Propagating cassava plants using aeroponic culture at Hung Loc Agricultural Research Center

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outline

Why do we need the aeroponics system?

What is the origin of aeroponics system

How to design aeroponic system?

How does it work?

What are advantages and disadvantages of the system?

I. Why do we need the aeroponics system?

- **Cassava** is a **vegetatively propagated** crop **-> easily infected** by any certain diseases in **large scale**
- In **Tay Ninh** province, **92,6%** of planting area was **infected with CMD** *(Tay Ninh-SubDPP, 2019) -> similar scenario for Dong Nai soon.*

To stop the spreading of CMD

- **Stop** reusing **infected material**
- Quickly **provide** (in large quantity) **hyper-tolerant variety**

Solution

A **close, rapid repropagation system** help prepare stock for sustainable production

I. The origin of our aeroponics system

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An efficient method of propagating cassava plants using aeroponic culture

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Stock Sol.		Molecular weight	Concentration µM (Final)	g/L	g/100 L	Stock (20X) g/L	Stock (40X) g/3L
1	Ammonium Nitrate (NH_4NO_3)	80.1	300	0.024	2.403	0.4806	2.8836
	Potassium Sulfate (K_2SO_4)	174.3	300	0.0523	5.229	1.0458	6.2748
	Sodium Phosphate (Na_2HPO_4)	142	180	0.0256	2.556	0.5112	3.0672
	Calcium Chloride Dehydrate ($CaCl_2.2H_2O$)	147	360	0.0529	5.292	1.0584	6.3504
	Magnesium Sulfate Heptahydrate ($MgSO_4.7H_2O$)	264.5	460	0.1134	11.339	2.2678	13.6068
	Ethylendiamineteraacetic acid iron (III) Sodium Salt (FeIII EDTA)	367.1	45	0.0165	1.652	0.3304	1.9824
	Hydrochloric acid (HCl)		adjust pH 6.0				
							Stock (5000X) g/100mL
2	Boric acid (H_3BO_3)	61.83	18	0.0011	0.1113	0.5565	
	Manganese (II) Sulphate Monohydrate ($MnSO_4.H_2O$)	169	4.6	0.0008	0.0777	0.3885	
	Zinc Sulfate Hepthydrate ($ZnSO_4.7H_2O$)	287.5	1.5	0.0004	0.0431	0.2155	
	Cupric Sulfate ($CuSO_4$)	249.7	1.5	0.0004	0.0375	0.1875	
	Sodium Molybdate (Na_2MoO_4)	242	1	0.0002	0.0242	0.121	

Note: both stocks look cloudy after making. After add stocks into water, check pH again to make sure pH of final solution is 6.0

