Online Training Course on Hydroponics for African Countries

# Seedling, Planting, and Maintenance

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# OBJECTIVES

After this session :
Participants expected to understand the importance of seedling, planting, and maintenance in hydroponics

# Hydroponic Growing Process

## Seed

Put the seed into the sponge and wait for sprout

## Sprout

Leaf eating vegetables will need 3-10 days to sprout. fruit eating plants will need longer

## Seedling

When it grow in certain period, it needs to be tranplanted

## Transplant

Transplant to planting hole with the sponge together

## Grow

After 30-60 days, vegetables are ready for harvest

## Harvest

Taste your own planting vegetables

Seedling

# SEEDLING

Is an initial activity in the field that aims to prepare seeds ready for plant

# Why We Need Seeding

The seedling method can optimize plant growth

Easy to care for when growing early planting

Seedling makes plants quick adapt

Plant sorting process

# 01 Prepare land for nursery site

# Nursery House

Is an area, in which new saplings or a new seedling are raised and nourished until they are ready for transplanting

# Sterilization of The Nursery House

- Prepare 5 ml of carbolic acid per liter of water, for 10 liters it will need about 50 ml of water, stir it evenly.

- Pour the carbolic solution into the sprayer, spray it all over the nursery’s house, wait  for a days.

# 02 Preparing the growing media

- Husk charcoal
- Rockwool
- Cocopeat
- Hydrogel
- Hydrotone, etc.

# Media

Is a subtance or material in which something exists or grows, from the soils and other materials for plant growth

# Characteristics of growing medium

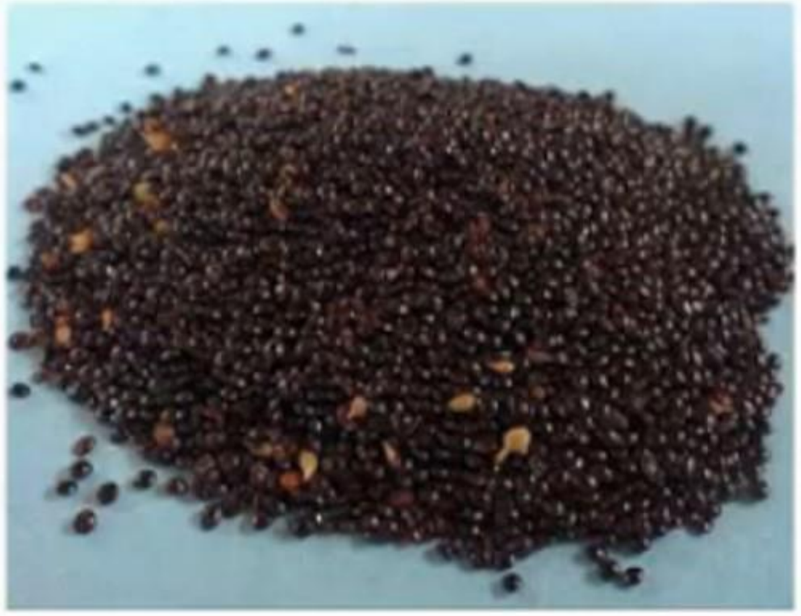
- The medium must be able to store water content so that plants get enough nutrients from the water content stored in the media.
- The medium has a loose structure, fertile, and can absorb water well.
- Has a low salt content.
- Not easy to change shape or it is not easy to become dry when the temperature in the room changes.
- Does not have pests or disease that can interfere with plant growth.


