# Nitrogen Transformations in Aquaponic System

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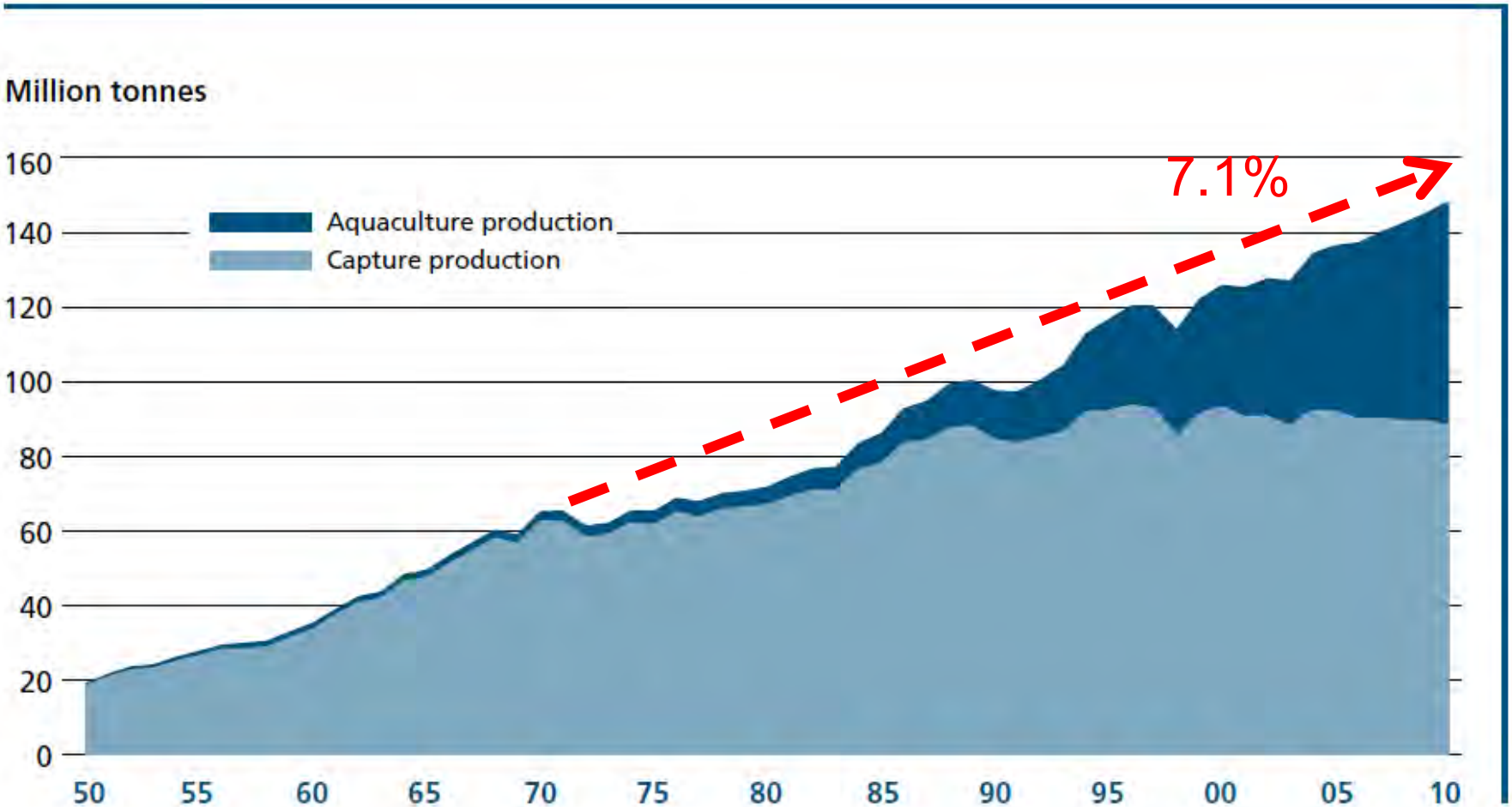
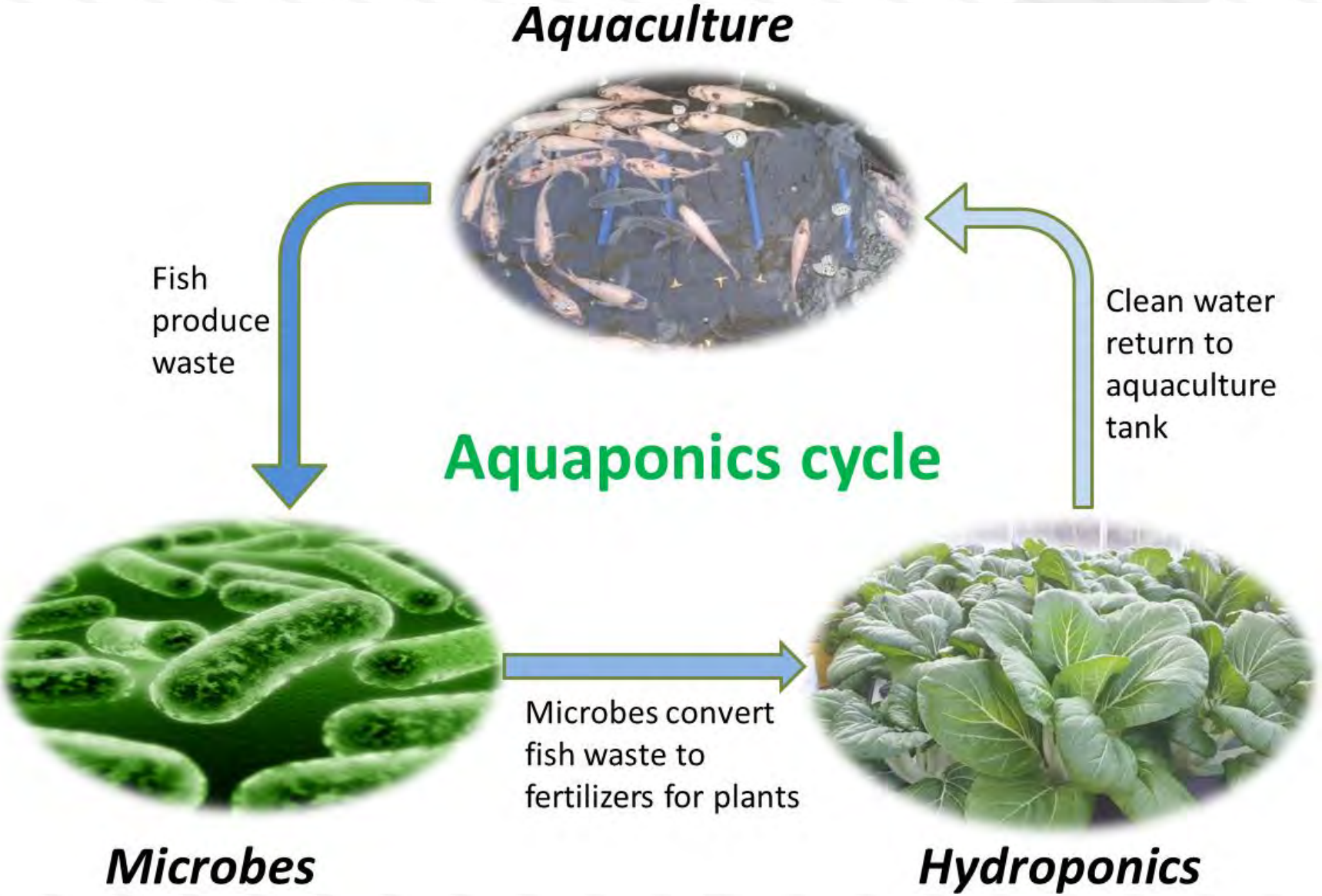
# 1. Introduction

