NURSERY, PLANTING, AND MAINTENANCE

Online Training of Hydroponic Vegetable Cultivation

Lembang, 28 Mei 2021

Lecturer Team
ICAT Lembang

AGENCY FOR AGRICULTURE EXTENSION
AND HUMAN RESOURCES DEVELOPMENT
AGRICULTURE MINISTRY

Professional
Competitiveness
Entrepreneurship

1

Nursery

1) Seed preparation

- ❑ Certified
- ❑ Expired date
- ❑ We have to do germination test:
  - ➢ Minimum seed viability is 90%
  - ➢ Growing healthy and normal
  - ➢ Free from pest and disease
  - ➢ Fresh green stem and leaves
  - ➢ Healthy roots
  - ➢ The seeds are grow uniformly

Continue...

Process 1 :

Soft seeds such as kale, spinach, lettuce, and caisim

Soaked seeds → Lukewarm water → ± 15 minute

Hard seeds such as chilies, peppers, watermelon, and melon

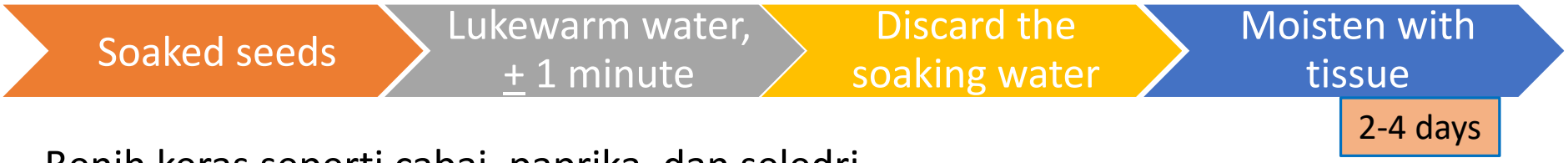
Soaked seeds → Lukewarm water → ± 1 hour

The seeds are ready to go straight sowing on the planting medium before germinating

Continue…

Process 2 :

Soft seeds such as kale, spinach, lettuce, and caisim



Benih keras seperti cabai, paprika, dan seledri

After the seeds germinate, will be moved to growing media

2) Seed Treatment

- Seed Treatment applied to seeds that have not received treatment from the producer.
- Seed Treatment aims to avoid pests, fungi and bacteria during the nursery.
- Seed Treatment can use pesticides, insecticides, fungicides and bactericides.

Continue ...

❑How to apply the pesticides:

- ➢Dry method : pesticides are mixed directly with the seeds, usually in powder.
- ➢Wet method : pesticides, in the form of powder or liquid, mixed with water, then the seeds are soaked in a pesticide solution.

Continue...

- Fungicide dosage / concentration
  - Can use the recommended dosage/concentration listed on the packaging.
  - If using liquid pesticides (wet method) = 2 ml / 1 liter of water for 1 kg of seed.
  - If using powder pesticides (wet method) = 2 g / 1 liter of water for 1 kg of seed.
  - If using powder pesticides (dry method) = sprinkle evenly until the entire surface of the seeds is covered.

3) Hydroponic Media

- Does not contain nutrients
- Clean and aseptic
- Porosity is good
- Have an ability to keep the water
- Does not contain tree sap
- Does not contain oil
- Does not contain coloring agent
- Does not contain hazardous and toxic materials

Alternative Growing Media on Hydroponic Technology

Rockwool

Cocopeat

Cocopeat briquettes

Husk Charcoal

Cocogrow

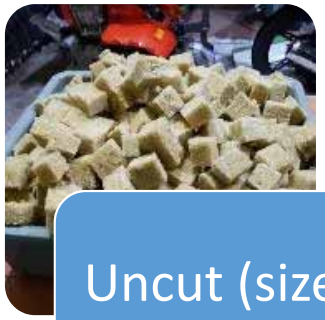
Hydrotone

Hydrogell

Preparation of Rockwool Growing Media

Soaked Rockwool

Drained



Uncut (size 2.5x2.5 cm)

Perforated (± 0.5 cm depth)

4) Nursery House

- It aims to protect plants from temperature, humidity, light intensity, rainfall, and pests and diseases.
- It can be made of materials with a bamboo, wood, mild steel, or pipe framework.
- Ideally, the roof and walls of the Nursery House are made of Ultra Violet (UV) plastic material.

Continue...

