Project WASP: Autonomous Self-Watering Planter Using Atmospheric Water

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Maintaining optimal soil moisture is an ongoing issue in agriculture. Over-irrigation can lead to waterlogged soil and disease while insufficient water limits crop yield. Irrigation systems can cause sodium accumulation in fields and the degradation of nutrient-rich soil. Climate change exacerbates these issues leading to increasingly hostile growing conditions, causing increased need for monitoring, oversight, and human intervention. Project WASP is a fully autonomous plant growth system that uses a combination of atmospheric-water(AW), UV-light, and integrated sensors to provide an optimized environment for self-sustaining plant growth. WASP is fully customizable—all components are parametrically scalable and 3D-printed, and the interface provides plant-specific profiles for soil moisture and light exposure. WASP is powered by solar panels, eliminates the need for freshwater irrigation, and provides a sustainable solution for autonomous agriculture. Plant growth (over 2 months) was measured in 3 experimental plants (fully controlled by WASP), 3 negative controls (without UV-light/AW), and 3 positive controls (manually maintained). Project WASP successfully maintained plant growth similar to human caretaking. Mean growth in experimental plants (+5.33 cm, SD±1.50) was significantly greater than negative-controls (-12.6, SD±7.0), p=0.049), and mean growth in experimental plants was similar to positive-controls with human caretaking (+5.2, SD±1.23), p=0.91). Project WASP offers a novel, self-sustaining agriculture solution that harvests AW for irrigation, automates controls for light and soil moisture, and is sustainably powered. Future versions could be utilized for larger-scale agricultural purposes to provide a more efficient and sustainable food production system.