# 03 Preparing seeds

- Lettuce
- Tomato
- Chili
- Potato
- Squash, etc

# Characteristics of Quality Seeds

- Known variety, certified or labeled
- The purity level reaches 98%
- Its growth power is above 80%
- Clean and uniform
- The yield potential is high
- Healthy means are free from fungal infections and free from pests
- Not expired



# Seed treatment

**Soaking seeds on tap water before planting**

1. **Breaking dormancy to speed up germination**
2. **Seed sorting**
3. **Soft seed (water spinach, spinach, lettuce, mustard green, etc) soaked in ± 15 minute**
4. **Hard seeds (chili, pepper bell, watermelon, melon, etc) soaked in ± 1 hour**

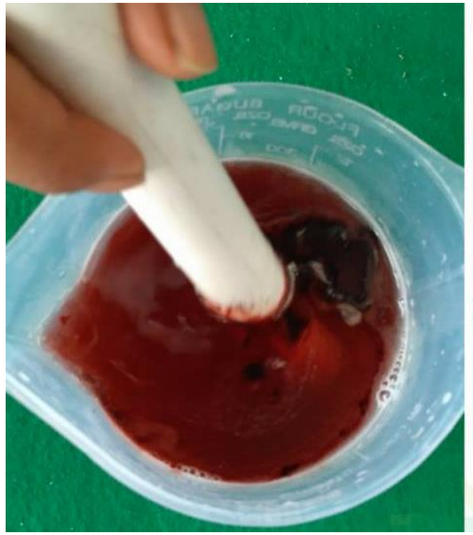
# Seed Germination on Rockwool

# Tools

1. Nursery house
2. Tray
3. Ruler
4. Cutter
5. Toothpick
6. Tissue
7. Glass
8. Tweezers

# Materials

1. Rockwool
2. Seeds
3. AB mix nutrition
4. Water




Empty and bad quality of seeds will float
and just be thrown away.

01


The good seeds are drained on a tissue

02


CUT THE ROCK WOOL WITH A SIZE OF 2x2 CM

03


PUT THE ROCK WOOL INTO THE TRAY

04


WET THE ROCK WOOL BY SPRAYING
WITH WATER USING A SPRAYER

05


06


07


08


09


10


11

# Always maintain the humidity and cleanliness in the nursery house

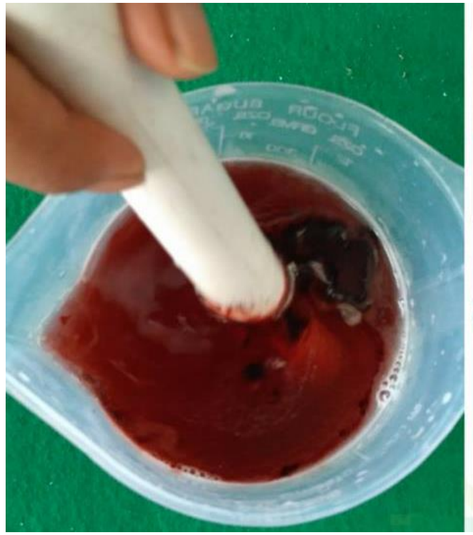
# Seed Germination on Husk Charcoal

# Tools

1. Nursery house
2. Seed Tray
3. Tissue
4. Glass
5. Tweezers

# Materials

1. Husk charcoal
2. Seeds
3. AB mix nutrition
4. Water



# Prepare the husk charcoal, put in tray

01

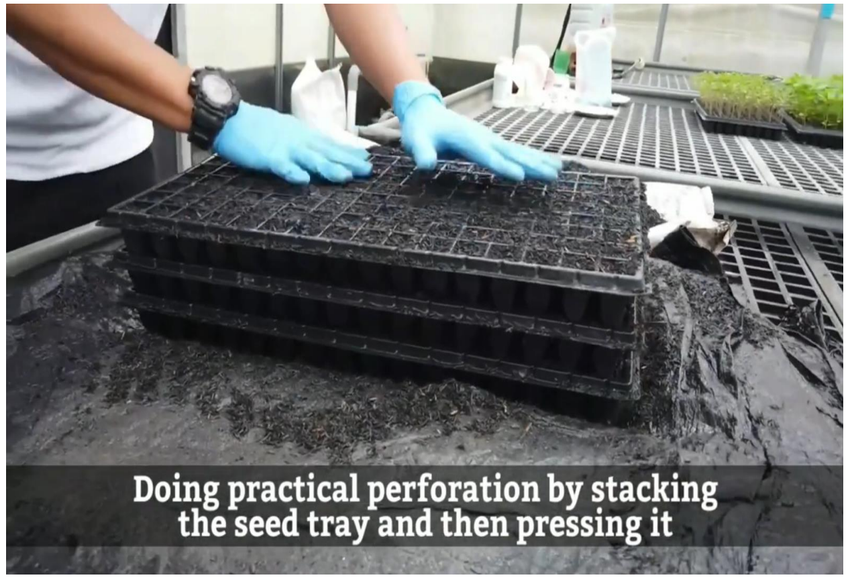
02

03

04


Fulfill the tray with husk charcoal, then flatten it,
watering it evenly so that the media gets wet.