- Inside the nursery House, there are seedbed racks.
- Seedling racks are placed at a height that is not in direct contact with the soil.
- Seedling shelves are intended to prevent the seeds from microorganisms in the soil.

Continue...

- Seedling racks also facilitate the process of caring for seeds while in the nursery.
- Seedling racks can be made of bamboo, wood, mild steel, paralon pipes, or a combination of these materials.

5) Media Sterilization

- **Sterilization using chemicals**
  - The planting media was soaked with fungicides and bactericides 2 g / 1 liter of water or 2 ml / 1 liter of water, for 1-2 hours and then drained.

- **Sterilization by "steaming"**
  - The planting medium is "steamed" using a steamer pan, autoclave drum, or other steamer, for 1 hour, then cool down.

Autoclave

6) Technique of Planting Seeds

- Prepare a good seedling location (temperature, humidity, light intensity and rainfall are controlled).
- Prepare a seed tray to store the seedling media.
- Prepare the seedling media that has been selected and "sterilized“.
- "Spray" the seedling medium with clean water. Make sure all of the media is wet.

Continue...

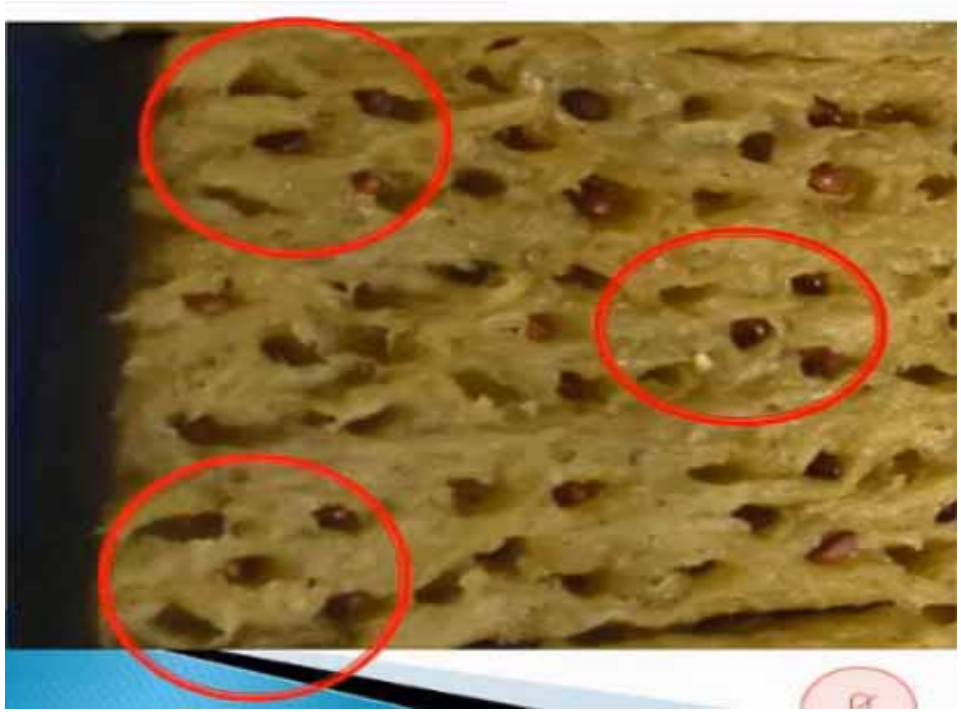
- Make the planting hole based on the size of the seed of the plant. Make sure the planting hole is not too wide and too deep.
- Plant the seeds into the hole in the seed medium. Make sure that each seedling hole contains only 1 plant seed.
- Cover the planting hole (if not using Rockwool).
- Water again. Make sure the planting medium is not too wet.
- While in the nursery, make sure the conditions of the planting media are always wet.

Continue…

Spinach seeds

Continue…

Kangkoong seeds



Continue…

Lettuce seeds

2

Planting in Hydroponic System

1) Pre Planting

- Make sure the seeds that will be transplanted have met their age.
- The age for transplanting ranged from 7 to 21 days, depending on the type of crop commodity and the location where it was grown.
- Make a selection of seeds before the planting process. Make sure that only seeds that grow healthy and normal are planted.

2) Planting Techniques

- Plant in the morning or evening, or when the weather is not hot.
- Try to keep the plants from sinking too much into the net pot or other growing media.
- Make sure no plant leaves touch the pipe.
- Make sure the flow of nutrients is smooth and normal.

