

Agricultural Water Use in South Sulawesi during the Dry Season

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Background of This Study

- Three primary canals diverted from Bili-Bili dam irrigate 23,600 ha of Jeneberang River watershed. 
- Water User's Association (P3A), irrigated from a gate in the 2nd canal, has been completed in 2007. 
- Rice can be cultivated in dry season May – Dec.
- Based on the reliance to the water manager (Mandro Jene) and the cooperative activity (Gotong Royong) by all farmers 
- But still, rice has been cultivated under insufficient water even in the 1st dry season in the lower reach.

What we are studying now.

- Clarifying the water use feature for rice in the drying season.
- Knowing the intellect of farmers and P3A for water management.

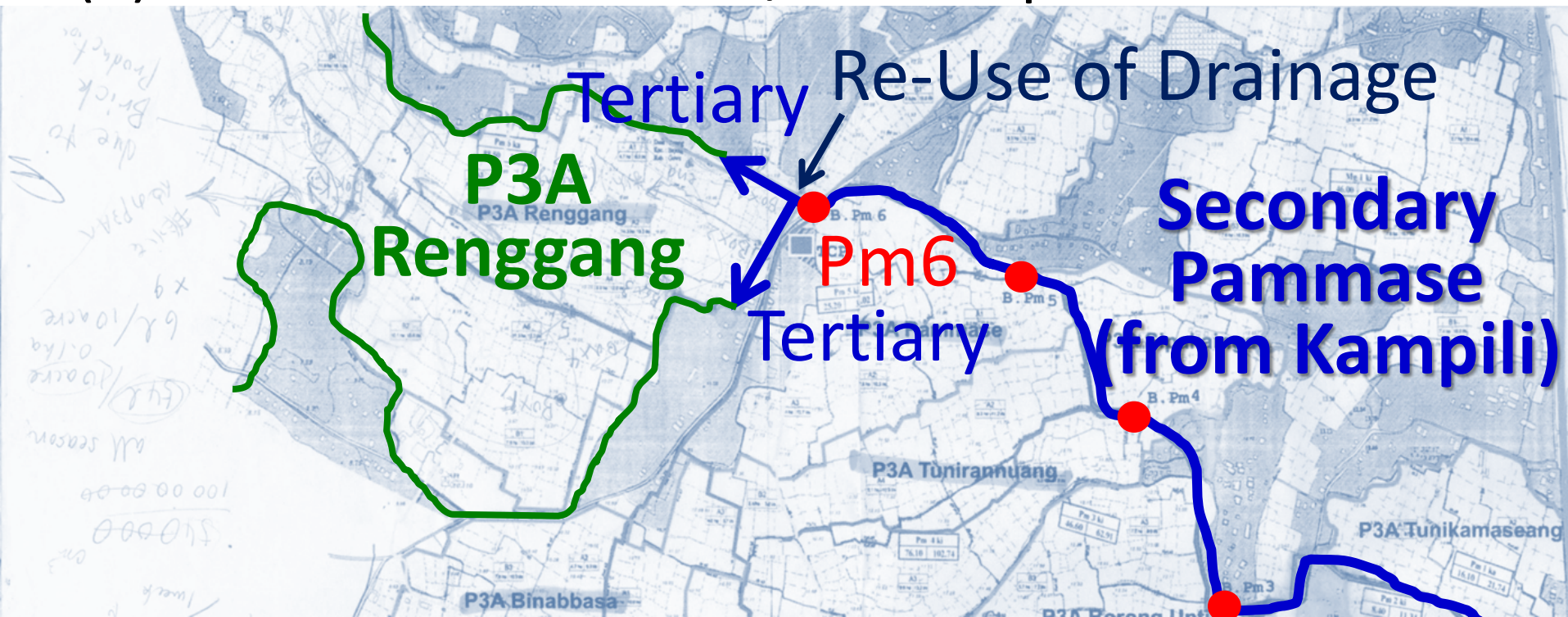
What we will study for future.