05


Doing practical perforation by stacking
the seed tray and then pressing it

06


INSERT THE SEEDS INTO THE PLANTING HOLE USING TWEEZERS

07


THEN COVER THEM AGAIN WITH HUSK CHARCOAL

08


WATER THE SEED TRAY AGAIN

09


Arrange the seed trays in the nursery,
then cover them with used sacks

10


Open the cover when it has been 7 days or 2
early leaves appear

11


After the vegetable seeds grow 2-3 pairs
of leaves for leafy vegetables and 4-5
pairs of leaves for fruit vegetables,
the seeds are ready to move to
the hydroponic installation.

# MAINTENANCE AT THE NURSERY

- Stage using husk charcoal, carried out using fertilizer as is done in a nursery using rockwool.
- Use foliar fertilizer at a dose of 5 gram/10 liters of water or NPK at a dose of 15 gram/10 liters of water done at the age of 3-4 weeks of the nursery.


# Seed Germination on Hydroponic System

# Planting seeds on Gutter

# Planting seeds on Wick System

# Sowing seeds on Water Culture System

01 Prepare a container filled with nutrient solution

02 Cover with styrofoam board

03 Put rockwool in the planting hole, let it get wet

04 Put the seeds into rockwool

# PLANTING

Is the activity of transferring seeds from the nursery to the planting area to obtain products from cultivated plants

THE FIRST THING TO DO IS SEED SELECTION.

GOOD QUALITY SEEDS ARE ESSENTIAL,
SO THEY ARE EASIER TO MAINTAIN
AND PRODUCE OPTIMAL YIELD.
THE BEST SEEDS ARE THOSE THAT LOOK
VIGOROUS, FRESH AND PHYSICALLY GOOD.

THE AGE IS SUFFICIENT E.G :
LETTUCE AND PAK CHOY SEEDS HAVE
BEEN SOWING FOR 14-21 DAYS, WHILE
CHILLIES AND TOMATOES HAVE BEEN
SOWN FOR 21-30 DAYS.

# 01 Planting Lettuce

# Tools and Materials

Rockwool

2-3 weeks
years old lettuce

Netpot
and flannel cloth

NFT installation

Prepare the netpot

Put the plants that have been wrapped with rockwool into the netpot on NFT system

# 02 Planting Tomato

# Tools and Materials

Plants

Polybag and
Husk Charcoal

Drip Irrigation
System

PUT THE ROASTED HUSKS INTO THE POLYBAG UP TO 3/4 OF THE HEIGHT OF THE POLYBAG. PUT THE PLANT SEEDS IN A POLY BAG, RIGHT IN THE MIDDLE, UNTIL IT IS CLOSE TO THE BASE OF THE STEM. INSERT THE DRIP IRRIGATION PE HOSE INTO THE HUSK

# MAINTENANCE

Is the treatment of plants and their environment so that plants grow healthy and normal

# 01 pH and Nutrition Control

Nutrition check

Added nutrition

Nutritional replacement

Making nutrition

Nutrient concentration

pH


# Nutrient Density and Acidity

- The concentration of the nutrient solution the plant needs:

| Plant age | TDS (ppm) | EC (mS/cm) |
|---|---|---|
| Early planting | 200 – 400 | 1,2 |
| 14 HST | 600 – 800 | 1,5 – 2,0 |
| 30 HST | 800 – 1000 | 2,0 – 2,5 |
| Generative | 1200 | 2,5 – 3,0 |

