 I.    Summarized Problem Statement

The global population is expanding exponentially with about 8 billion people at present, however, there is not enough food for all. Specifically, the rapid growth in the United States has led the farming industry to have to produce more yield per season often leading to the use of pesticides and genetically modified produce (GMO) to keep up with the demand. Farmers and home gardeners would greatly benefit from a tool which would help them more closely monitor plant health and maximize crop yield. Smart planters would allow families and farmers alike to have access to a reliable way to monitor plant health and growth. Families would be able to grow herbs, fruits, and vegetables reliably minimizing the agricultural knowledge gap required to garden and help the family save money on store-bought produce. Farmers would also benefit from smart planters as it would allow them to more efficiently care for their crops with the goal of minimizing wasted crops. The use of smart planters will allow both families and farmers to maximize produce production while also reducing waste.

***A.*   *Objectives***

1) The smart planter must be able to accurately display humidity, nitrogen levels, ambient temperature, and the presence of sunlight.

2) The smart planter must be user friendly and easy to set up.

***B.*   *Constraints***

1) The smart planter must be able to handle different weather conditions and be waterproof.

2) The smart planter must be cost effective and easy for non-technical at-home gardeners to use.

II.    Concept Development

***A.*   *Concept***

           The smart planter is a unique way for agriculturalists to monitor plant health both for enterprise and at home use. This planter is unique as it allows the user to connect to the application and view that statistics of the plant and its environment for that day, but also overtime. The application would also alert the user to hazardous conditions for the plant such as a low humidity level. The sensors that will be used for this project are: Taidacent Temperature and Humidity Sensor Module, Xinwoer IP68 ABS Soil NPK Sensor (soil fertility), SI1151 Grove sunlight sensor, and an Arduino.

This system is unique because unlike most at-home gardening monitoring systems, this is meant for a planter (not a single pot) and for outdoor use. This is great since most at home-health monitoring kits are expensive, for indoor use only, and for a single plant. This would be advantageous to the home gardeners and small-scale farmers who would like to increase their crop yield without spending thousands on an enterprise system. This planter also tracks the kind of plants in the container to let the user know important information about how best to grow that kind of produce. The application is a hub where the user can easily connect to further understand the present conditions the plant is in.

***B.*   *End Product Description***

            The final product will be a planter approximately 3 X 1 feet in size which uses an Arduino Uno as the main computer and a Bluetooth module to communicate with the application on the phone or tablet device. The application will be able to track previous measurements and plot them to show the user the health of the plant’s environment over time. It will be the hub for the planter where the user learns everything they want to know about the health of the plant. The humidity and temperature sensor will alert the user of low soil humidity, the sunlight sensor will alert the user of sunlight exposure, and the NPK sensor will alert the user of low soil nutrient content. The sensors themselves are waterproofed to prevent water from damaging the electronics, those devices which are not inherently waterproof will be waterproofed and placed in a storage compartment on the side of the planter.

Diagram

Description automatically generated

Fig. 1.     Smart Planter System Block Diagram