3

Maintenance

1) Nutritional Control

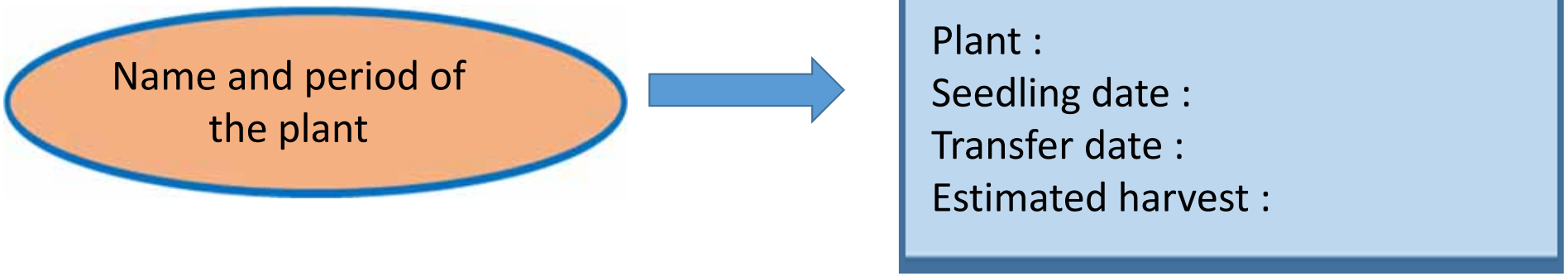
- Nutrition check
- Nutritional enhancement
- Substitution of nutrients
- Nutrient manufacture

Dense concentration

pH

TDS/EC Meter

2) Labeling



Example :

Kangkoong
Seedling : 2/12
Transfer : 6/12; 13/12; 20/12
Estimated harvest : 27-30 Des

3) Set the Lighting

Very hot

Install a paranet/shade net

Causes wilting and a bitter taste of vegetables

Digital Lux Meter

Lack of light

- Move it into a place of sufficient light
- Adding LED lights (wasteful of electricity)

Causes wilting, etiolation and less than optimal growth

4) Check Temperature and Humidity

Temperature

Thermo Hygrometer

→ Temperature in the greenhouse → addition of a fan

→ Temperature in the nutrient tank → the reservoir is stored in the shade

Humidity : 50-80%

→ **High** humidity reduces nutrient absorption

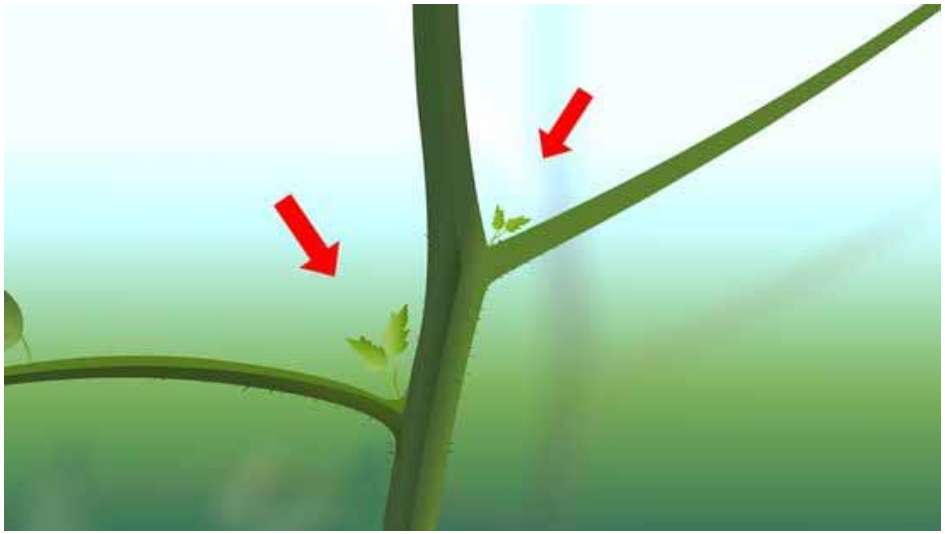
→ **Low** humidity withered plants
Solution: Install paranets and sprinklers in the greenhouse