- The acidity (pH) of the nutrient solution is in the range 5.8 - 6.5

# Recommended pH and Nutritional Concentration in Hydroponics

| pH and PPM Values for Leaf Vegetables | | |
|---|---|---|
| **Vegetable Name** | **pH** | **PPM** |
| Artichoke | 6.5 – 7.5 | 560 – 1260 |
| Asparagus | 6.0 – 6.8 | 980 – 1200 |
| Pre onion | 6.5 – 7.0 | 980 – 1260 |
| Spinach | 6.0 – 7.0 | 1260 – 1610 |
| Broccoli | 6.0 – 6.8 | 1960 – 2450 |
| Brusell sprouts | 6.5 | 1750 – 2100 |
| Endive | 5.5 | 1400 – 1680 |
| Kailan | 5.5 – 6.5 | 1050 – 1400 |
| Water spinach | 5.5 – 6.5 | 1050 – 1400 |

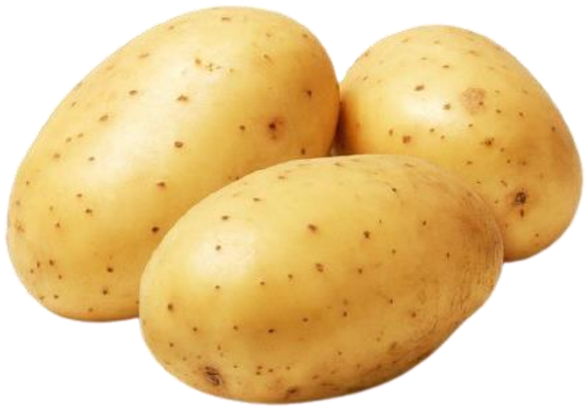
# Continue…

| pH and PPM Value for Leaf Vegetables | | |
|---|---|---|
| **Vegetable Name** | **pH** | **PPM** |
| Cabbage | 6.5 – 7.0 | 1750 – 2100 |
| Flower cabbage | 6.5 – 7.0 | 1750 – 2100 |
| Pakcoy | 7.0 | 1050 – 1400 |
| Mustard greens | 5.5 – 6.5 | 1050 – 1400 |
| Bitter mustard greens | 6.0 – 6.5 | 840 – 1680 |
| Celery | 6.5 | 1260 – 1680 |
| Lettuce | 6.0 – 7.0 | 560 – 840 |
| Silverbeet | 6.0 – 7.0 | 1260 – 1610 |

# Continue…

| pH and PPM Values for Fruit Vegetables | | |
|---|---|---|
| **Vegetable Name** | **pH** | **PPM** |
| Chili | 6.0 – 6.5 | 1260 – 1540 |
| Peas | 6.0 – 7.0 | 980 – 1260 |
| Okra | 6.5 | 1400 – 1680 |
| Tomato | 6.0 – 6.5 | 1400 – 3500 |
| Eggplant | 6.0 | 1750 – 2450 |
| Cucumber | 5.5 | 1190 – 1750 |
| Zucchini | 6.0 | 1260 – 1680 |

# Continue…



| pH and PPM Values for Tubers | | |
|---|---|---|
| **Tuber Name** | **pH** | **PPM** |
| Shallot | 6.0 – 6.7 | 980 – 1260 |
| Garlic | 6.0 | 980 – 1260 |
| Potato | 5.0 – 6.0 | 1400 – 1750 |
| Radish | 6.0 – 6.5 | 1260 – 1680 |
| Taro | 5.0 – 5.5 | 1750 – 2100 |
| Sweet potato | 6.0 | 980 – 1260 |
| Cassava | 5.5 – 6.0 | 1400 – 1750 |
| Carrot | 6.3 | 1120 – 1400 |
| Turnip | 6.0 – 6.5 | 1260 – 1680 |