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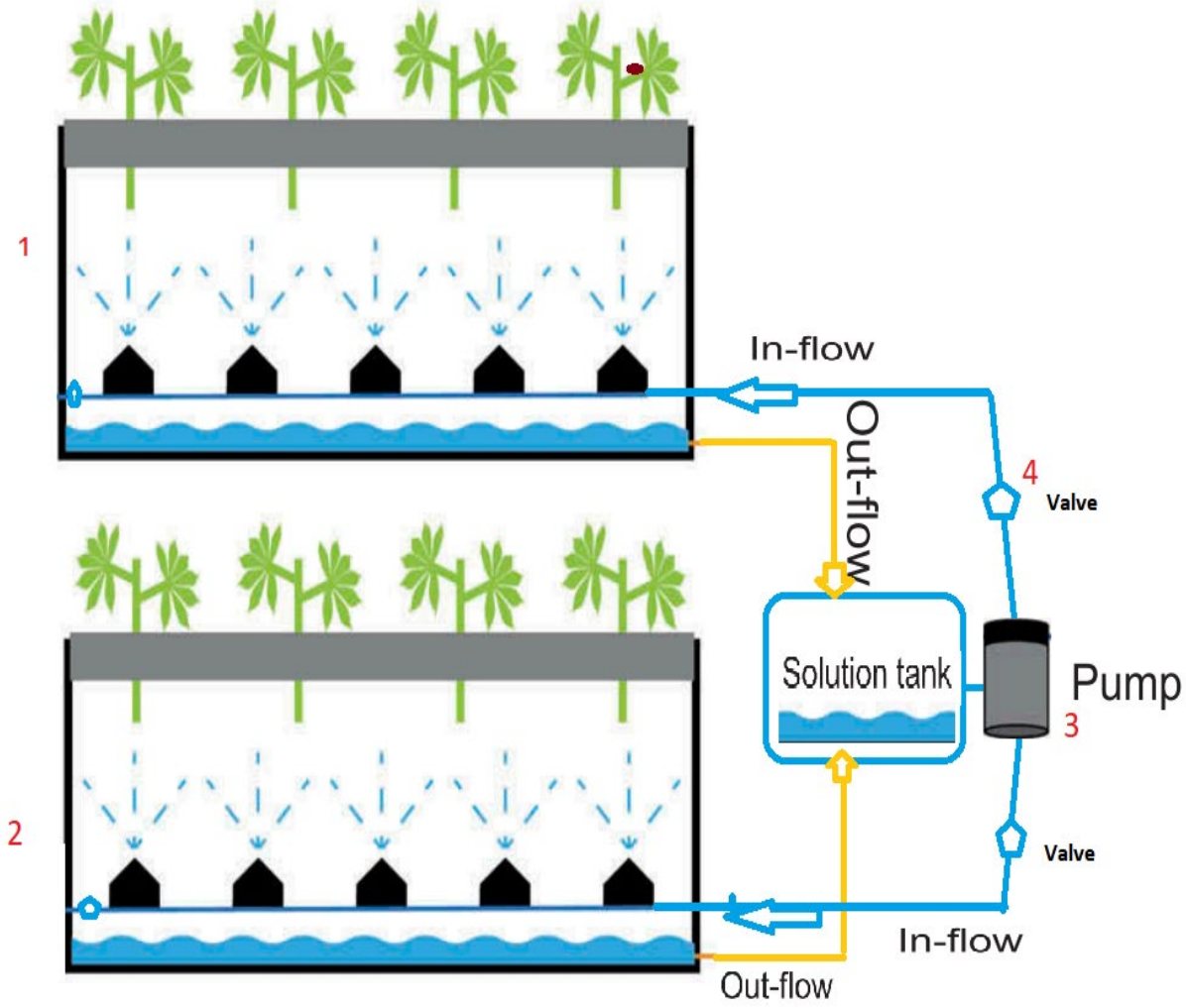
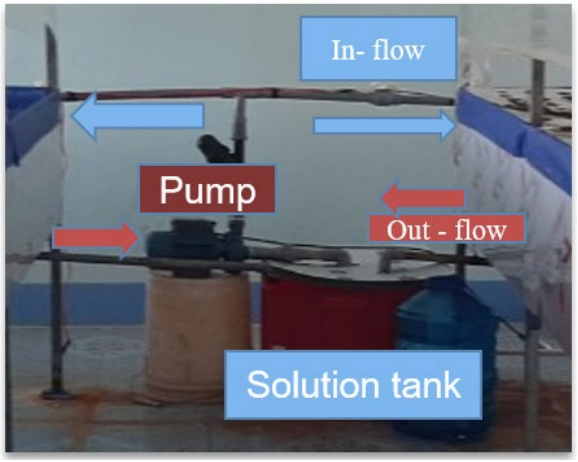
III. HLARC aeroponic system

1. Design:





III. HLARC aeroponic system:

2. Technical Index :

Index	Value
Number of lignified cuttings can be multiplied/ system	300
Number of immature cuttings can be multiplied/ system	450
Media	An Thuat Phuoc hydroponic stock
pH	6.0 (weekly monitor)
Light/Dark period	12h/12h
Spray/Stop period	30-50 s/7-10min.
Propagation Rate	x3 after 10 days (w/ continuous material)

III. HLARC aeroponic system:

3. Process:

- 1 young stem can be cut into 3 part (2-3 nodes each)
- After transferring cover the whole system to maintain optimum humidity

