**1st Topic: AQua: An Energy-Efficient Water Quality and Monitoring System**

**EXECUTIVE SUMMARY**

Aquaculture is the world's fastest-growing food production method, with fish farms producing roughly half of all fish consumed by humans. Aquaculture is particularly popular in the Philippines at the farm level since it increases rural employment, livelihood, and food security, thus growing the production of the aquaculture industry. However, aqua farmers face several difficulties and concerns that have an impact on their output. With the integration of the Arduino, the project aims to build an energy-efficient water quality monitoring system that can transmit real-time data to aquaculturists and government officials' mobile phones in selected regions of Mindanao, Philippines. The water parameters to be measured are the pH, oxidation reduction potential, temperature, dissolved oxygen, total dissolved solid, and turbidity. The SMS contains information on all the parameters analyzed at a specific time interval and warning if any parameters' values exceed the permissible levels. The data collected from the sensors were recorded and analyzed using the PLX-DAQ software. The goal of this study is to increase yield production and reduce fish kills in the aquaculture industry.

**Objectives**

General

The main objective of this research is to develop a real-time water quality progress report for water treatment ensuring a safe natatory environment for aquaculture using Arduino.

Specific

This research project aims to achieve the following:

Design and construct the AQua device using Arduino Uno.

Monitor water pH, temperature, dissolved oxygen, total dissolved solids, oxidation reduction potential and turbidity using AQua.

Assess the accuracy of the results when applied to a wide range of water conditions and different water samples.

Display accurate readings in AQua through LCD and store the reports in an excel sheet using the PLX-DAQ software tool.

Disseminate real-time information regarding the water quality to respective aquaculturists and local government authorities using a GSM module.

**Significance of the Study**

Aquaculture is the practice of raising, reproducing, and harvesting aquatic organisms in a controlled natatory environment such as seas, lakes, rivers, ponds, and streams. The expansion of this industry is essential to addressing food production, restoration of threatened and endangered species populations, wild stock population enhancement, the building of aquariums, fish cultures, and habitat restoration. Since it is popular at the farm level, it provides increased rural employment and livelihood. Associated with its rise, however, are compounding problems brought by poor water quality. Thus, our project aims to aid in the rapid transmission of water parameter data to specified local government officials and specialists, that is to say, critical in the water treatment decision-making and action-taking process.

**IoT-based Flood Level Detector and Drainage Management System**

Most of the drains found in highly urbanized areas are congested in many places and as a result the flow in the drain is obstructed heavily. According to Dr. Agripino Dacera Jr., City Disaster Risk Reduction and Management Office head, the heavy flooding, which reportedly reached waist-deep in some areas last May this year, was reported in 12 of the city’s 26 barangays. The situation was worsened by the clogged canals and other waterways, posing a great problem in city dwellers' daily lives. As a result, the proposed system aims to detect the flood level. Once the parameters exceed the permissible levels, it notifies the central unit to automate the blockage detection and blockage removal system which temporarily removes the waste to reduce workload and ensure proper water flow. For continuous standalone power supply, a solar panel setup was added as using a battery cell might require routine maintenance. The parameters considered in detecting flood were temperature, rainfall, and humidity. With the help of the ESP8266 wifi module, the sensor data values are transmitted to the Thingspeak cloud website for easy access of the authorities and local government officials.