- Servicing empowerment of P3A aiming more effective and sustainable water use.



Specification of P3A Renggang in GP3A (FWUA) Sirannuang

- (1) Irrigated by 2nd Pammase through Pm6Ka and reused drainage water from P3A Sappaya, etc.
- (2) 88.5 ha with 119.48 l/s under plan at Pm6Ka



Measurements in the experimental field and P3A Renggang, 2012

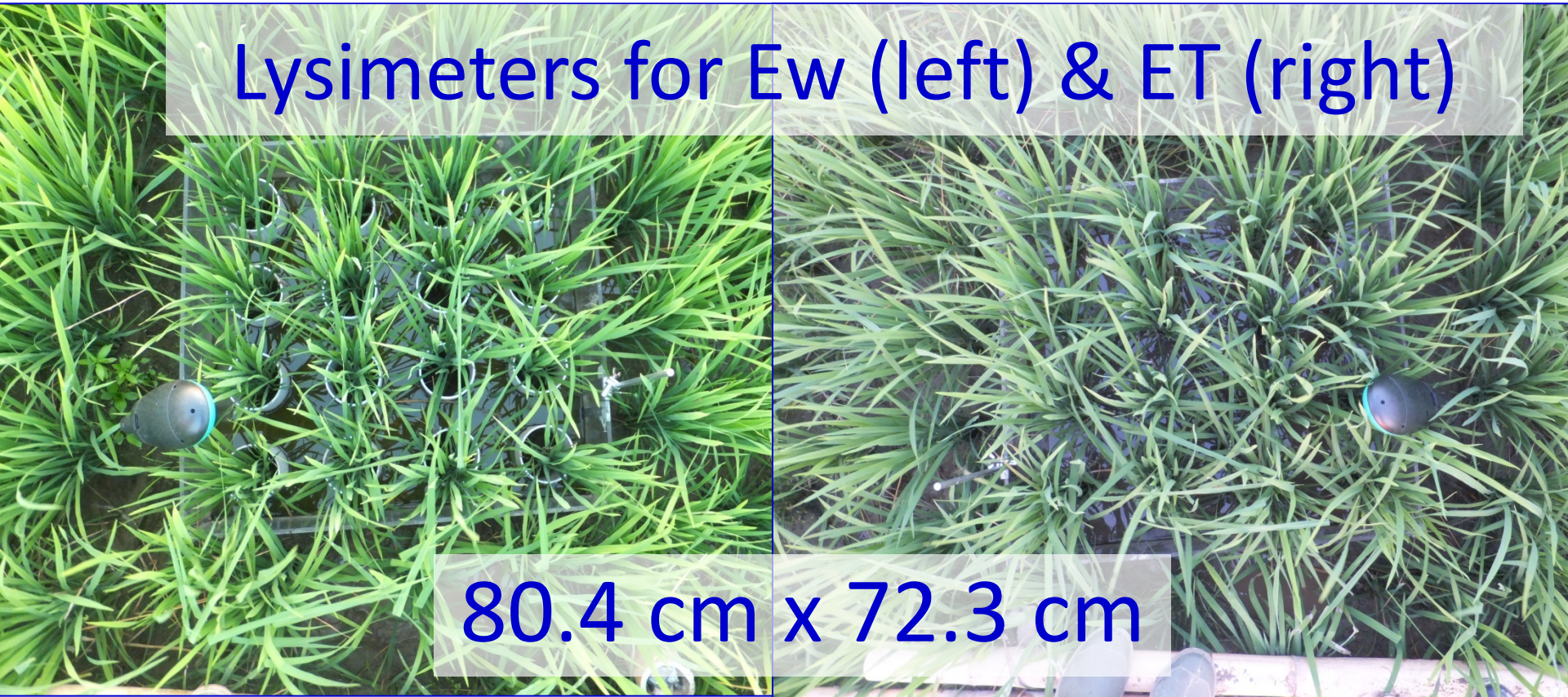
- Rice (*Oryza sativa* L. subsp. *Javanica*), cv. Ciliwung
- Transplanted on May 25, Harvested on Aug 25
- Water balance terms
- Evapotranspiration (ET) measured by Lysimeters
- ET estimated by Bowen Ratio Energy Balance
- Crop growth measurements