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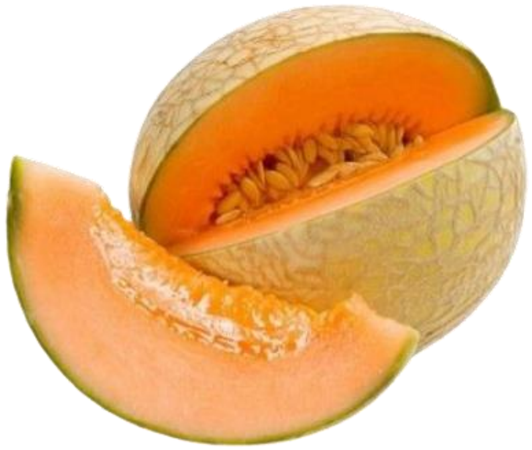
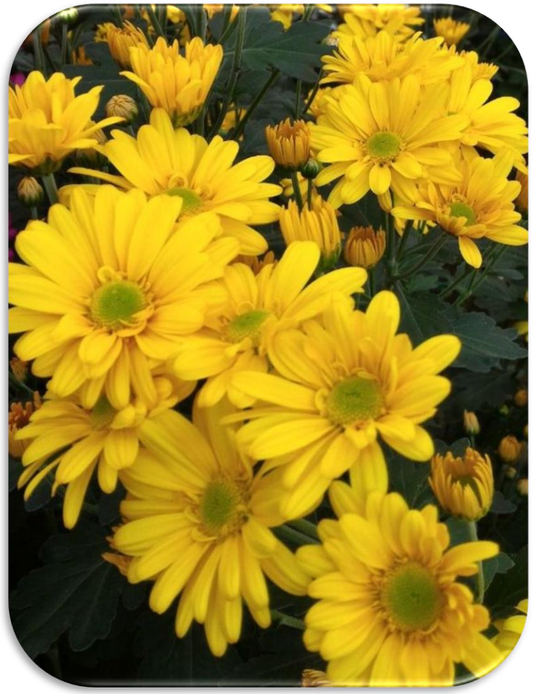


| pH and PPM Values for Fruit Plants | | |
|---|---|---|
| **Fruit Name** | **pH** | **PPM** |
| Blueberries | 4.0 – 5.0 | 1260 – 1400 |
| Black currant | 6.0 | 980 – 1680 |
| Red currants | 6.0 | 1400 – 1680 |
| Melon | 5.5 – 6.0 | 1400 – 1750 |
| Passion fruit | 6.5 | 840 – 1680 |
| Pineapple | 5.5 – 6.0 | 1400 – 1680 |
| Banana | 5.5 – 6.5 | 1260 – 1540 |
| Papaya | 6.5 | 840 – 1680 |
| Strawberries | 6.0 | 1260 – 1540 |
| Watermelon | 5.8 | 1260 – 1680 |

# Continue…

| pH and PPM Values for Ornamental Plants | | |
|---|---|---|
| **Flower Name** | **pH** | **PPM** |
| African violet | 6.0 – 7.0 | 840 – 1050 |
| Anthurium | 5.0 – 6.0 | 1120 – 1400 |
| Antirrhinim | 6.5 | 1120 – 1400 |
| Aphelandra | 5.0 – 6.0 | 1260 – 1680 |
| Daisies | 6.0 – 6.5 | 1260 – 1680 |
| Begonia | 6.5 | 980 – 1260 |
| Bromeliads | 5.0 – 7.5 | 560 – 840 |
| Caladium | 6.0 – 7.5 | 1120 – 1400 |
| Aster | 6.0 – 6.5 | 1260 – 1680 |

# Continue…



| pH and PPM Values for Ornamental Plants | | |
|---|---|---|
| **Flower Name** | **pH** | **PPM** |
| Canna | 6.0 | 1260 – 2450 |
| Carnation | 6.0 | 1260 – 2450 |
| Chrysanthemum | 6.0 – 6.2 | 1400 – 1750 |
| Cymbidiums | 5.5 | 420 – 560 |
| Dahlia | 6.0 – 7.0 | 1050 – 1400 |
| Dieffenbachia | 5.0 | 1400 – 1680 |
| Dracaena | 5.0 – 6.0 | 1400 – 1680 |
| Ferns | 6.0 | 1120 – 1400 |

