DETERMINING IRRIGATION AND DRAINAGE RATES TO ANTICIPATE EXTREME WEATHERS

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INTRODUCTION

• Sustainable farming requires accurate information on climate trend, weather pattern and available rainwater.
• Needs to use precise methods to identify dry/wet periods.
• Introduce polynomial equations to determine start, end, length and peak of dry/wet periods.
• Determine irrigation/drainage rate to anticipate extreme dry/wet period.

RAINFALL & EVAPOTRANSPIRATION

A-Type or wet region (Schmidt-Fergusson)
C-Zone (Oldeman)
Desirable planting seasons:
- 1st: Paddy (Oct–Jan/Feb)
- 2nd: Paddy (Feb/Mar–Jun/Jul)
- 3rd: Corn/Soybean (Jun/Jul–Sep)

CLIMATE CLASSIFICATION

METHODOLOGY

• Location: Serang Regency, Banten Province, Indonesia.
• Daily climate from 1978–2018:
  - Temperature (T), Rainfall (R), Evapotranspiration (ET) calculated with Hargreaves’ model.
• Dry/Wet periods analysed with polynomial equations.
• Available rainwater calculated as (R-ET).
• Climate change analysed with:
  - Parametric linear model
  - Non-parametric Mann-Kendall method
TRENDS OF TEMPERATURE & RAINFALL

Available Rainwater

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Wet1</th>
<th>Dry1</th>
<th>Wet2</th>
<th>Dry2</th>
<th>Wet3</th>
<th>Dry3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence in 40 years</td>
<td>12%</td>
<td>2%</td>
<td>15%</td>
<td>6%</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>Start (day)</td>
<td>1</td>
<td>107</td>
<td>166</td>
<td>327</td>
<td>330</td>
<td>358</td>
</tr>
<tr>
<td>End (day)</td>
<td>121</td>
<td>260</td>
<td>526</td>
<td>329</td>
<td>351</td>
<td>385</td>
</tr>
<tr>
<td>Length (days)</td>
<td>121</td>
<td>158</td>
<td>62</td>
<td>3</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>Length (% in 365 days)</td>
<td>33%</td>
<td>43%</td>
<td>17%</td>
<td>1%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>Av. Rainwater (mm)</td>
<td>398</td>
<td>-354</td>
<td>205</td>
<td>-139</td>
<td>146</td>
<td>-25</td>
</tr>
<tr>
<td>Peak Day (day)</td>
<td>8</td>
<td>200</td>
<td>301</td>
<td>301</td>
<td>348</td>
<td>264</td>
</tr>
<tr>
<td>Peak Rate (mm/day)</td>
<td>10.0</td>
<td>-3.8</td>
<td>5.4</td>
<td>-1.9</td>
<td>6.1</td>
<td>-1.5</td>
</tr>
</tbody>
</table>

- Irrigation*: 1.56 m³/h and 4.15 m³/h.

CONCLUSIONS

- The location experienced temperature rise and rainfall decline.
- Extreme dry season 1997 with rainfall 1115 mm and wet season 2013 with rainfall 2914 mm. In the average, rainwater surplus 231 mm.
- Dry season: rainwater deficit from 2.5 mm/d to 3.8 mm/d.
- Wet season: rainwater surplus from 2.8 mm/d to 10.0 mm/d.
- Required irrigation and drainage rates per ha: 1.56 m³/h and 4.15 m³/h.

* per hectare, Efficiency not accounted.
THANK YOU FOR YOUR ATTENTION