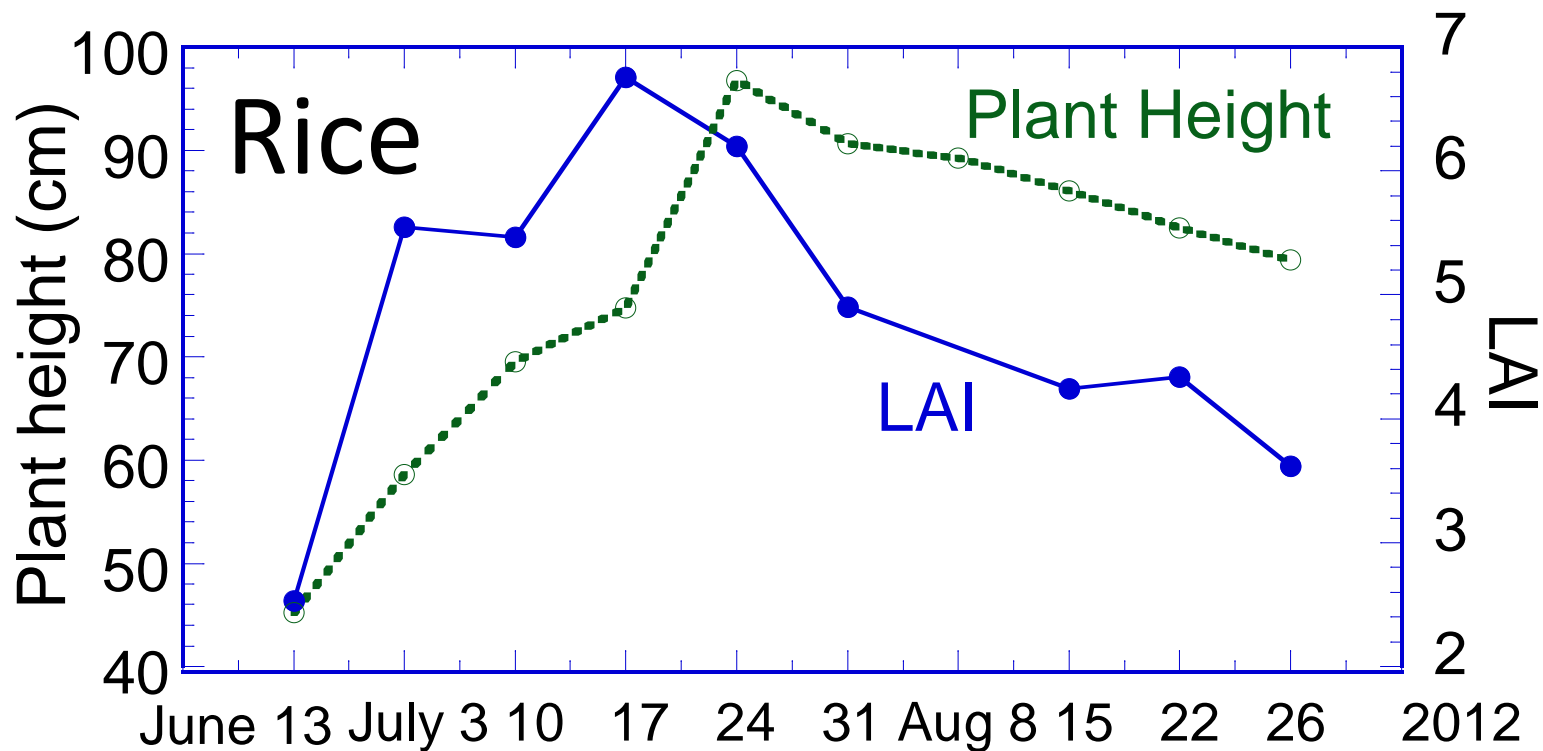


Meteorological measurements

Lysimeters for Ew (left) & ET (right)