# Continue…

| pH and PPM Values for Ornamental Plants | | |
|---|---|---|
| **Flower Name** | **pH** | **PPM** |
| Ficus | 5.5 – 6.0 | 1120 – 1680 |
| Freesia | 6.5 | 700 – 1460 |
| Impatiens | 5.5 – 6.5 | 1260 – 1400 |
| Gerbera | 5.0 – 6.5 | 1400 – 1750 |
| Gladiolus | 5.5 – 6.5 | 1400 – 1680 |
| Monstera | 5.0 – 6.0 | 1400 – 1680 |
| Palms | 6.0 – 7.5 | 1120 – 1400 |
| Roses | 5.5 – 6.0 | 1050 – 1750 |

# Continue…

| pH and PPM Values for Herbal Plants | | |
|---|---|---|
| **Herbal Name** | **pH** | **PPM** |
| Basil | 5.5 – 6.5 | 700 – 1120 |
| Chicory | 5.5 – 6.0 | 1400 – 1600 |
| Chives | 6.0 – 6.5 | 1260 – 1540 |
| Fennel | 6.4 – 6.8 | 700 – 980 |
| Lavender | 6.4 – 6.8 | 700 – 980 |
| Lemon Balm | 5.5 – 6.5 | 700 – 1120 |
| Marjoram | 6.0 | 1120 – 1400 |

# Continue…

| pH and PPM Values for Herbal Plants | | |
|---|---|---|
| **Herbal Name** | **pH** | **PPM** |
| Mint | 5.5 – 6.0 | 1400 – 1680 |
| Mustard Cress | 6.0 – 6.5 | 840 – 1680 |
| Parsley | 5.5 – 6.0 | 540 – 1260 |
| Rosemary | 5.5 – 6.0 | 700 – 1120 |
| Sage | 5.5 – 6.5 | 700 – 1120 |
| Thyme | 5.5 – 7.0 | 560 – 1120 |
| Watercress | 6.5 – 6.8 | 280 – 1260 |

# 02 Set the Lighting


Digital Lux Meter

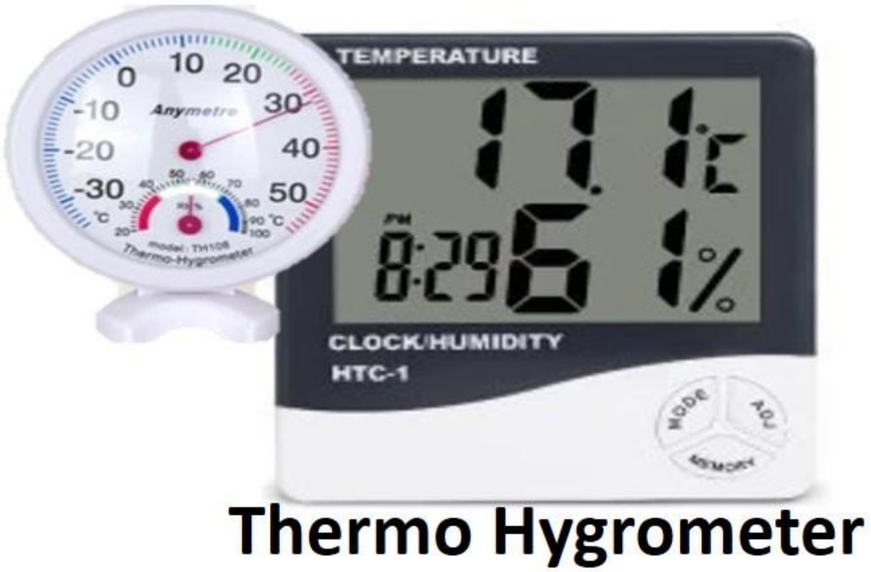
## Excess sunlight

- Installing a paranet/shade net
- Will cause wilting of plants and bitter taste of vegetables

## Lack of sunlight

- Move it into a place that has sufficient light
- Installing additional LED lights will result in a waste of electricity
- Causes plants to wilt, etiolate, and growth are less than optimal

