Fabrication of Automated Hydroponic Farming Setup

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ABSTRACT

With the rise of civilization, open-field agriculture is encountering significant challenges, particularly the decrease in per capita land availability. In 1960, when the global population was 3 billion, the per capita land was 0.5 hectares. However, with the current 6 billion people, it has dwindled to only 0.25 hectares, and projections indicate it will further decline to 0.16 hectares by 2050. This decline is exacerbated by rapid urbanization, industrialization, and the melting of icebergs due to global warming, which further reduces arable land for cultivation. Another issue is the saturation of soil fertility and the stagnation of productivity despite increased fertilizer usage. In addition, certain cultivable areas suffer from poor soil fertility, with limited opportunities for natural fertility build up by microbes due to continuous cultivation. Frequent drought conditions, unpredictable climate, and weather patterns, rising temperatures, river pollution, inadequate water management, excessive water wastage, and declining groundwater levels also pose threats to conventional soil-based agriculture and food production.

In light of these circumstances, relying solely on open-field agricultural production will soon make it impossible to sustain the entire population. Consequently, soil-less culture has gained relevance in addressing these challenges. This method involves cultivating plants without soil, utilizing improved techniques that conserve space and water. Soil-less culture has demonstrated promising results worldwide as a means of food production. This paper discusses the way to automate a small-scale hydroponics system by building a computerized system consisting of:

- Microcontroller
- pH sensor
- EC sensor (to measure nutrient level in solvent)
- Temperature sensor
- Fluid pumps connected to pH- and nutrient reservoir

Keywords – Hydroponic system, Soil-less farming, Agriculture, Food, Production, Population