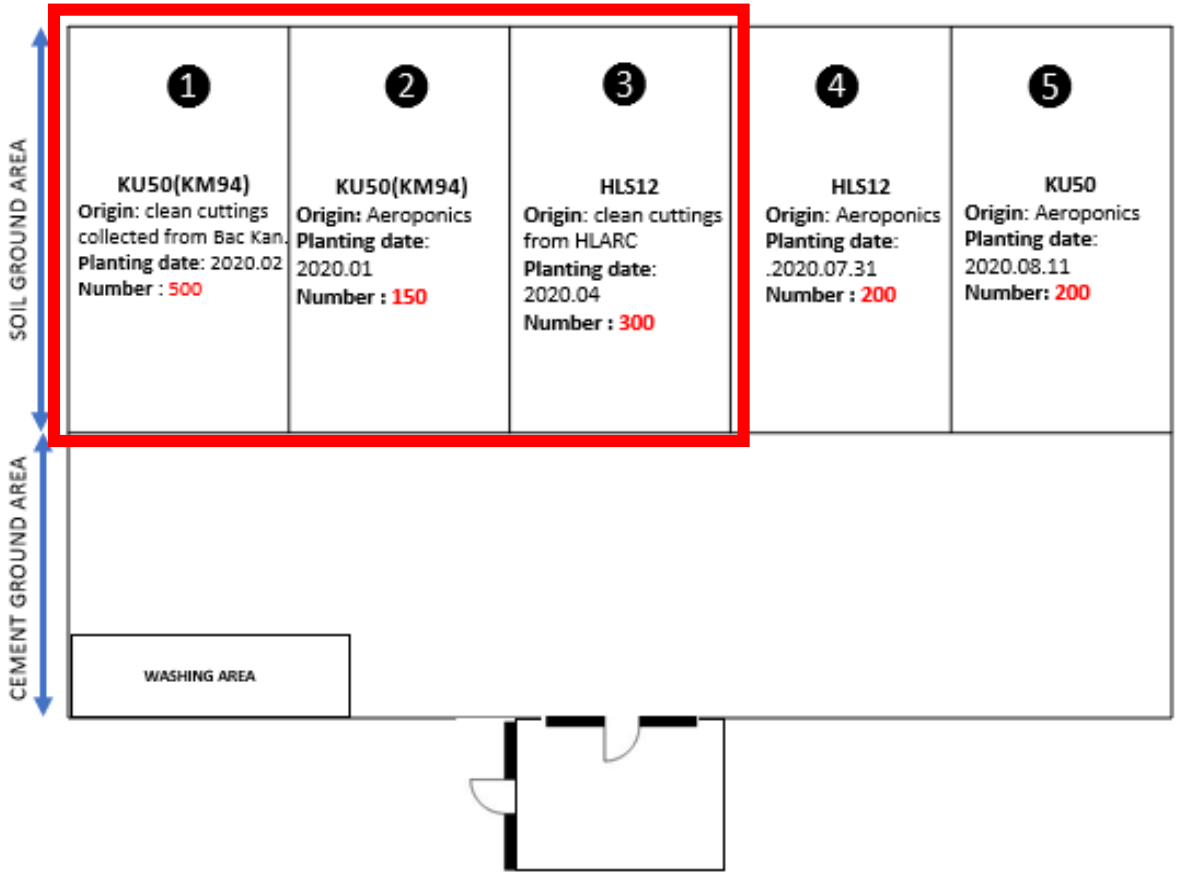
- TN1 soil mix

- 1-2 month old plants are optimum
- Lignified cuttings are also possible

- pH is monitored every 2 days to keep at 6.0

- Watering daily
- Pesticide is applied if needed.