# 03 Check Temperature and Humidity



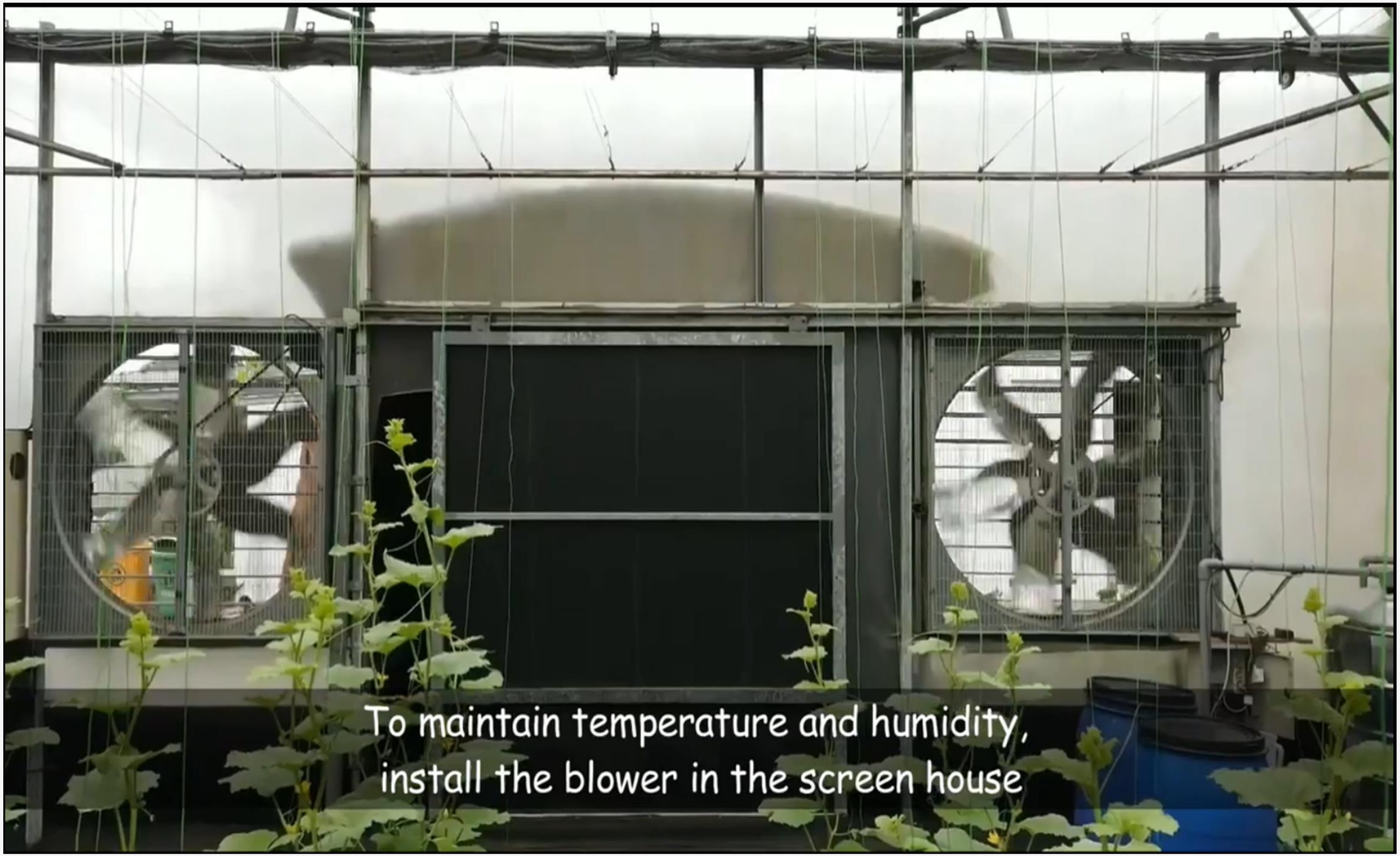

Thermo Hygrometer

## Temperature

- Use a fan to control the temperature in the greenhouse.
- Place the tank in a shady place to control the temperature in the nutrient tank.

## Humidity

- In the high humidity, the absorption nutrient will reduce.
- If the humidity is low, the plant will be wilting. The solution is to install paranet and sprinklers in the greenhouse.


