 TKP3501
 Farm Mechanization

 Topic 10: Integrated Farming

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Integrated Farming (IF)

- Purpose of IF: Combination of multiple agriculture production system, continuous improvement and managing all resources available
- For instance aquaculture, horticulture, fruit production, and water recycle were combined under one system
- Benefit:
  - Maximization of the space
  - Optimum of water usage
  - Integrated system
  - Cost effective
  - Eco-friendly
1. Water Treatment

- **Water quality**
  - Water pH, turbidity, Dissolved oxygen level, water harness

- **Water control**
  - Pumping system
  - Tank and filtration system
Water filtration system

Pumping system
2. Fish farming

High quality water → Moderate quality water → Low quality water → To vegetable

PATIN

KETUTU

KELAH
Vertical Farming
Vertical Farming Pumping System


FISH

Table 1.0 Requirement of growing fish used

<table>
<thead>
<tr>
<th></th>
<th>Tilapia</th>
<th>Catfish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum temperature (°C)</td>
<td>23-27</td>
<td>24-29</td>
</tr>
<tr>
<td>Carnivore or omnivore</td>
<td>omnivore</td>
<td>omnivore</td>
</tr>
<tr>
<td>Mature size (kg)</td>
<td>0.68</td>
<td>0.60</td>
</tr>
<tr>
<td>Time to reach maturity</td>
<td>9-12 months</td>
<td>12-18 months</td>
</tr>
<tr>
<td>Oxygen needs</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
MAINTENANCE

- Ammonia and nitrite levels should be less than or equal to 0.5 ppm
  - Ammonia rise -> dead fish
  - Nitrite rise -> bacteria environment damaged
    - Solution: - get more plants
    - harvest fish
3. Vegetable / Crop Farming

- Rice production
  - Combine rice and fish (e.g. Ikan puyu/ talapia or cat fish)
Vegetable production

- Water filtration process
- Water injector – fertigation system
- Gravity fed system
- Autopot
4. Fruit Farming

- Fruit production
  - Rock melon, tomato, sweet corn, banana, herbs and etc
5. Wetland / Composting

- **Wetland**
  - Reused the water to the wetland plant.
  - To produce ‘clean’ water to be recycle back to the other crop
Composting

- Reused the plant material or as a food for the worm casting
- Produce organic fertilizer
- Possible to collect the methane gas-use for heating or cooking
Advantages

- Year-round production
- No weather-related crop failure
- No agricultural run-off
- Allowance for ecosystem restoration
- No use of pesticides, herbicides, or fertilizer
- Use of 70-95 percent less water

Main benefits

1) Supply enough vegetables for that particular area
2) Environmental friendly
3) Low production cost, increase profit
Agriculture in Greenhouse or Open Shelter System
Rain shelter

- Advantages;
  - Shading
  - Protect from potential disease
  - Precise control for water

- Disadvantages;
  - High in investment cost
  - Required regular maintenance for canopy and structure
  - Required certification for the structural
Rain shelter
Simple root
Hydroponic system
Wick system

Drip system

Ebb and Flow

Water culture

NFT-Nutrient Film Technique

Aeroponics
Fertigation System
Fertigation System

- Control Panel
- Polyethylene Tubing
- Mix tank
- Pump set
- Plant
2nd Design

1. Fertilization Mixer
2. Software
3. Radio Controlled Valve

Components

Design

Technology
BASIC DESIGN & COMPONENT

Microcontroller

STOC K A

STOC K B

STOC K B

Sensor - weather, temperature

Injector

Pump

Verturi

MIXING TANK

WATER TANK

Sensor - pH

-Moisture soil - water

PC Interfacing: Software
2nd design

- Sensors
- PC interfacing
- Microcontroller
- Fertilizer, Water and Solution Tanks
- Fertigation pumps
Questions/ Review

- What is the drawback of integrated farming?
- What is the challenge could be faced by adopting the IF at urban area?
Thank you.