[**DESIGN CLIMATE ACTION**](https://my.designclimateaction.com/) **(International design thinking competition)**

**PROJECT ECOHARVEST**

**INTRODUCTION**

Food wastage is a major global issue that greatly increases greenhouse gas emissions. According to the Food and Agriculture Organization, a third of all food produced globally is lost accounting for about **1.3 trillion dollars**. This leads to the release of **150 TG** of **methane gas** annually which is equivalent to **10 billion 15kg** domestic gas cylinders contributing to global warming. Alarming data according to the Global Carbon Budget report by the Global Carbon Project also shows that, carbon dioxide emissions are estimated to have increased by **1.1%** from **2022** to **2023**, reaching a new record high of **36.8 billion metric tons**. Recent statistics highlight a critical link between food waste and greenhouse gas emissions. Food waste accounts for about **8–10%** of worldwide emissions. This comes up to an astounding **4.4 gigatons** of carbon dioxide equivalent every year, a staggering figure equal to the emissions from all road transportation combined!

**PROBLEM STATEMENT**

With **29.77** million individuals in Ghana, about **35 %** of food goes to waste every year. Farmers put in effort and investment into their farmlands yet their produce perish due to lack of preservation units. **Akumadan**, a rural community in Ghana with a population of over **15,000** farmers was once the nation’s major supplier of fresh tomatoes but the community now contributes to methane and carbon dioxide emissions as a result of excessive spoilage of farm produce especially from tomatoes. Due to the rapid spoilage of the farmers' produce, traders and consumers have diverted their attention to purchasing imported tomatoes from Burkina Faso, a neighboring country of Ghana drastically crippling the local agricultural economy. An extensive needs assessment revealed that farmers do not have proper preservation unit to store their farm produce. Therefore there is the need to provide efficient and effective preservation unit system to prolong the shelf life of tomatoes.

**SOLUTION**

Inspired by this, we came up with a **low-cost, sustainable green storage** unit based on the **evaporation cooling principle** that reduces carbon dioxide emissions by eliminating an estimated **1.5 tons** of **carbon dioxide** emissions annually and preserves tomatoes for **20 days** in a controlled environment. The unit is made of easily accessible materials such as

* Sand( type of uses for building house or river sand)
* Bricks
* Cement
* Solar panels
* Automatic watering pumps
* Water tank

This helps maintain steady humidity and temperature within the unit and prolongs the storage period of tomatoes. The unit reduces temperature and increase humidity.

**OBJECTIVES**

Ecoharvest projects aims to:

1. Reduce carbon dioxide emissions by **55%** through the adoption of eco-friendly storage practices.
2. Prolong the shelf life of tomatoes to **20 days** in a controlled environment, thereby reducing food loss.
3. Develop a low-cost, sustainable green storage unit based on the evaporation cooling principle.
4. Enhance farmers' understanding of both modern farming techniques and the business aspects of agriculture.

**METHODOLOGY**

Components of the Green Storage Unit:

The storage unit is constructed using easily accessible materials, including:

* Sand (for building and insulation purposes)
* Bricks
* Cement
* Solar panels (for renewable energy to power the unit)
* Automatic watering pumps
* Water tank

The storage unit employs the evaporation cooling principle to:

* Maintain steady humidity and temperature within the unit.
* Reduce temperature and increase humidity, prolonging the storage period of tomatoes.
* Utilize solar panels for sustainable and cost-effective energy supply.
* Incorporate automatic watering pumps for efficient water management.

The first step in building the green storage unit is to prepare the location and install a foundation with sand or bricks. Bricks should be laid out in the chamber's floor plan to create a rectangle that is roughly 165 cm long, 115 cm wide, and 65.7 cm tall. Sand is another option for a base.

After that, two walls are built, with 7.5 cm between them. Wet fine sand, which acts as an insulator, will be used to fill this hollow. The sand's evaporative cooling process aids in controlling the chamber's inside temperature.