Step 1. Preparing input material

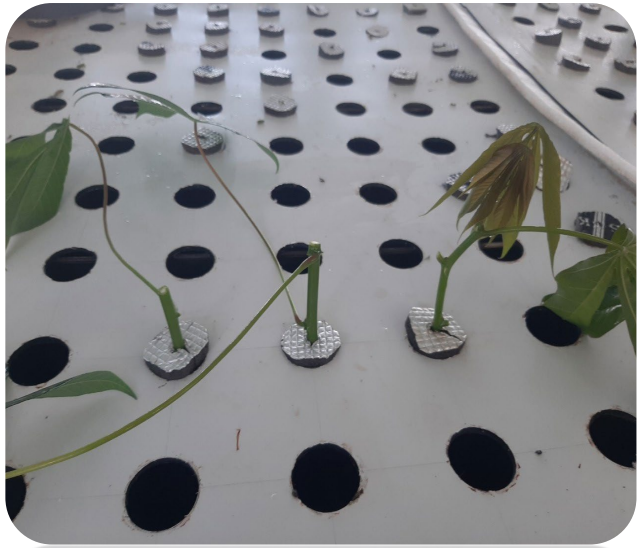


Map in HLARC screenhouse (input material in red)

Step 2: Transfer material to the system

Cutting qualified stems into three mini parts (2-3 nodes each, keeping 1 leaf minimum)

Wrapping the stem with positioning foam



Putting young cuttings into position

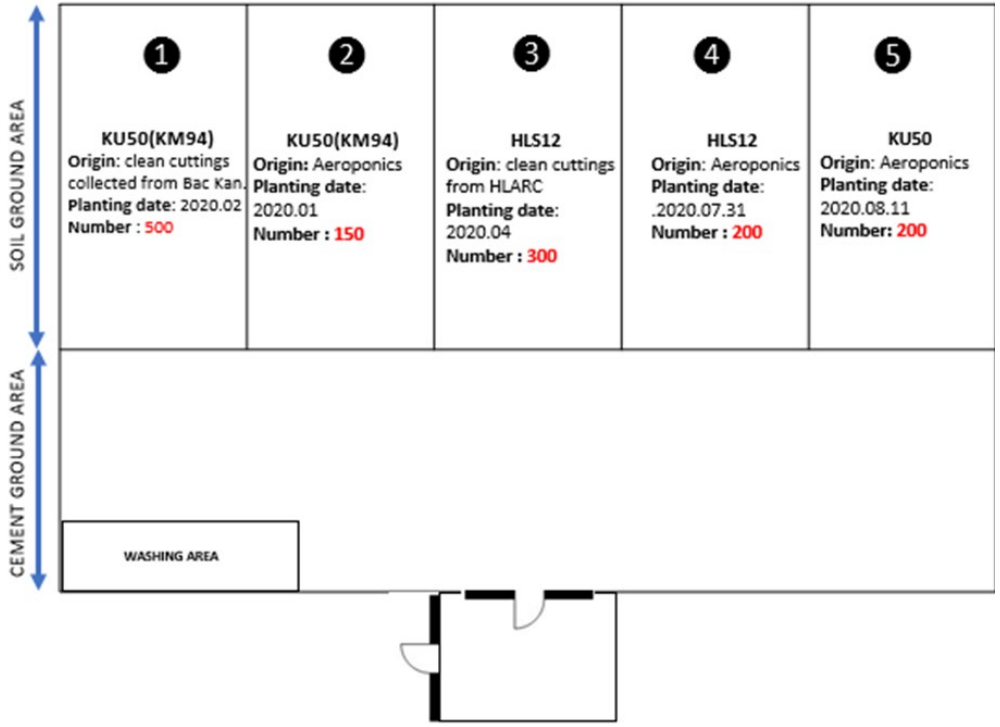
Cover the whole system using plastic film.

Step 3: 10 days to make root

Step 4: Transfer young plants to soil pots

Step 5: Adapt in screenhouse for 2 weeks

IV. Summary of Aeroponics Plants Management at HLARC



For the two recent cycles of multiplication cycles we achieved high survival rate at app. 85%.