5) Pruning or Thinning

Fruit vegetables/
Fruit plants

→ Cutting branches, stems, leaves that are not productive

For example: tomatoes, melons, watermelons, eggplants, peppers



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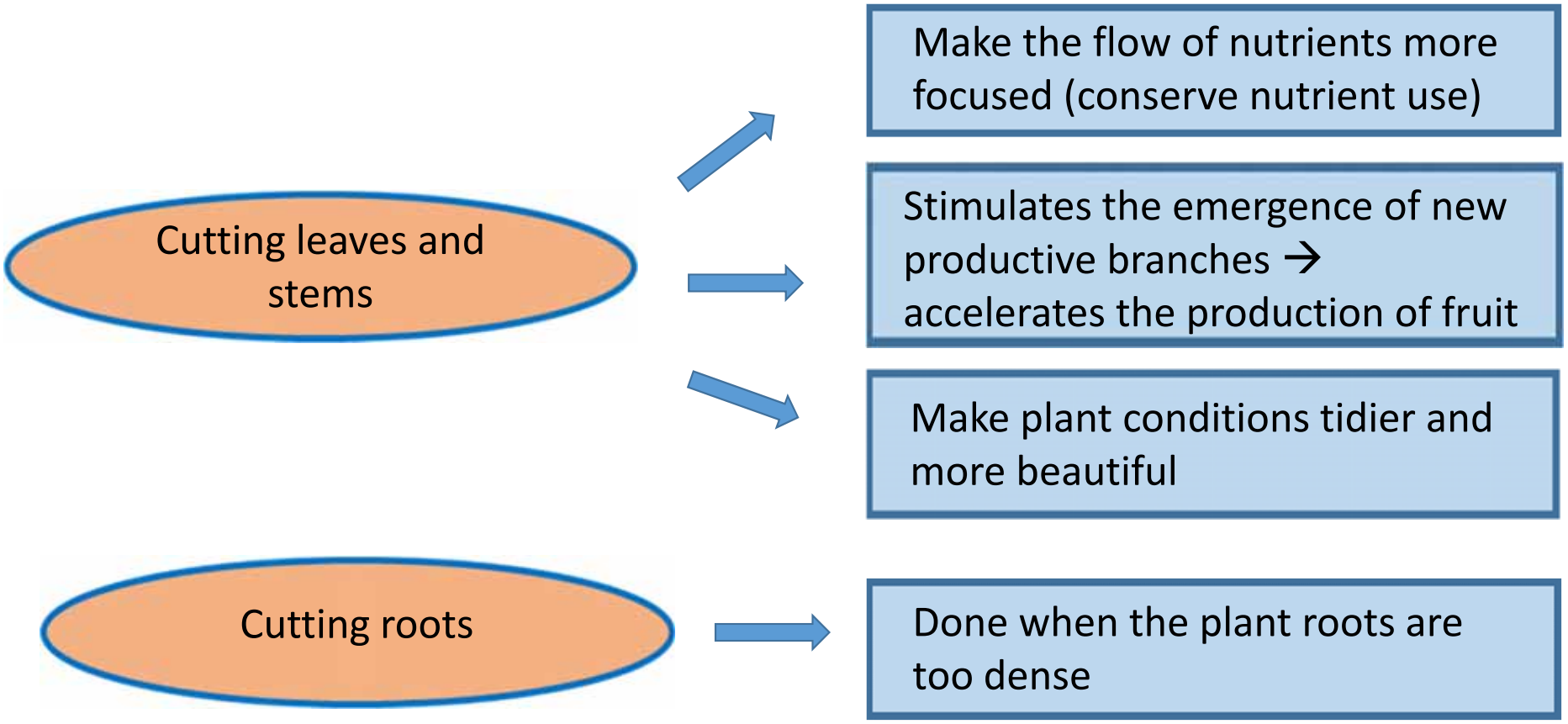

Cutting leaves and stems
Make the flow of nutrients more focused (conserve nutrient use)
Stimulates the emergence of new productive branches → accelerates the production of fruit
Make plant conditions tidier and more beautiful
Cutting roots
Done when the plant roots are too dense

6) Monitor the Installation

Cleanliness

Clean = minimal moss

Schedule an installation wash.
For example, at harvest

No leakage

Provide adhesive/ paralone glue

7) Pest Control

Using vegetable pesticides → Extracts of neem leaves, soursop leaves, garlic, betel leaf, tobacco, lemongrass

Use traps → The bottle is painted with light color (eg yellow), the impraboard is smeared with glue

Natural Pest Control

Yellow Trap

Advantages of Vegetable Pesticides

- Environmentally friendly because vegetable pesticides have organic material that is easily biodegradable.
- Vegetable pesticide residues are easily biodegradable.
- Non-toxic to humans.
- Materials and processes for making pesticides are easily available.
- Do not poison or damage plants.
- The manufacturing cost is relatively cheap.
- The use of vegetable pesticides provides added value.