To maintain temperature and humidity,
install the blower in the screen house

# 04 Check The Installation

## Cleanliness

- Clean means no moss
- Schedule washing installation, after harvest time

## No leakage

If there is a leak, apply adhesive or paralon glue


Clean tank at least once every 3 weeks, to keep algae growth to a minimum

# 05 Pest and Disease Control

## Using organic pesticides

**Extracts of neem leaves, soursop leaves, garlic, betel leaf, tobacco, lemongrass**

## Use traps

**Paint the bottle with light color (yellow) and smeared the board with glue**


Identify pests and diseases periodically

# 06 Harvest

- Harvesting is done after the plants enter the harvest time or have met the harvest criteria.
- Harvest time and criteria for each commodity are different.

# Hydroponics Plant  Harvest Time Table

| Vegetable Harvest Time | | | Vegetable Harvest Time | | |
|---|---|---|---|---|---|
| **No.** | **Vegetable Name** | **Harvest Time (day after sowing)** | **No.** | **Vegetable Name** | **Harvest Time (day after sowing)** |
| 1 | Mustard greens | 40 - 60 | 7 | Chili | 65 - 75 |
| 2 | Spinach | 30 - 40 | 8 | Cucumber | 60 - 70 |
| 3 | Lettuce | 30 - 50 | 9 | Eggplant | 70 - 80 |
| 4 | Water spinach | 27 - 35 | 10 | Pakcoy | 45 - 60 |
| 5 | Tomato | 45 - 75 | | | |

# Harvesting

## Harvest time

**Each plant has a different harvest periode**

## Do the harvest when the weather is not too hot

**Generally in the afternoon in order to reduce the risk of wilting and damage to plants**

# How to Harvest

## Harvest crops with roots

+ Make the condition of vegetables stay fresh and last longer shelf life
+ Ensure plant certainty from hydroponics
- It is necessary to re-seed immediately, the harvest will take longer

## Harvest crops without roots

+ Save on crop usage and can harvest faster
- Vegetable storage can not last long (except storage in the refrigerator)

# Potato Nursery


# Tools

- DFT Installation
- EC/TDS meter
- pH meter
- Tray
- Tweezers
- Handsprayer
- Bucket

# MATERIALS

- Potato plantlet
- AB Mix nutrition
- Husk charcoal
- 70% alcohol
- Insecticide
- Detergent
- Clorox
- Water

# 01 Sterilized the screen house and DFT instalation

Screen house

DFT Instalation

# Prepare the growing media, put in tray

**02**

Open the botle and remove planlet

↓

Clean the planlet

↓

Cut the planlet

↓

Plant it into the growing media

↓

Placed the tray in DFT

used the AB mix

↓

check the solution EC

↓

in 14 - 21 days its ready for cuttings



# 1 st Cuttings

- Sterilized the screen house, DFT and tray
- Cut the the seedling from planlet
- Dip into root hormone
- Plant into seedling tray contain media
- Maintain the first cutting as in the nursery

03

# 2 nd Cuttings

- Sterilized the screen house, DFT and tray
- Cut the the seedling from planlet
- Dip into root hormone
- Plant into seedling tray contain media
- Maintain the second cutting as in the nursery

**04**

# 3 rd Cuttings

- Sterilized the screen house, DFT and tray
- Cut the seedling from planlet
- Dip into root hormone
- Plant into seedling tray contain media
- Maintain the third cutting as in the nursery
- After the plant age is 21 dap. or it already have 5-7 leaves. The plant was able to move into aeroponics container

Remove the plant from tray and it was cleaned

Dip into fungicides

Put into Styrofoam, using rockwool or foam

# 06 Plant into the aeroponic container

# **07** Maintenance


# **08** Harvest


Potato tubers are ready to be harvested after 75-90 days after planting,
and ready to be used as G0 seeds after storage and further treatment

G0

Breeder Seed


G1

Foundation Seed 1

G2

Foundation Seed 2

G3

Stock Seed

G4

Extension Seed

Consumption


Thank
you