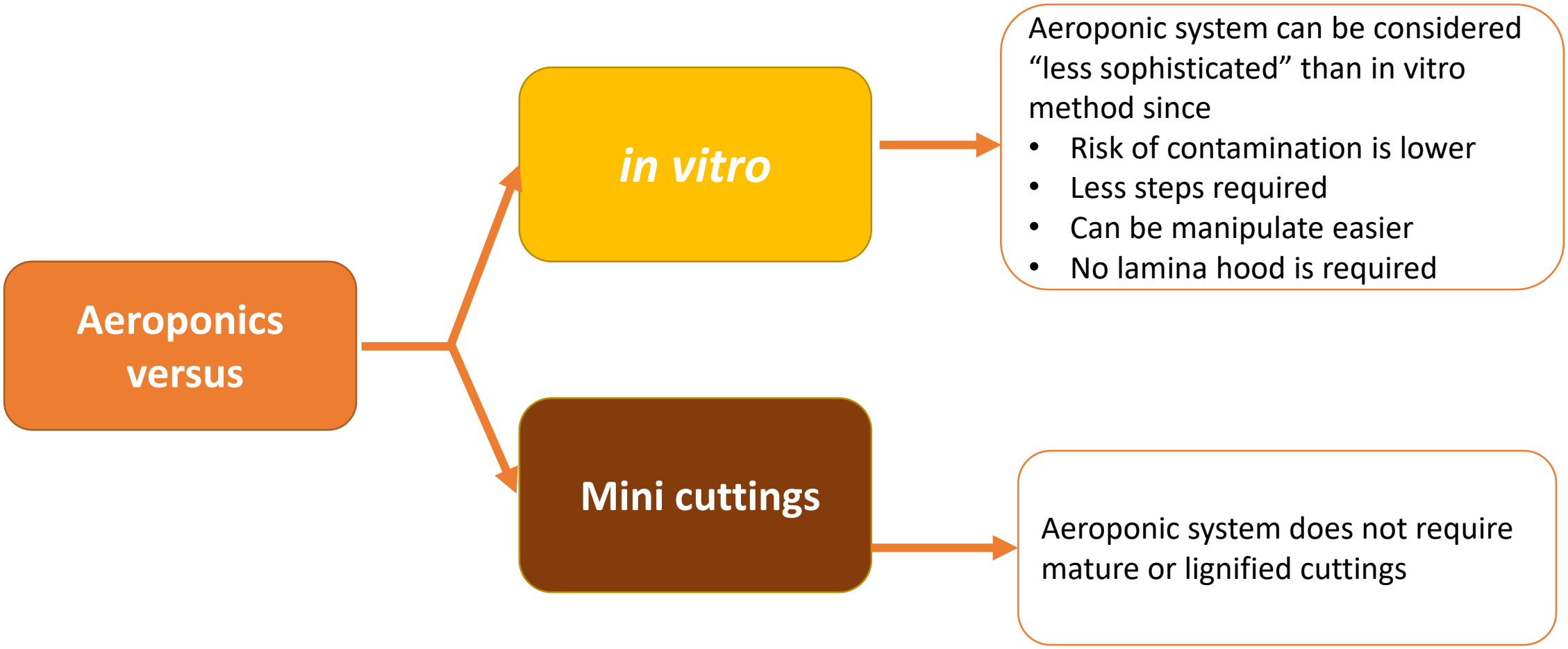
Screenhouse plants summary

Area	Variety	Origin	Number of plants	Planting date	Average height (cm)*	Average node number*	App. number of young stems can be collected.
1	**KU50(KM94)**	Clean cuttings collected from Bac Kan	500	2020.02	50	13	150
2	**KU50(KM94)**	Aeroponics (HLARC)_2019 Trial (Mother plants were clean cuttings from HLARC field)	150	2020.01	55	15	50
3	**HLS12**	Clean cuttings from HLARC field	300	2020.04	30	11	100
4	**HLS12**	Young cuttings collected from Area 3	200	2020.07.31	35	n/a	n/a
5	**KU 50**	Young cuttings collected from Area 1	200	2020.08.21	n/a	n/a	n/a

(*) The average height and node number are not the natural measurement since plants have been cut several times to serve as input material for aeroponics system

