

DETERMINING IRRIGATION AND DRAINAGE RATES TO ANTICIPATE EXTREME WEATHERS

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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).
 - Parametric linear model
 - Non-parametric Mann-Kendall method



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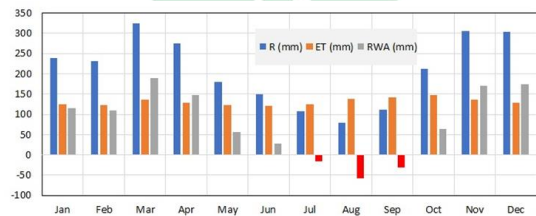
INTRODUCTION

- 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.



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RAINFALL & EVAPOTRANSPIRATION



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OBJECTIVES

- To identify how climate change has occurred.
- To figure out rainwater deficit/surplus during extreme dry/wet weather.
- To determine rates of irrigation/drainage to anticipate drought/flooding.



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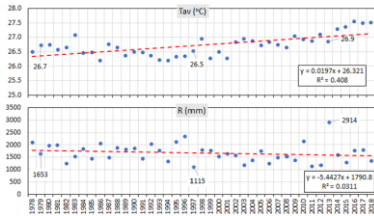
CLIMATE CLASSIFICATION

- 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)



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TRENDS OF TEMPERATURE & RAINFALL



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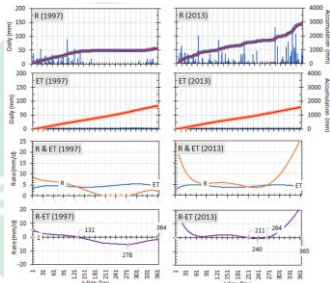
AVAILABLE RAINWATER

Parameters	PERIODS					
	Wet1	Dry1	Wet2	Dry2	Wet3	Dry3
Occurrence in 40 years	12%	2%	15%	68%	83%	90%
Start (day)	1	107	266	327	330	358
End (day)	121	265	326	329	351	365
Length (days)	121	158	62	3	22	8
Length (% in 365 days)	33%	43%	17%	1%	6%	2%
Av. Rainwater (mm)	398	-354	205	-139	146	-25
PeakDay (day)	8	200	301	301	348	264
PeakRate (mm/day)	10.0	-3.8	5.4	-1.9	6.1	-1.5

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EXTREME DRY/WET WEATHERS



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REQUIRED IRRIGATION AND DRAINAGE RATES

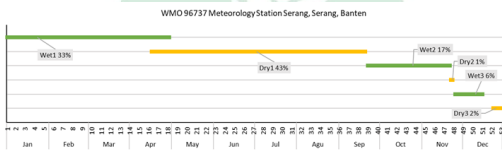
Weather	Irrigation*		Drainage*	
	(m ³ /h)	(l/s)	(m ³ /h)	(l/s)
Normal	1.03	0.29	1.18	0.33
Extreme	1.56	0.43	4.15	1.15

* per hectare. Efficiency not accounted

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WET & DRY PERIODS



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CONCLUSIONS

- The location experienced temperature rise and rainfall decline.
- Extreme dry season 1997 with rainfall 1115 mm and wet 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.

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THANK YOU FOR YOUR ATTENTION