- Aquaculture



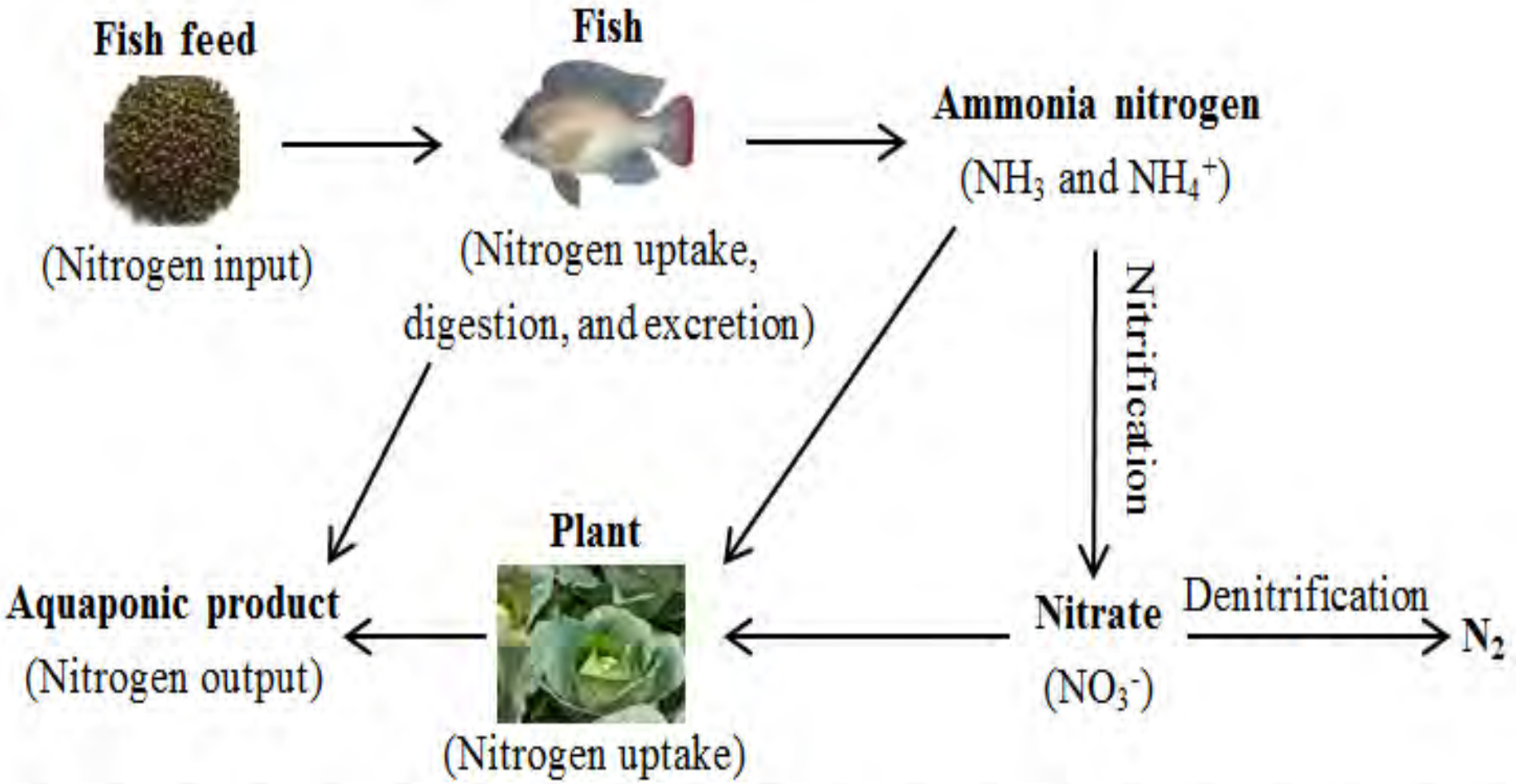

World capture fisheries and aquaculture production.




Aquaponics cycle

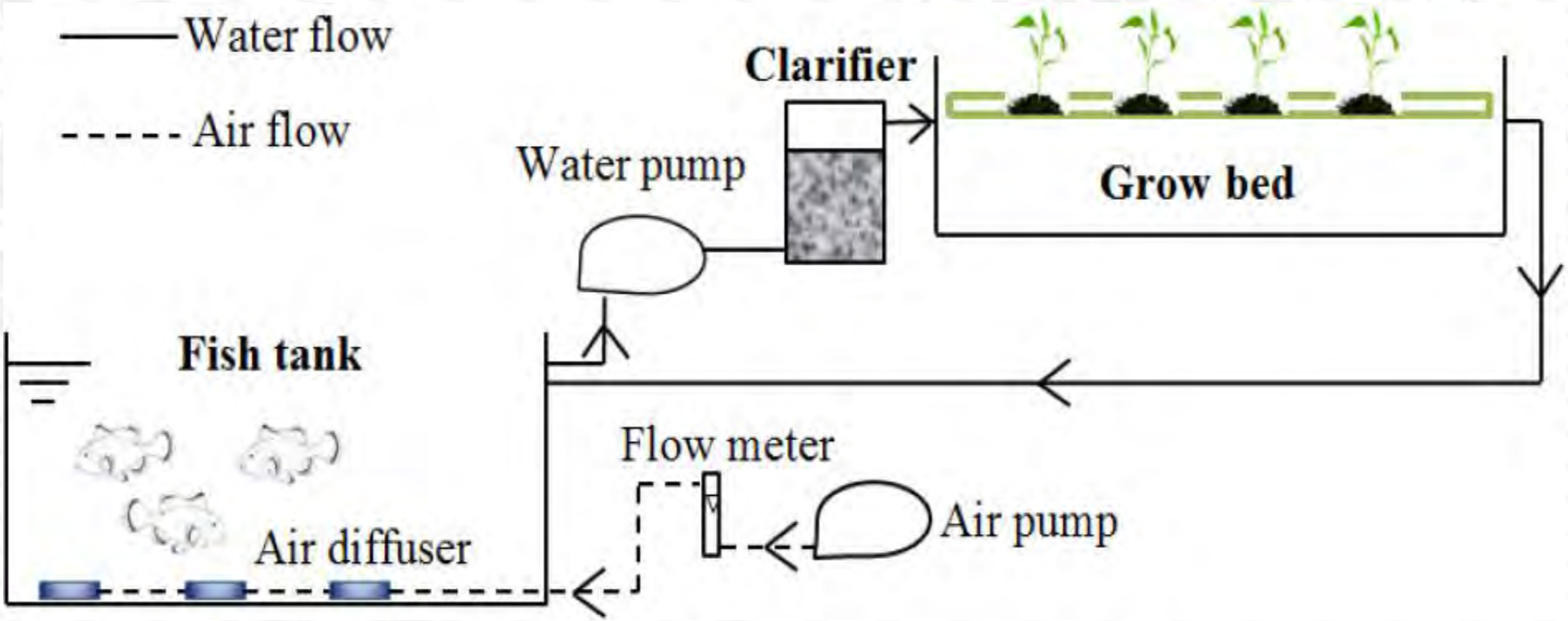
## Advantages of aquaponics

- Improve nutrient retention efficiency
- Reduce water usage
- No wastewater discharge to the environment
- Two crops are produced from one input