Lack of Vegetable Pesticides

- The spraying performance of vegetable pesticides is not as fast as chemical pesticides.
- Evaporates easily because of the high intensity of the sun.
- Storage doesn't last long.
- Vegetable pesticide raw materials are available in large quantities.
- Low toxicity.

Garlic Extract (almost all types of pests (90%) can eradicated, both pests on leaves and planting media

Materials

- 5-6 pieces of garlic
- 1 teaspoon galangal
- 1 teaspoon cloves
- 1 liter of water
- Diswashing liquid soap
- Methylated spirits

Tools

- Grater
- Pestle
- Bucket
- Mixer
- Filter/soft cloth

How to make

Grate the garlic and galangal → put in a container

Mash the cloves, then mix with the grated garlic and galangal

Pour 1 liter of water, mix well, then save for one day or until the waste of the material settle

Continue…

Filter the solution using a filter or soft cloth, mix with methylated spirits, and mix well

Let stand for a while, then store in a tightly closed bottle

Mix 0.25 liters of solution with 1 tablespoon of liquid soap and stir well, then put it in the sprayer

How to use

Application	• Spray onto the base of the affected plant in the afternoon/evening
Prevention	• Just spray every two weeks

8. Use of stakes

Support so that the grown plant stems do not fall

Calculating Hydroponic Nutritional Needs (AB MIX)


NUTRISI
HIDROPONIK
AB Mix
MIX
B
Aturan Pakai :
Pembuatan Larutan Stock
- Siapkan 2 Buah botol ukuran 500 ml
- Stock A Masukkan Mix A Kedalam botol
Tambahkan Air sampai mencapai 500 ml
Kocok sampai larut sempurna.
- Stock B Masukkan Mix B Kedalam botol
Tambahkan Air sampai mencapai 500 ml
Kocok sampai larut sempurna
Pembuatan Larutan Nutrisi
Untuk membuat 1 liter larutan nutrisi siap pakai, siapkan 1 Liter air kemudian tambahkan 5 ml larutan stock A dan 5 ml larutan stock B. Aduk rata.
Campuran A dan B dalam 100 Liter bernilai kurang lebih EC = 2,0 / 1000 PPM
Bahan Penyusun :
Calcium Nitrat,
Kalium Nitrat,
Mono Kalium Phosphat,
Amonium Sulfat,
Kalium Sulfat,
Magnesium Sulfat dan
Chelated Micromix Nutrients
PERHATIAN :
Jangan Campurkan Larutan Stock A dan Stock B dalam kondisi Pekat
MINIMAX
Formulated by : PROTEAG SARANA MANDIRI (PSM)
Distributed by : FAJAR SEJATI SUKSES pt.

Convert EC Units (µS / cm) to TDS Units (ppm) According to Several Versions

EC	Hanna	Eutech	Truncheon	CF
ms/cm	0.5 ppm	0.64 ppm	0.70 ppm	0
0.1	50 ppm	64 ppm	70 ppm	1
0.2	100 ppm	128 ppm	140 ppm	2
0.3	150 ppm	192 ppm	210 ppm	3
0.4	200 ppm	256 ppm	280 ppm	4
0.5	250 ppm	320 ppm	350 ppm	5
0.6	300 ppm	384 ppm	420 ppm	6
0.7	350 ppm	448 ppm	490 ppm	7
0.8	400 ppm	512 ppm	560 ppm	8
0.9	450 ppm	576 ppm	630 ppm	9
1.0	500 ppm	640 ppm	700 ppm	10
1.1	550 ppm	704 ppm	770 ppm	11
1.2	600 ppm	768 ppm	840 ppm	12
1.3	650 ppm	832 ppm	910 ppm	13
1.4	700 ppm	896 ppm	980 ppm	14
1.5	750 ppm	960 ppm	1050 ppm	15
1.6	800 ppm	1024 ppm	1120 ppm	16
1.7	850 ppm	1088 ppm	1190 ppm	17
1.8	900 ppm	1152 ppm	1260 ppm	18
1.9	950 ppm	1216 ppm	1330 ppm	19
2.0	1000 ppm	1280 ppm	1400 ppm	20
2.1	1050 ppm	1334 ppm	1470 ppm	21
2.2	1100 ppm	1408 ppm	1540 ppm	22
2.3	1150 ppm	1472 ppm	1610 ppm	23
2.4	1200 ppm	1536 ppm	1680 ppm	24
2.5	1250 ppm	1600 ppm	1750 ppm	25
2.6	1300 ppm	1664 ppm	1820 ppm	26
2.7	1350 ppm	1728 ppm	1890 ppm	27
2.8	1400 ppm	1792 ppm	1960 ppm	28
2.9	1450 ppm	1856 ppm	2030 ppm	29
3.0	1500 ppm	1920 ppm	2100 ppm	30
3.1	1550 ppm	1984 ppm	2170 ppm	31
3.2	1600 ppm	2048 ppm	2240 ppm	32