80.4 cm x 72.3 cm





During 1st drying season 2012

Variation of plant height and LAI in P3A-Renggang
(Transplanted on 25 May 2012)

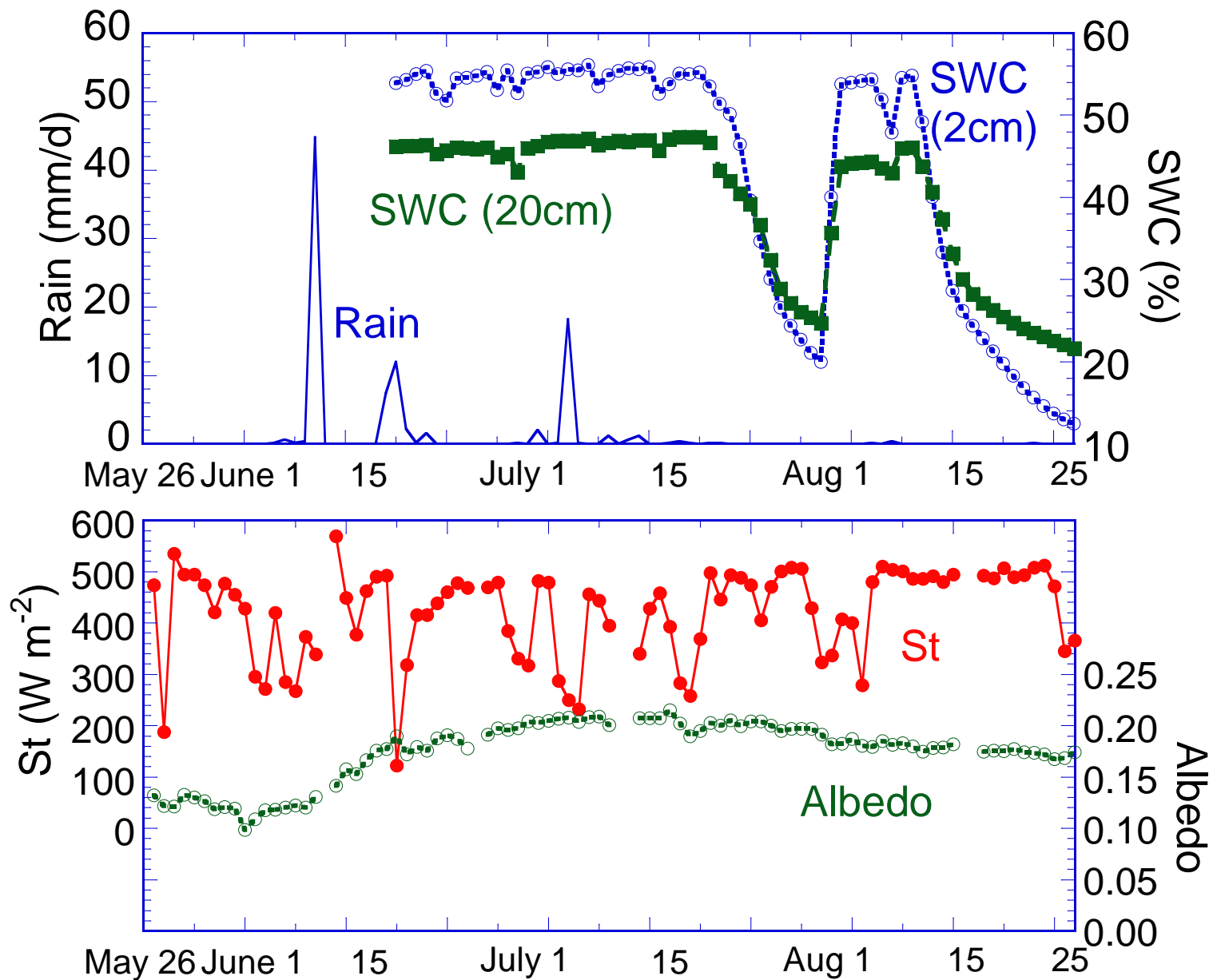


Fig. 2 Daily variation of rain, soil water content (SWC), solar radiation (St) and albedo, 2012