Nitrogen transformations in aquaponic system

# 2. Experiment setup




Schematic diagram of an aquaponic system


Our greenhouse

Tank and fish

Grow bed

Photo of our aquaponic systems

# 3. Results and Discussion

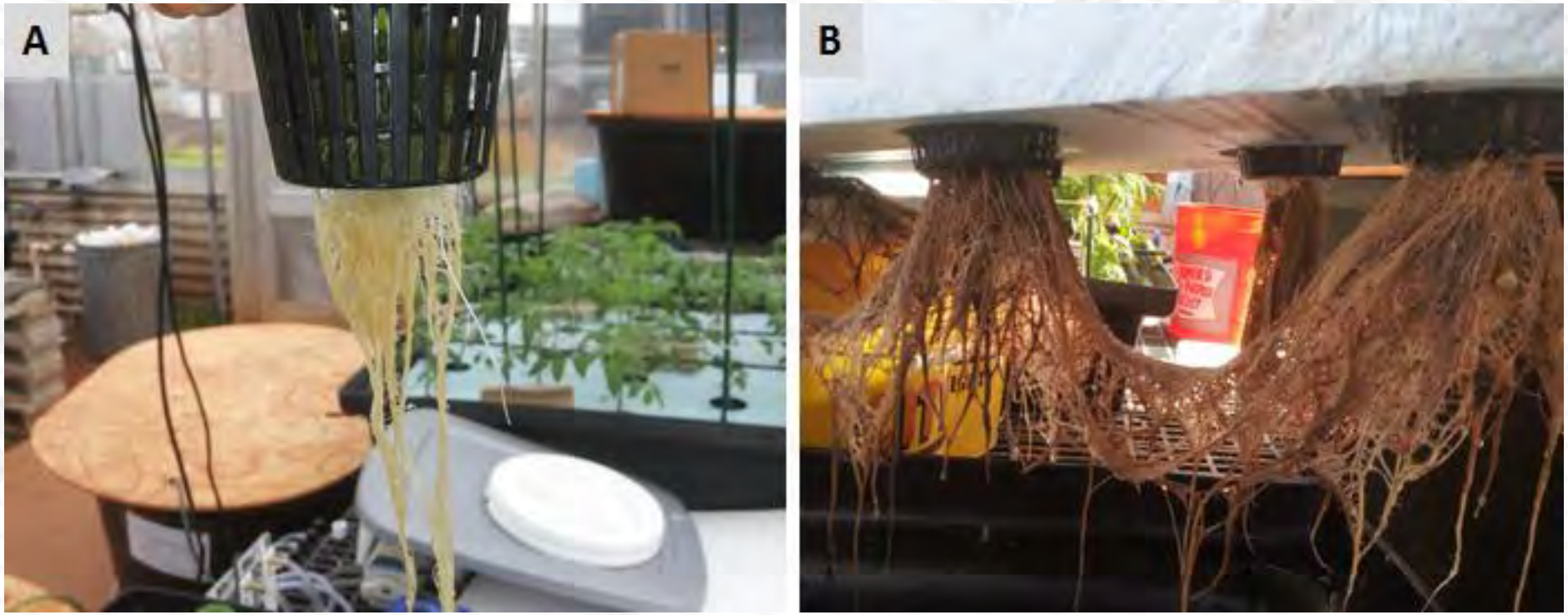
- 3.1 Aquaponics performance


Tomato


Pak Choi

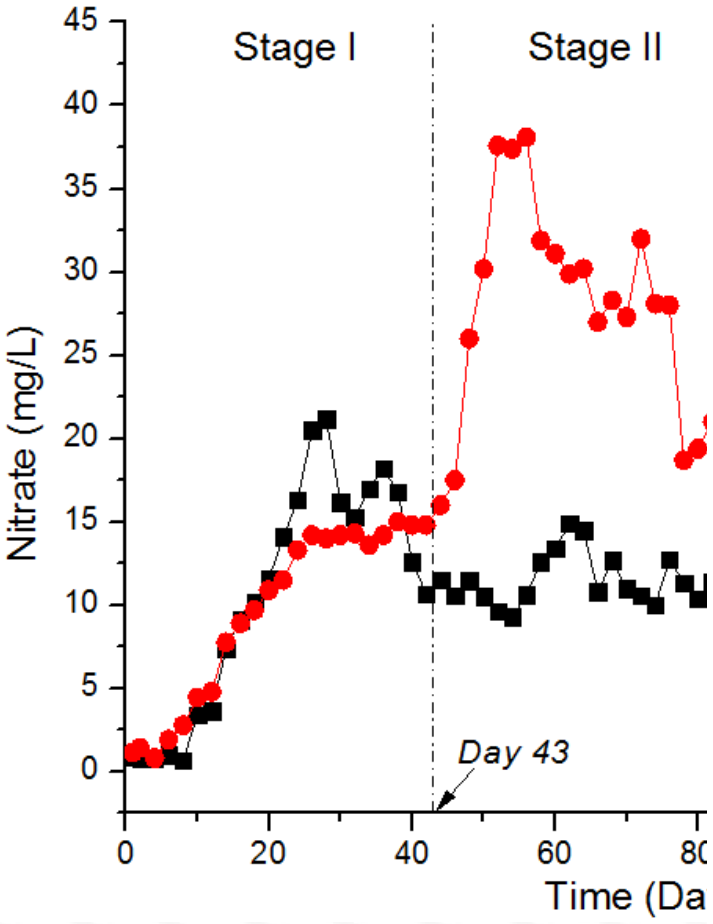
13.9 kg Tomato fruits, and 24.9 kg Pak Choi leaves.