The inside temperature of the chamber is intended to be kept **10–15 degrees Celsius** lower than the surrounding air. It also guarantees a **90% relative humidity**. As an alternative, an automated irrigation system can be put in place for more effective and reliable humidity management.

**BUDGET FOR THE UNIT**

For model construction the cost breakdown will be:

|  |  |
| --- | --- |
| **ITEM** | **COST** |
| Sand (for building and insulation | $250 |
| Bricks | $300 |
| Cement | $250 |
| Solar panels | $850 |
| Water Tank | $200 |
| Miscellaneous (wiring, connectors, pipes, etc.) | $260 |
| Automatic watering pumps: | $150 |
| Labor | $900 |
| **Total** | **$3,060.00** |

**IMPACT**

EcoHarvest aims to address a global issue at its base, not only preserve tomatoes. We present a ray of hope in Akumadan, where the fast deterioration of tomatoes causes despair and contributes to global warming. Our low-cost, environmentally friendly solution is based on the principles of **SDG 13: Climate Action**.

EcoHarvest hopes to cut food waste in half at Akumadan by **2030** by extending tomato shelf life by **20 days**. This corresponds to an approximate yearly decrease of **120 tons** of tomato waste in Akumadan alone, making a substantial contribution to the accomplishment of this crucial worldwide goal.

However, EcoHarvest goes beyond that. As evidence of Target **13.2**, its solar-powered chambers signify a move toward greener production methods. By eliminating an estimated **1.5 tons** of **carbon dioxide emissions** annually, each unit is a silent triumph against climate change and a step toward a low-carbon future as compared to traditional methods.

Our mission is not merely to empower local farmers; it is woven into the very fabric of EcoHarvest. By providing specialized training and engaging the community, we support Target **13.a**, which aims to increase public knowledge of climate action and its consequences. Not only can local farmers get the benefits, but they also become change agents, able to disseminate the sustainable message much beyond Akumadan.

The EcoHarvest project's emphasis on finding a sustainable solution to the widespread problem of rapidly spoiling produce is in line with SDG 13's broader objective of addressing climate change and its adverse impacts.

**STAKEHOLDERS**

**Local Farmers:** Primary beneficiaries and participants in the project. Local farmers play a crucial role in adopting modern farming practices, receiving training, and utilizing the green storage unit for preserving their tomato yields. Their active involvement is vital for the success of the initiative.

**Community Leaders and Authorities:** Act as advocates and facilitators for the project within the community. Community leaders and authorities can support the initiative by endorsing it, encouraging participation, and helping overcome any logistical or social challenges. Their backing is essential for community-wide acceptance and cooperation.

**Environmental Agencies:** Monitor and assess the environmental impact of the project. Environmental agencies can provide expertise in evaluating the reduction in carbon dioxide emissions, the sustainability of the green storage unit, and overall environmental benefits. Their involvement adds credibility and ensures alignment with eco-friendly standards.

**Solar Energy Providers:** Supply and install solar panels for the green storage unit. Solar energy providers contribute to the project by facilitating the use of renewable energy, reducing the environmental footprint, and ensuring a sustainable power source for the storage unit.

**Agricultural Officers:** They will provide specialized knowledge and training to local farmers. Agricultural experts contribute to the project by conducting workshops, offering guidance on sustainable farming practices, and ensuring that farmers acquire the skills needed to maximize the quality of their tomato yields.

**CONCLUSION**

Our project aims to address food loss and environmental impact, specifically climate change by integrating modern farming practices, empowering local farmers, and implementing a low-cost, environmentally friendly storage unit. The green storage unit, made from sand, bricks, and solar panels, will aid eliminate an estimated **1.5 tons** of **carbon dioxide emissions** annually. EcoHarvest's initiative aligns seamlessly with the objectives of Sustainable Development Goal 13 - Climate Action. By working together, we can create a domino effect that safeguards the environment by mitigating climate change.