URBAN VERTICAL GARDEN

- Applies "one-pump rule" to lift nutrient solution using a low-head submersible pump from the reservoir to the uppermost portion of the Nutrient Film Technique system and allows water to cascade by gravity in planting beds back to the fish tank
- Grows more than 120 hills of leafy vegetables (lettuce, pechay, mustard, water spinach, sweet potato, etc.) in 1 square meter area
- A viable way of producing safe and healthy food with minimal water and electricity
- Can be attached to a solar panel and controlled automatically

"Oh My Gulay!"

- The Philippines is now a country of meat eaters.
- Average daily consumption per person was 110g of vegetables, down from 145g in 1978 and 54g of fruits, down from 104g in 1978 (IRIN, 2012).
- Chronic malnutrition among children is directly related to the country's low vegetable and fruit consumption; an estimated 29 percent of children under age five years and 33 percent of children under age 10 years were too short for their age groups (IRIN, 2012).
- The declining vegetable consumption is among the major factors of illnesses in the country; it is related to production.

Project Title: Hydroponics System Using Smart Technique for Vegetable Crop Production

Funding Agency:

Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)

For more information contact:

Dr. Chito F. Sace
CLSU Hydroponics and Aquaponics Technology
Institute for Climate Change and Environmental Management
CENTRAL LUZON STATE UNIVERSITY
Science City of Muñoz, Nueva Ecija
(044) 456-0107
09175373972
clsu_hydroponics@yahoo.com.ph
Clsu Hydroponics Aquaponics

Packaged by:

CLSU Science and Technology Centrum

March 2016

Smart Farming Technique Series No.1

Smart Farming Systems to Conserve Water, Food and Energy

HYDROPONICS

Honing Tomorrow's Agriculture

CENTRAL LUZON STATE UNIVERSITY
Science City of Muñoz 3120
Nueva Ecija, Philippines

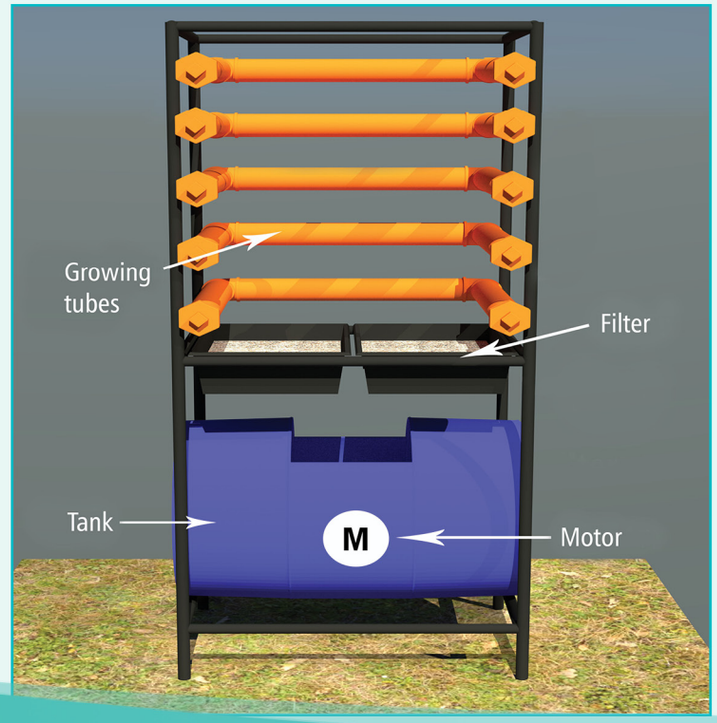
ISSN: 2507-8313

What is Hydroponics?

Hydroponics is a technology of growing plants in non-soil media. It is derived from two Greek words "*hydro*" meaning water and "*ponos*" which means labor; literally, it means "water-working." The heart of hydroponics is the nutrient solution.

Concept of Hydroponics

- Soil is no longer crucial for the plant to thrive when the required mineral nutrients are introduced artificially into plant's water supply and plant roots are able to absorb them; the reserves of nutrients and moisture contained in the soil, and the support the soil renders the plant are critical.
- The main components of the hydroponic system are the growing tubes for the plants, the filter that strains solids coming from the tubes and the nutrient solution tank.
- The water is lifted by low-head pump to the uppermost growing tube then cascades or flows by gravity through the pipes down to the filter basin to the nutrient solution tank. Water is recirculated to the whole system.



Advantages

- Households have direct access to clean, safe foods
- Can be a source of family income
- Encourages recycling
- Supports government's efforts to implement smart-farming agriculture
- Conserves limited resources such as water, electricity, space, and time

Types of System

- **Closed or recirculating**: nutrient solution is reused
- **Open or non-recirculating**: solution is discarded after single use

Plant Management

- Prepare seedlings; can be germinated directly in cups using non-soil growing media such as rice hull, coco peat, gravel, scoria, perlite, and expanded clay
- Check the growing plants regularly
- Harvest when the plants are ready

Types of Culture

- **Water or solution culture:** only fertilizer solution is used; includes Nutrient Film Technique (NFT), Deep Flow Technique (DFT), Tube Culture, Cascade NFT.
- **Media or substrate culture:** growing media is used; includes gravel, coco peat, pumice, rockwool, perlite, vermiculite.

Managing the System

- Fill the system with water; run the system to test for leaks.
- Maintain the quality of the nutrient solution; three important parameters to maintain are:
  - **ph**. It is a major determinant of nutrient uptake by the plant. ph range: 5.8 to 6.8 (6.3 optimal)
  - **Electrical Conductivity (EC)**. It is the strength of ionic fertilizer solutions. EC: 0.5 to 2.0 mS/cm
  - **Temperature**: 20 to 25 °C (24 °C optimal)
- Always check if pumps function normally.

History

- Aztecs, an American nomadic tribe which was once treated roughly by their neighboring tribe, developed hydroponics.
- In search for peace, the Aztecs left their homes, travelled south and settled in Lake Tenochtitlan of the central valley of Mexico.
- There they built *chinampas* or the "floating garden" which is made of rafts of branches and stems and soil scoured from the bottom of the lake.
- As time passed by, vegetables, flowers and even trees grew on the *chinampas*. From this arose the concept of hydroponics, considered the first form of sustainable agriculture.
- Later, they defeated the people who once oppressed them but they never abandoned the lake, making it a huge and magnificent city.