AUTOMATIC SUBSURFACE IRRIGATION AND DRAINAGE USING SHEET-PIPE TYPED MOLE DRAIN

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INTRODUCTION

- Indonesia swamp land ±43.7 million hectares, ±9.8 million ha potential for farmlands, and ±1 million ha cultivated and more being developed.
- Problems:
  - Low productivity and intensity
  - Inundated due to high rainfall, flat lowland & sea tides.
  - Saline/acidic soils with low percolation due to heavy clays.
  - Hard soil and Soil cracking during dry periods.
- Need appropriate surface/Sub-surface drainage techniques
- Introduce subsurface drainage with sheet-pipe type-mole drain.

OBJECTIVES

- Optimize irrigation and drainage rates to maintain expected water level.
- Characterize effectiveness of sheet-pipe for draining and leaching.
- Come up with a control system of irrigation and drainage using the sheet-pipe.
- Characterize performances of the control system.

SHEET-PIPE INSTALLATION

CONCEPTUAL DESIGN
**RESEARCH PLAN**

- First Stage in 2018/2019:
  - Box experiment in laboratory to characterize WL profiles and drainage flow;
  - Field experiment to characterize WL, hydrograph, drainage and leaching.
- Second Stage in 2019/2020:
  - Field monitoring on irrigation efficiency and water productivity.
  - Box experiment in lab to test the performance of the control system.
  - Engineering design of the automatic control system in field scale.
- Third Stage in 2020/2021:
  - Installation and monitoring of the control system in the field.
  - Field monitoring on irrigation efficiency and water productivity.

**EXPERIMENTAL SITE**

- Rice Research Centre, Ministry of Agriculture, Sukamandi District, Subang Regency, West Java, Indonesia.
- P1: Plot without SP 1.12 ha.
- P2: Plot with SP 1.1 ha.
- P3: Drainage canal

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**RAINFALL EVENTS**

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<th>No</th>
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<th>Length (h)</th>
<th>Amount (mm)</th>
<th>Rate (mm/h)</th>
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**RAINFALL, TEMPERATURE & HUMIDITY**

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**WATER LEVEL & PERCOLATION**

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**WATER LEVEL & DRAINAGE RATE**

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**WATER TEMPERATURE & CONDUCTIVITY**

- Sheet-pipe can drain faster, manage water level, and regulate soil aeration.
- After rainfall, rainwater percolates faster resulting in parabolic curve.
- WL level was flat but lower closer to the sheet-pipe.
- Soil EC was lower due to leaching effect which is good to neutralize the soil.

**CONCLUSIONS**

**THANK YOU FOR YOUR ATTENTION**