Recommended pH and Nutritional Concentration in Hydroponics

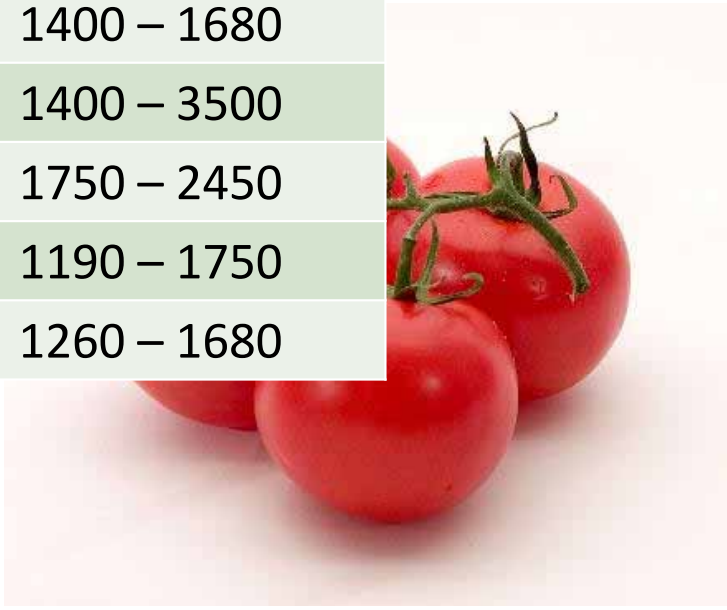
pH and PPM Tables for Leaf Vegetables		
Vegetable Name	**pH**	**PPM**
Artichoke	6.5 – 7.5	560 – 1260
Asparagus	6.0 – 6.8	980 – 1200
Pre onion	6.5 – 7.0	980 – 1260
Spinach	6.0 – 7.0	1260 – 1610
Broccoli	6.0 – 6.8	1960 – 2450
Brusell sprouts	6.5	1750 – 2100
Endive	5.5	1400 – 1680
Kailan	5.5 – 6.5	1050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

Continue…

pH and PPM Tables 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 Tables 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



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pH and PPM Tables 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
Strawberry	6.0	1260 – 1540
Watermelon	5.8	1260 – 1680

Continue…

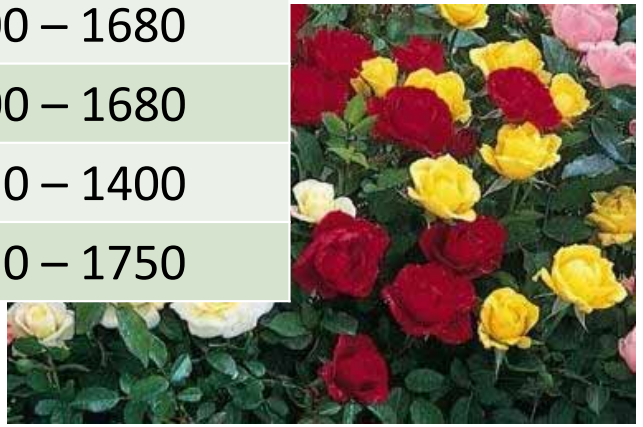
pH and PPM Tables for Flower Plants		
Flower Name	**pH**	**PPM**
African violet	6.0 – 7.0	840 – 1050
Anthurium	5.0 – 6.0	1120 – 1400
Antirrhinim	6.5	1120 – 1400
Aphelandra	5.0 – 6.0	1260 – 1680
Daisies	6.0 – 6.5	1260 – 1680
Begonia	6.5	980 – 1260
Bromeliads	5.0 – 7.5	560 – 840
Caladium	6.0 – 7.5	1120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

