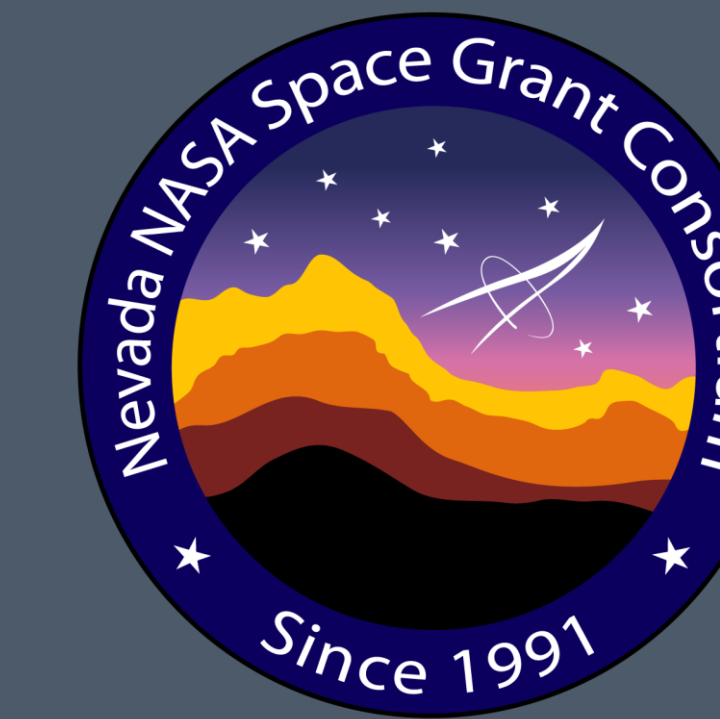


Aeroponics

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THE GOAL: TO CREATE A SELF-SUSTAINING GROWTH SYSTEM

- **Short Term Goal:**
 - To explore efficient growth systems
- **Long Term Goal:**
 - To create an entirely automated growth system
 - Reduce resource usage, especially land and water

WHAT ARE HYDROPONICS

- The process of growing plants in sand, gravel, or liquid with added nutrients but without soil
- Hydroponic Goal: higher growth efficiency



Image Credit: NASA

TYPES OF HYDROPONICS

- Some types of hydroponics systems:
 - Drip
 - Water Culture
 - Nutrient Film
 - Aeroponic

THE PROBLEM

- **Agricultural Inefficiencies**
 - Seasonally affected
 - Resource Intensive
- **Movement of water, necessary for life, is financially unfeasible**
- **Hydroponic Limitations**
 - Still resource Intensive

THE SOLUTION

- **Aeroponic Systems**
- **Form of Hydroponics that deviates from conventional systems**
- **Much more efficient than conventional farming and Hydroponics**

HOW AEROPONIC SYSTEMS WORK

- Similar to conventional Hydroponics but differs in growth strategy
- A seedling is transplanted to an Aeroponic System
- No growth medium necessary
- Plant is suspended, foliage and roots free of obstructions
- Nutrient mix is sprayed or misted directly onto the roots
- Reservoir holds nutrient mix
- A pump supplies nutrient mix to the roots

