Developing a Hydroponic System With the Incorporation of an Arduino Uno Powered pH Sensor

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From 2005 to 2050, crop demands will increase by 100% to 110% and 50% of land will not be suitable for agriculture (Monsees, 2019). To address this issue of land depletion, we engineered a cost-efficient hydroponic system. In Phase 1 of our project, we compared the growth of plants in a long, shallow system and a deep, short system. All p-values were over 0.05, indicating that there is no significant difference in plant growth in the two systems; therefore, it does not matter which tub is used. During Phase 1 we faced problems with consistently measuring the pH which led to the wilting and deaths of some plants due to the over absorption of nutrients. Thus, the focus was to consistently measure the pH in the Phase 2 project alongside two main, innovative goals: to design a cost-efficient hydroponic system that is sustainable to grow basil and to develop a pH sensor with the use of Arduino Uno that provides accurate, instant readings. The sensor monitors and records the system's pH, notifying users when the pH is not in its optimal range of 5.500-6.500. The sensor utilized unique spreadsheet and RGB LED light technology outside of the system that lit up when the pH was too high or too low, allowing for modifications to pH. The code for this sensor can be easily adjusted to accommodate for the optimal pH levels of specific types of plants. This system offers an alternative and innovative method to improve the monitoring of pH, while still being financially accessible at a price of $318.95; this system is significantly cheaper and offers unique features compared to other systems on the market. The accessibility of our system has a positive social and economic impact on developing global communities by increasing their availability of farming methods and fresh produce.