Continue…

pH and PPM Tables for Flower 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 Tables for Flower 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



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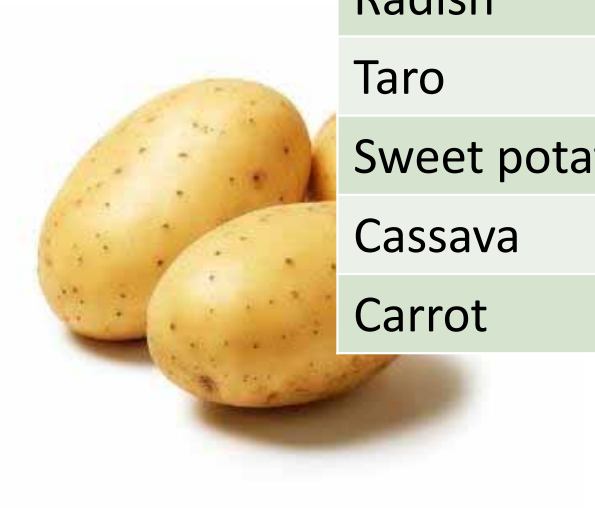
pH and PPM Tables for Herbal Plants		
Herbal Name	**pH**	**PPM**
Basil	5.5 – 6.5	700 – 1120
Chicory	5.5 – 6.0	1400 – 1600
Chives	6.0 – 6.5	1260 – 1540
Fennel	6.4 – 6.8	700 – 980
Lavender	6.4 – 6.8	700 – 980
Lemon Balm	5.5 – 6.5	700 – 1120
Marjoram	6.0	1120 – 1400

Continue…

pH and PPM Tables 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

Continue…

pH and PPM Tables for Tuber Crops		
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