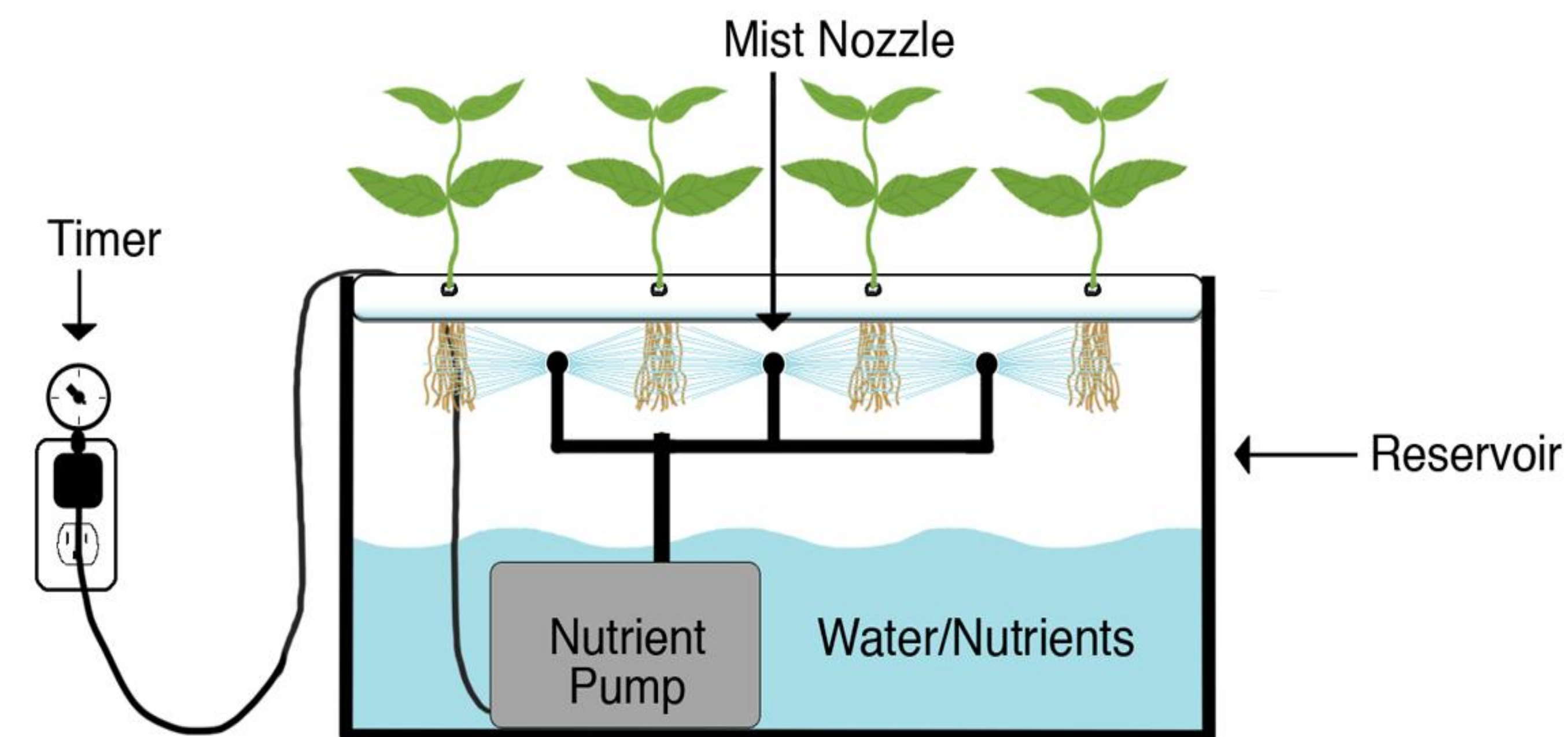


Image credit: Zambeza.com

AEROPONICS VS. HYDRPONICS

- **Aeroponic Systems can use up to 98% water than conventional farming (NASA)**
- **No soil means less chance of disease**
- **Vegetation can be grown out of season**
- **“Rapid Growth” Aeroponic crops grow much faster**
- **Higher efficiency**
- **Less water intensive**
- **Nutrient delivery directly to roots**
- **Better oxygen circulation**
- **Better scalability**

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LONG TERM GOAL: AUTOMATION

- **Powerful technology and intelligent engineering will be key**
- **Monitoring and “Big Data” will be essential**
- **Components added as necessary**
- **Timers, Ultraviolet lights (UV), Sensors**
- **Sensor examples:**
 - Moisture and Humidity
 - pH Sensors
 - Mineral Sensors (Nitrogen, Oxygen, Calcium)
 - Temperature and UV Sensors
- **Automated system sends data to a computer**
- **Algorithms take and process information using “data mining” to interpret data**
 - Data mining: examining large databases to generate new info
- **Computer can make adjustments on real-time data**
 - Adjust pH levels
 - Adjust nutrient flow
 - Adjust UV intensity

AUTOMATION BENEFITS

- **Self-sustaining**
- **Increased productivity and efficiency**
- **Reduced human involvement**
 - Reduced labor costs
 - Manpower can be focused elsewhere
- **Automated planting and harvesting**
 - Eliminate human intervention except during troubleshooting or emergencies

AEROPONICS: LOCAL APPLICATION

- **Automated and non-automated Aeroponic growth systems can reduce resource usage**
 - Water conservation
 - Agricultural land can be repurposed for other uses
- **Can be used in most climate due to indoor nature**
- **Crops can be planted and harvested out of season**
- **Better use of space allows for more biomass volume**