Life cycle of Pak Choi in aquaponics

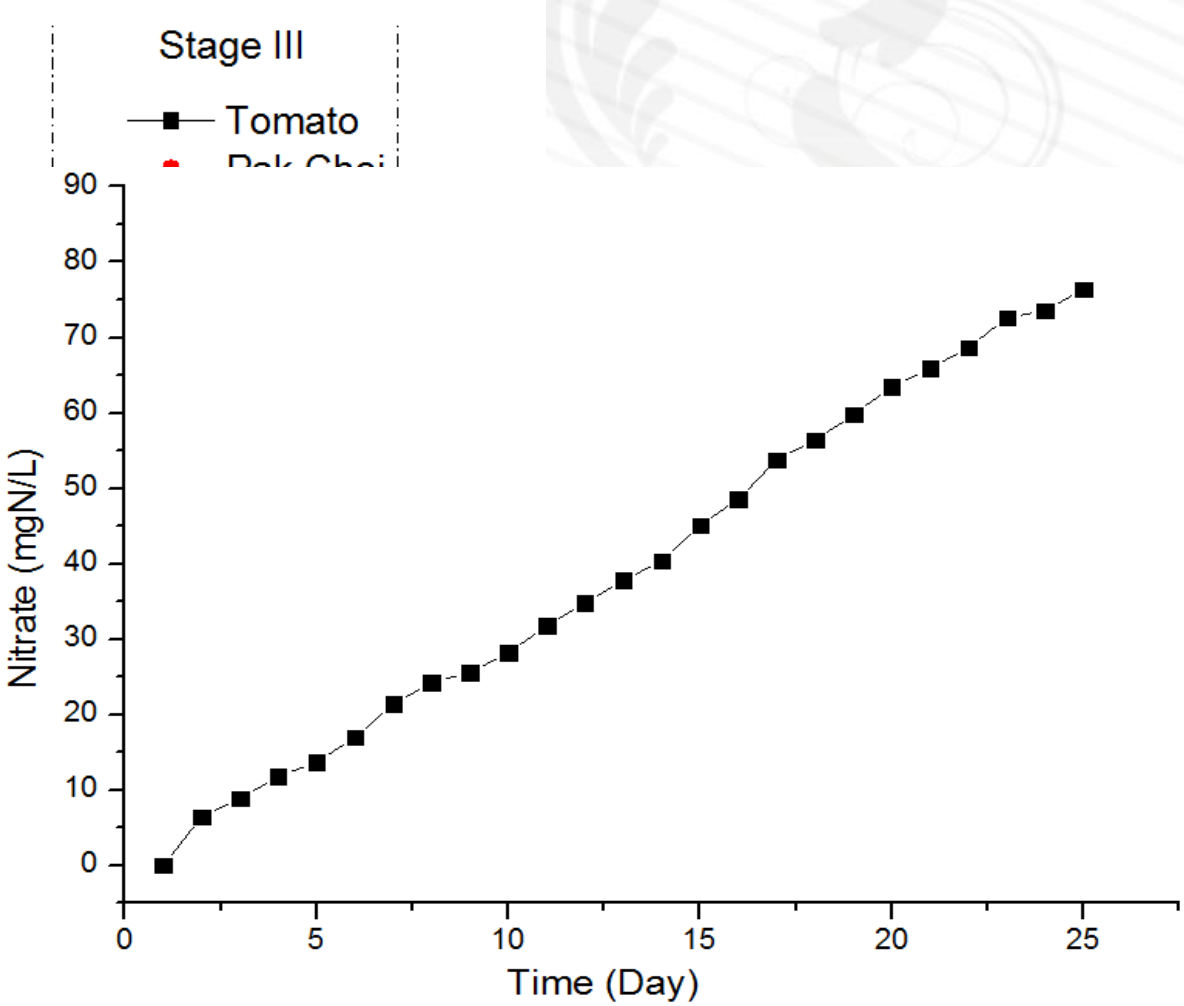



Pak Choi roots two weeks (A) and six weeks (B) after transplantation

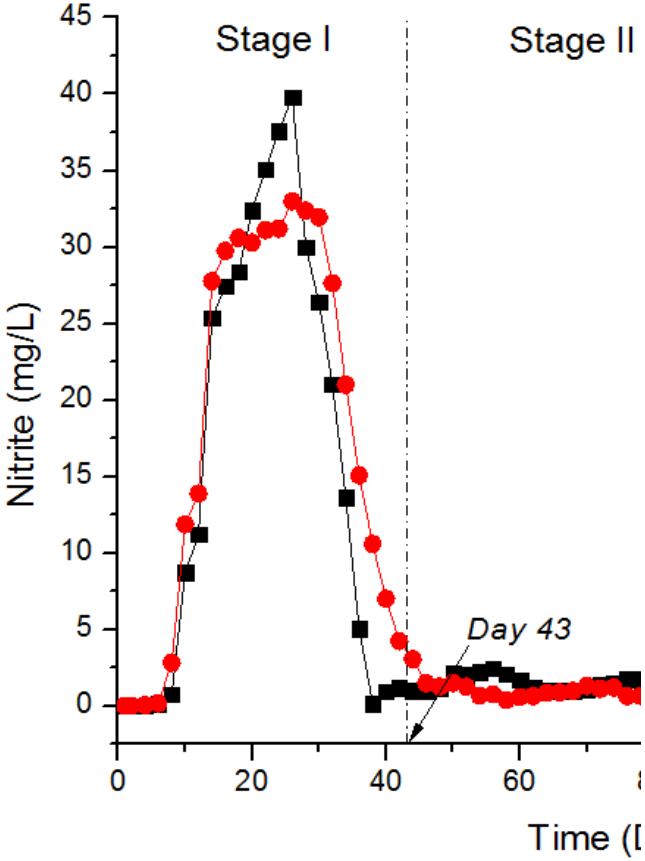
# 3.2 Water quality



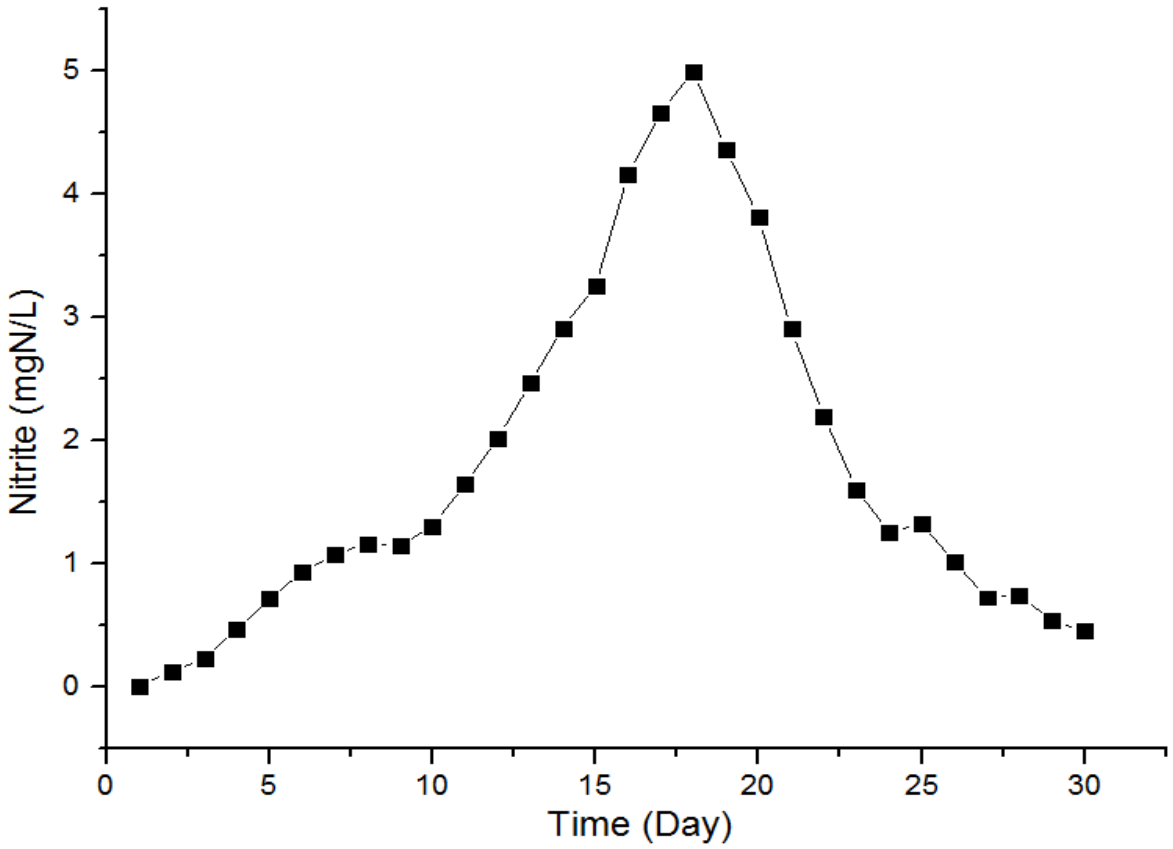

- Variation of $NO_3^-$ conce during the study period



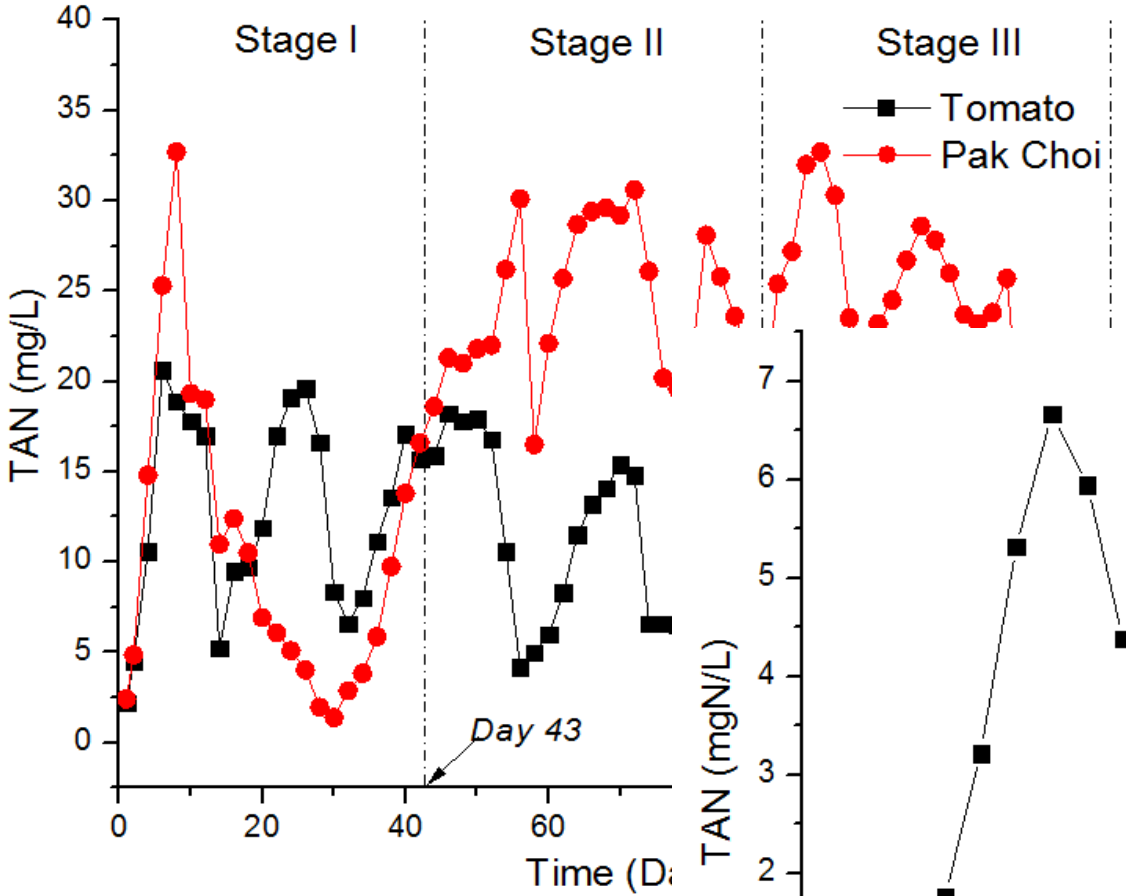

- Variation of $NO_3^-$ concentration in aquaculture system




- Variation of $NO_2^-$ concen
  aquaponics during the st




- Variation of $NO_2^-$ concentration in aquaculture system