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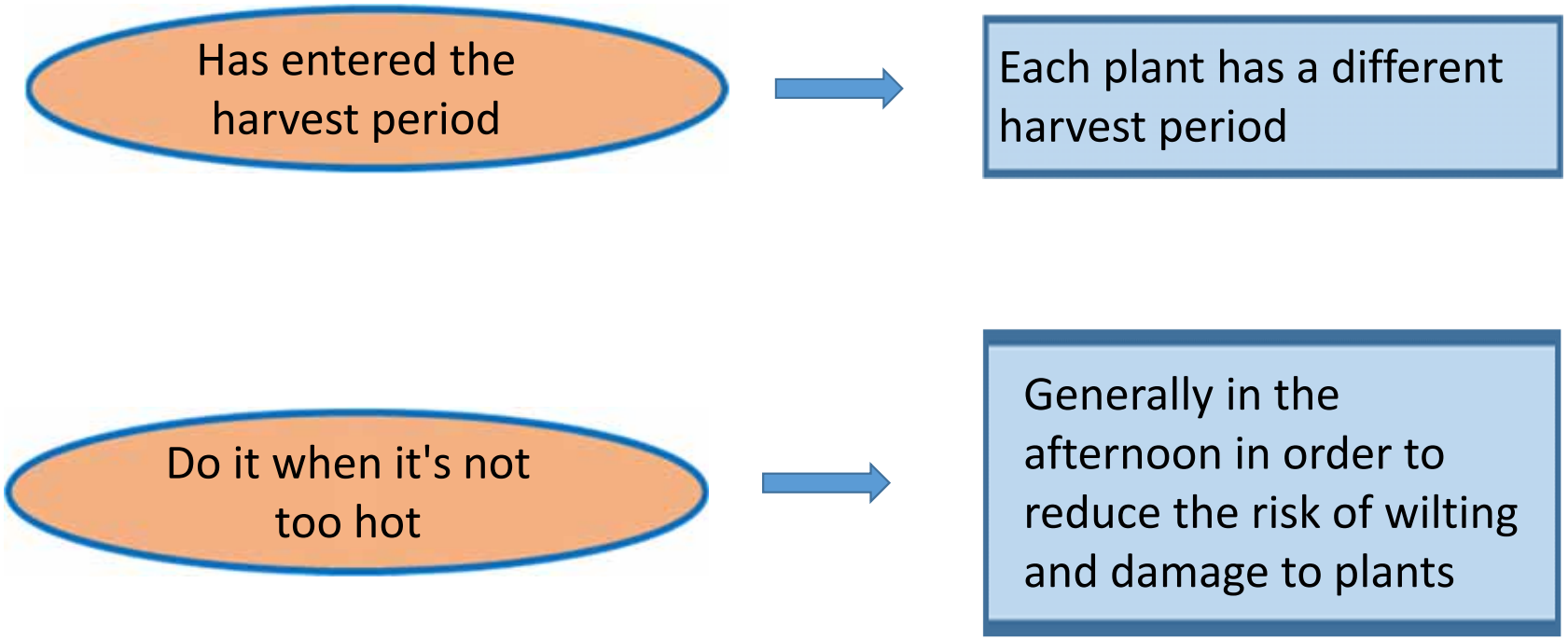
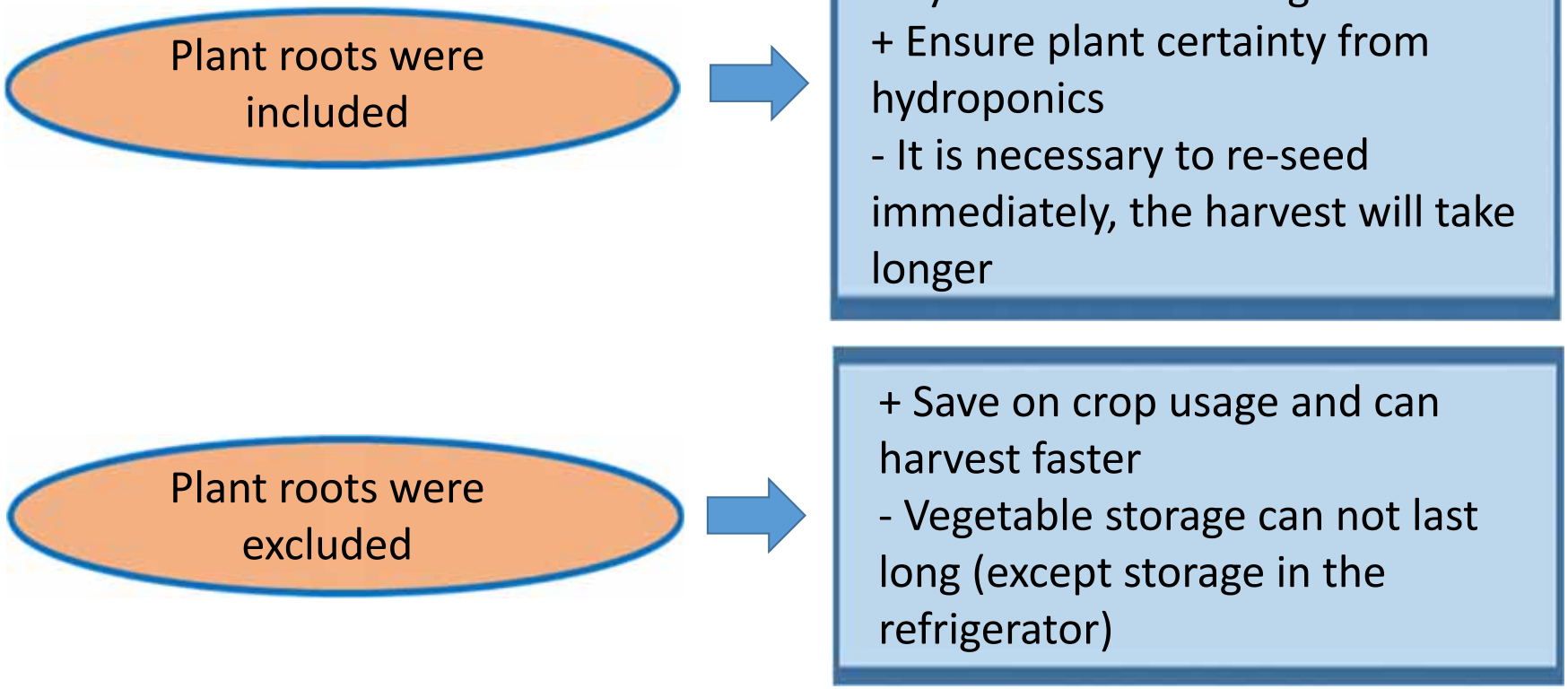
Harvesting

1) Harvest Time



2) How to Harvest



Accompanied by roots and rockwool

Accompanied by a little root without rockwool


THANK YOU