

## ABSTRACT

Agriculture is the knowledge of the process of producing food from plants. In the management of agriculture, especially in the process of farming, a new method was found, namely the hydroponic method. The hydroponic method is a method of farming that does not use soil (land) but uses many alternative media such as water, pipes, and others.

The Hydroponic method can use several plants, one of which is Red Spinach (*Amaranthus tricolor L.*). Red spinach plants in hydroponics require attention to several parameters that will affect plant growth. Some parameters are: water pH, and total solids in water. To keep the process parameters at the limit, we need humans or a tool that can maintain perfect hydroponic conditions, that's why an Early Warning System was created.

The Early Warning System created will automatically keep the parameters in hydroponics at their limits so that plant growth is maintained without obstacles. An Early Warning System is also made using IoT (Internet of Things) with the aim of providing information on parameters that are in hydroponics to humans so that hydroponics can still be monitored from anywhere.

The Early Warning System is created from the integration of all hardware and software. Some of the hardware used are: microcontroller, TDS sensor, water pH sensor, relay actuator, pump actuator, etc. Some of the software used are: MQTT IoT platform, Machine Learning KNN Algorithm, and Android application. The hardware and software are made with the aim of being durable and solving some of the problems that would occur in hydroponics. From the experimental results of selected parameters, successful experimental results are obtained to maintain hydroponic parameters. Parameters data and actuators can be seen in the android application was made.

**Keywords:** Hydroponic, Red Spinach, Early Warning System, IoT, KNN, Android