- Variation of TAN concentra
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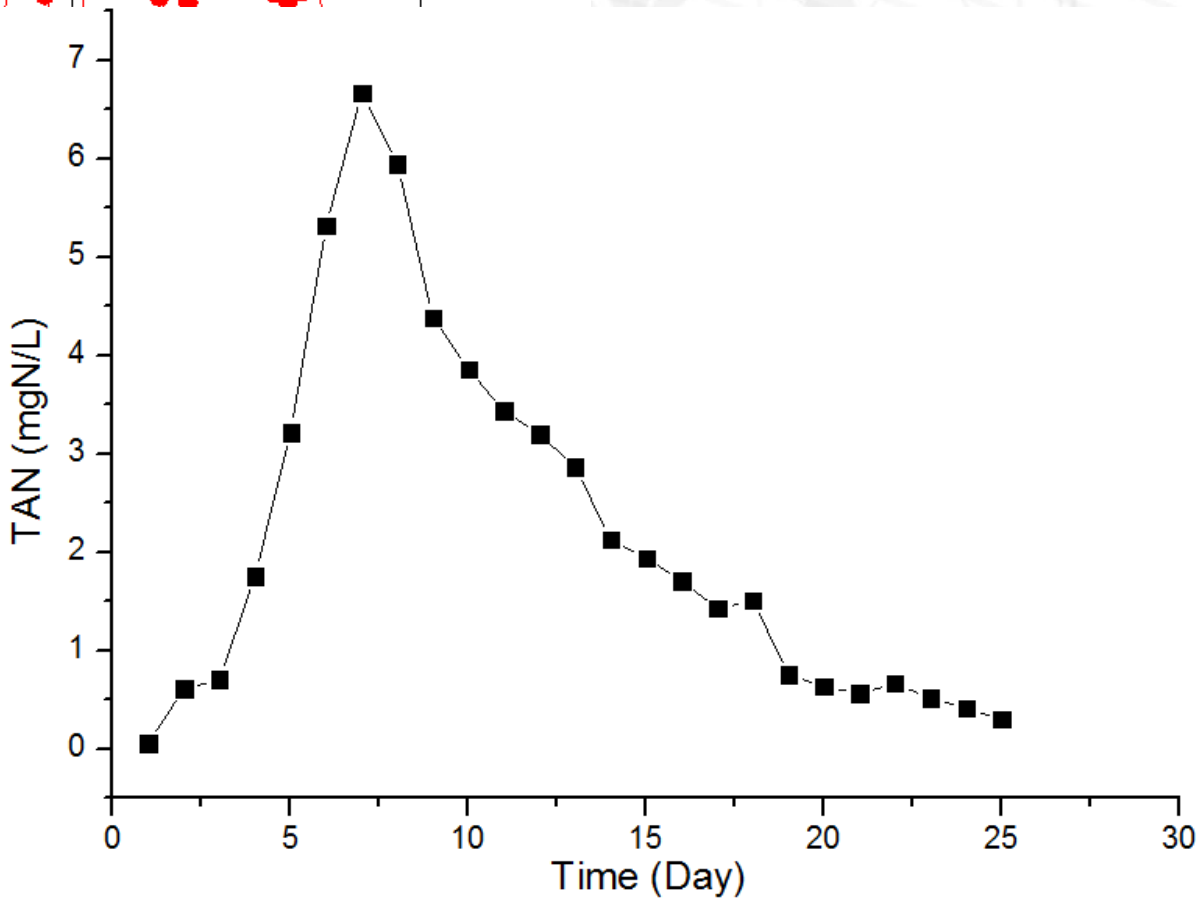


- Variation of TAN concentration in aquaculture system

# 3.3 Nitrogen distribution

Aquaculture tanks

| | Tomato tank | Pak Choi tank |
|---|---|---|
| Initial fish weight | 6137.98 g | 6030.93 g |
| Final fish weigh | 10482.93 g | 9316.48 g |
| Fish biomass increase | 4344.95 g | 3285.55 g |
| Fish feed input | 6946.95 g | 6606.38 g |
| Feed conversion ratio | 1.6 | 2.0 |
| Nitrogen input | 449.47 g | 427.43 g |
