

Automated Greenhouse

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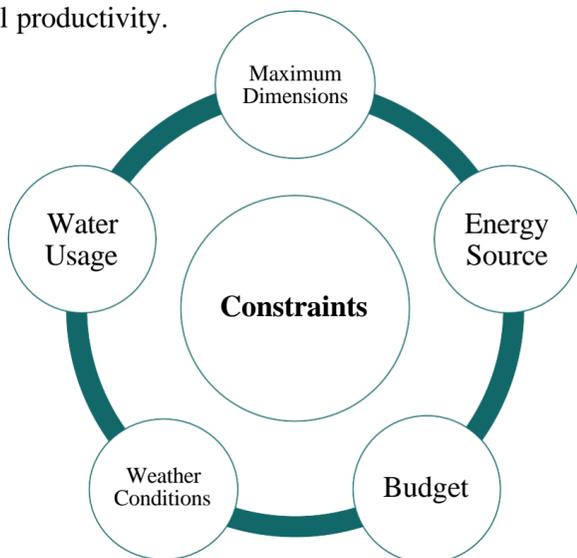
KFUPM Design Expo Team Design-60

Elevator Pitch

Saudi Arabia's agriculture faces challenges like water scarcity, harsh climates, and high energy demands. Solar-powered, automated greenhouses with smart sensors offer efficient resource usage, enabling sustainable and scalable food production. These systems optimize operations, reduce costs, and support year-round farming, addressing the region's need for sustainable agricultural solutions.

Introduction/Background

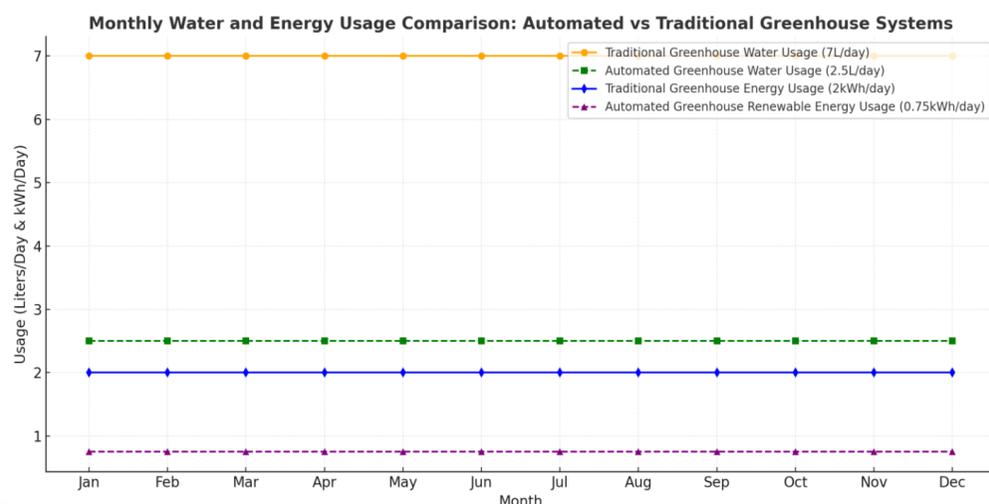
- **Problem Statement:** Our project addresses inefficient resource use in traditional greenhouses by developing an automated system that optimizes irrigation, climate control, and energy efficiency for sustainable agriculture.
- **Objective:** To develop an advanced automated greenhouse system that leverages smart sensors and renewable energy to optimize irrigation, control environmental conditions, and ensure sustainable, scalable agricultural productivity.



Specifications:

- ❑ **40% Renewable:** Powered by solar panels for sustainable energy.
- ❑ **24/7 working time:** Operates continuously to maintain optimal conditions.
- ❑ **Monitor Remotely:** Control and track system via mobile interface.
- ❑ **100% Automated:** Handles irrigation and climate control autonomously.
- ❑ **Crop growth:** Increasing crop growth and productivity by optimizing resources.

Comparison



Testing / Validation

Specifications Validation

Weather Control: The system maintains optimal temperature ranges from 18C to 38C and humidity levels between 50% and 70% ensuring ideal growth conditions.

Energy Efficiently: Total system energy consumption is 31.61W, ensuring cost-effective and sustainable operation with minimal energy usage.

Renewable Energy: With two solar panels providing 400 Wh/day, the system achieves 52.7% renewable energy usage reliance on conventional power sources.

Remote Monitoring: The system includes a dashboard for real-time remote mentoring & control, enhancing operational convenience and oversight.

Cost Effectiveness: All components and integrated systems are designed and implemented within a budget of 6000 SAR, supporting affordability and scalability.

Crop growth: The greenhouse realized a 9.25% improvement in crop growth productivity compared to a non-automated system.

Project Interior



Conclusion

After 4 months of the continuous work, we were able to launch the final prototype. All constraints were met, and the product has successfully exceeded the target specifications. Finally, we would like to thank KFUPM for giving us the opportunity to perform this outstanding project. Also, special thanks to Dr. Ahmed Azab and Dr. Zayd Leseman for the continuous support and assistance throughout the project period.