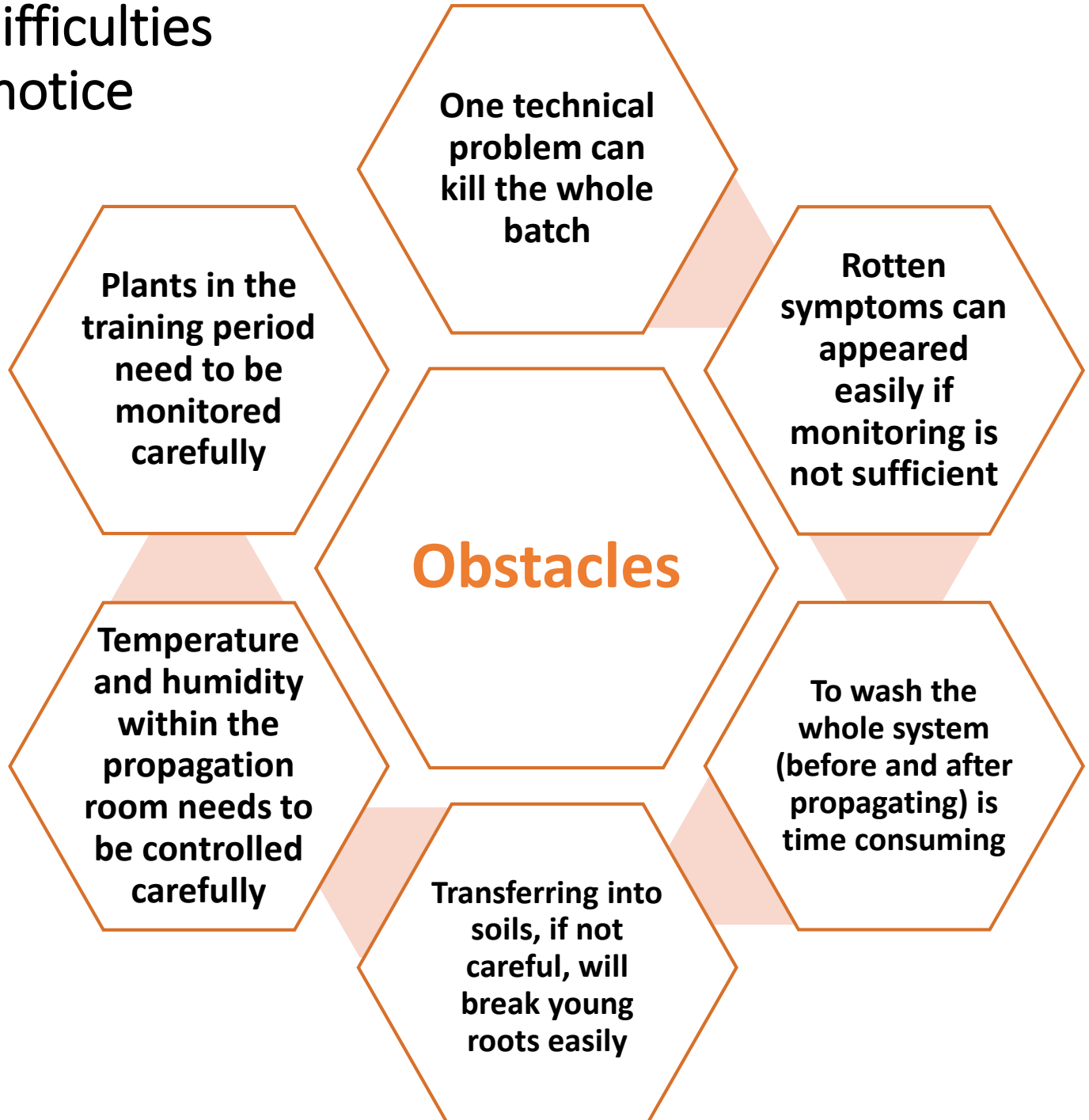
V. Advantages and Difficulties

1. Advantages:



V. Advantages and Difficulties

1. Difficulties and notice



VI. HLARC'S VISION FOR AEROPONICS SYSTEM:

- Using aeroponics to rapidly propagating elite candidates (CMD tolerance with high yield)

-> Maintaining clean stock to fight again CMD and sustain cassava production.

Thank you!