| Nitrogen uptake by fish | 109.49 gN | 82.8 gN |
| Nitrogen utilization efficiency of fish | 24.40 % | 19.37 % |

## Grow beds

| | Tomato | | | Pak Choi | |
|---|---|---|---|---|---|
| | Fruit | Leaf & Vine | Root | Leaf | Root |
| Plant production (wet weight) | 13858.17 g | 19933.49 g | 1260.94 g | 24897.43 g | 93.219 g |
| Plant production (dry weight) | 1218.13 g | 2423.91 g | 123.95 g | 1070.59 g | 6.08 g |
| TN uptake by plant | 24.00 gN | 48.48 gN | 4.29 gN | 59.95 gN | 0.26 gN |
| Nitrogen utilization efficiency of plant | | 17.08 % | | 14.09 % | |

- Total nitrogen utilization efficiency

(1)Tomato aquaponics: 42.2%;

(2)Pak Choi aquaponics: 33.5%.

# 4. Conclusions

(1) Aquaponics could improve the nitrogen utilization efficiency.

(2) Tomato might be a better choice than Pak Choi for aquaponics.

(3) Aquaponics has lower nitrate concentration, mainly because plants could absorb nitrate.

(4) In the present experiment, aquaponics didn’t reduce the TAN concentration, and further study is needed to elucidate this.

# Thank You For Your Attention!