

جــامـعــة بيروت العربية BEIRUT ARAB UNIVERSITY



Planet Earth Rejuvenators presents:

Sustainable Greenhouse

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Sustainable Greenhouse

Project Statement:

 Greenhouses are used in order to create the perfect environment for plants to grow in under different seasonal conditions.

 It protects them from the excessive sunlight radiation, cold weather, strong wind, snow, rain and hail etc...



Project Statement:

 However, it does come with a problem which is heat trap, causing undesired temperature increase inside, therefore burning the plants and drying their roots out..





***Examples:**

For tomato, greenhouse temperature For lettuce, greenhouse temperature

- should stay between 75 and 85 degrees Fahrenheit during the day.
- should not fall below 60 degrees overnight



- does not exceed 70 degrees F during the day
- when nighttime temperatures remains above 45 degrees



according to GardenGuides

Conventional Solutions:

1) Natural Ventilation Air naturally leaves the Greenhouse through windows.





2) Ventilation by a fan Forces the air outside.

Conventional Solutions:

3) Using Shades to decrease the solar penetration, decrease temperature





4) Cooling with Water Evaporation removes the stored heat moderate temperature.



Heat Exchanger: η = 60-70% Air conditioning and water desalination.



Lamps: Give light and heat ongoing photosynthesis.



Photovoltaic cells: $\eta = 15\%$ Provide shade and convert solar power into electricity



Air washers: Humidify the air and aid in the water desalination process.





Constraints:

•Financial: PV cells are expensive •Environmental: PV manufacturing produces toxic emissions & solar energy is inconsistent.

Requirements:

- •Enough sun power
- Uncontrollable weather

Cold Weather Design:



Cold Weather Design:

Waste Heat Reclaim: $\eta = 60-70\%$ Provide hot water for heat exchanger or MD.



Membrane Desalination: Desalinate water in warmer weather.



Windmill: Convert wind power into electricity.



Cold Weather Design:



Constraints:

Financial: windmills are expensive & MD has high operating cost
Environmental: windmills require large area

Manufacturing: MD control is not exact & it requires low pressure
Safety: windmills create noise

Requirements

•Health: windmills shouldn't be near residential areas

•Environmental: Air speed between 2-25 m/s & uncontrollable weather conditions



Outcomes:

- More efficient agriculture
- Use of renewable energy
- Water desalination
- •Higher profit
- Decrease Pollution
- Exhaust Heat Recovery

Thank you!