

# AquaGrow – A Smart Aquaponics Gardening System

*Project by:*

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## Project Description

“Aquaponics is a revolutionary system for growing plants by fertilizing them with the waste water from fish in a sustainable closed system. A combination of aquaculture and hydroponics, aquaponics gardening is an amazingly productive way to grow organic vegetables, greens, herbs, and fruits, while providing the added benefits of fresh fish as a safe, healthy source of protein.” – Sylvia Bernstein

Given the undeniable benefits of an aquaponics system for home growers, it’s essential that aquaponics users monitor many aspects of their system to maintain a healthy environment for the optimal growing condition. Elements such as temperature, sunlight, pH level, nitrate level, water level, etc. for both the fish tank and the growing bed must be regularly supervised, which may be a time-consuming factor for some people. Additionally, once an aquaponics system is designed and built, most of the system parameters are fixed and cannot be easily changed or controlled by the user.

In order to fully take advantage of the self-sustainability feature of aquaponics gardening, this project aims to create a flexible, automated and electrically-controlled dynamic aquaponics system. It will consist of a regular aquaponics setup, with the use of many sensors and necessary hardware for monitoring all system elements, which will be connected to a user’s home Wi-Fi connection. The user will then be provided with a Progressive Web Application and/or a Native Mobile Application that will tentatively have these following features:

- Provide the users a suggested list of plants/herbs/vegetables that are suitable to be grown in their area (based on USDA's Open Plant Hardiness Zones).
- Prompting the users to pick a preset or set up their own settings for the plant(s) they're growing.
- Provide the users options to monitor the system automatically or manually through the app.
- Send push notifications regarding system status, errors, real-time metrics, gardening tips, ...
- Provide the users with daily reports, suggested timeline for the plant(s) they're growing, and a garden portfolio that keeps track of all the plants they've grown.

### **High-level Tasks**

- Gather the dataset from USDA's Open Plant Hardiness Zones and data for the plants' presets
- Design the database and the application architecture/UI/UX
- Code the web application and integrate it with the system to send/receive POST/GET requests
- If time allows, create the mobile application from the web application code base
- Testing and documentation

### **Risks**

- The project scope not only involves knowledge in computer science, but also in biology, chemistry and electrical engineering. Therefore, the success of the project may be dependent on the aquaponics setup and the sensor system.
- The use of hardware and new technologies that provide real-time data, as well as communication between the sensor system and the web/mobile application.

### **Delivering Products**

A web application that integrates with the sensor system through Wi-Fi connection to control/monitor the aquaponics setup with the above features.