maintain the maximum aquaculture production level and to ensure the world demands the best quality aquaculture products.

With the continuous expansion of aquaculture scale and density, contemporary aquaculture methods have been forced to overproduce resulting in the accelerated imbalance rate of the water environment, the frequent occurrence of fish diseases, and the decline of aquatic product quality. Maintaining accurate water quality for nurturing aquatic products is highly crucial and due to a lack of frequent observation, the challenge has become tough to mitigate. The main challenges are the lack of farm labourers, an increase of ammonia in water, a decrease in oxygen, a high price of fish feed, a lack of nutrition in feed, etc. The four main water parameters to be maintained properly for profitable aquaculture cultivation are; dissolved oxygen (DO), the temperature of the water, salinity, and hydrogen potential (pH). The perfect content of these parameters varies with the type of aquaculture and the species to be cultured.

Solution

Under this project the automation of a fish farm through the automation of fish feed application system, water distribution and exchange system, Aeration system, water quality, and environmental parameter monitoring system. Overall the solution will make a total solution for communicating and control of all electrical devices through internet-based smart management. The solution involves a microcontroller-based IoT device that will be able to read the sensor data and operate a machine from anywhere. The IoT-based water quality monitoring system monitors the water quality in real-time and reduces the cost of production, increases efficiency, reduces human dependency, and thus ensures sustainable development economically and socially.

Impact

The proposed system monitors the water quality in real-time and sends a notification to the user instantly, which reduces the risk. Upon using the proposed solution, a farmer will be able to get real-time information on water pH, Dissolved Oxygen, etc. The device will be able to reduce 5 to 20% of the application of fish feed, which reduces water pollution and increases the fish farm productivity and income. It is possible to integrate more water quality sensors such as pH, turbidity, oxygen, etc. As per the sources, the overall installation of the smart device will cost a farmer 1.5 lac taka per acre.

Benefits for Fish Farmers from IoT-based Smart Fish Farm
- The fish farmers will be able to reduce the farm labor
- The fish farmers will be able to reduce the operational cost of a fish farm
- All types of fans will be able to use the device in both fish farms, poultry, livestock, and agriculture farm
- The device has an easy operational process because of the mobile application, computer application, and the remote control
- The farmers will be able to reduce human error in an agricultural-related farm
- The farmers will be able to increase the fish, poultry, and agriculture farm productivity and income
- Sensor based Fish farm automation