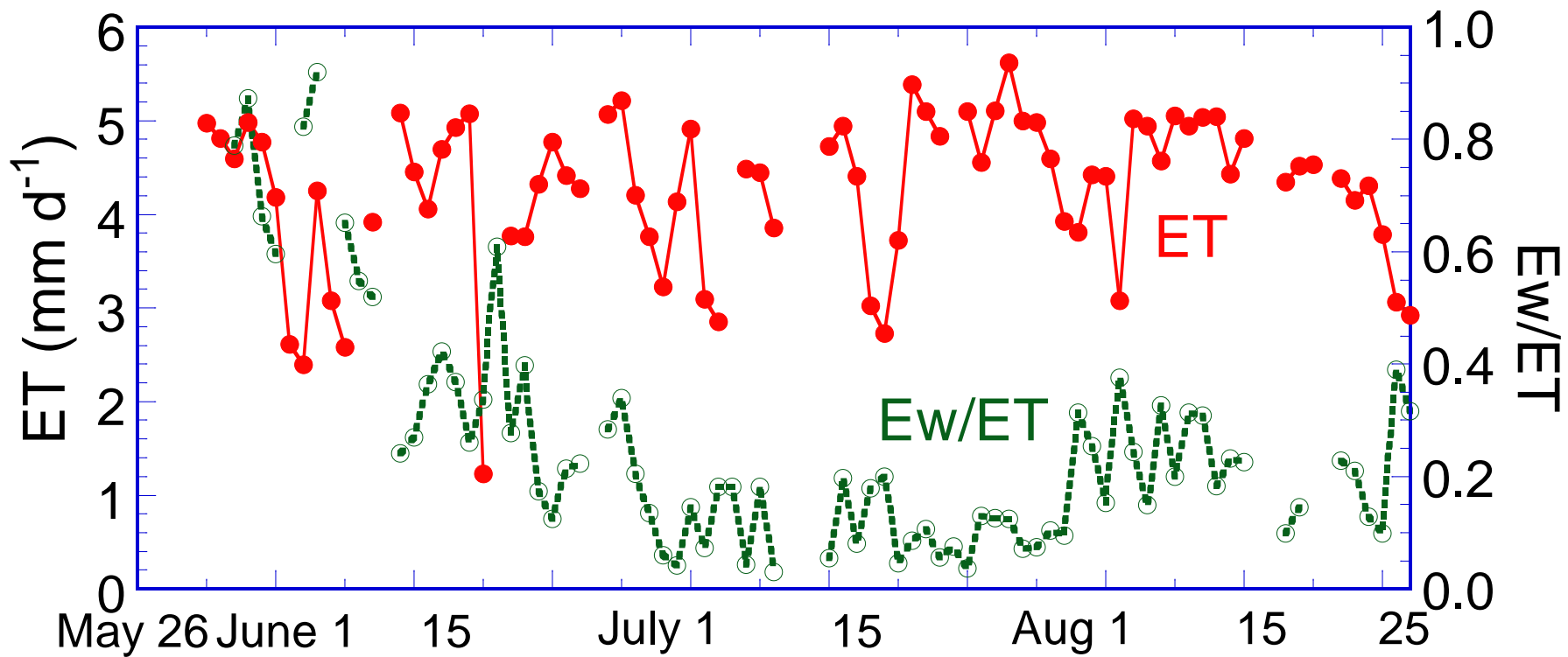
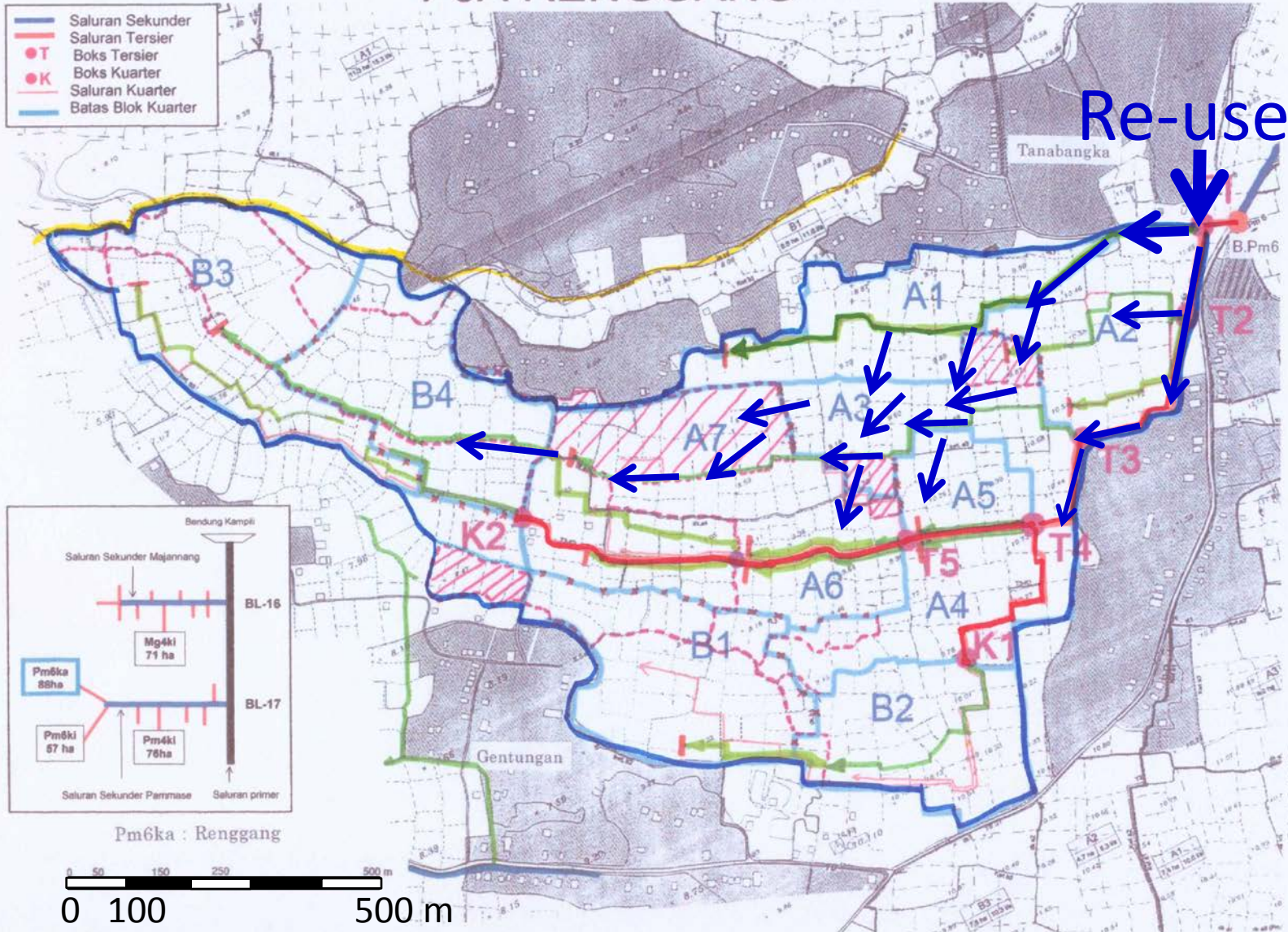


Fig. 5 Daily variation of ET and Ew/ET, 2012

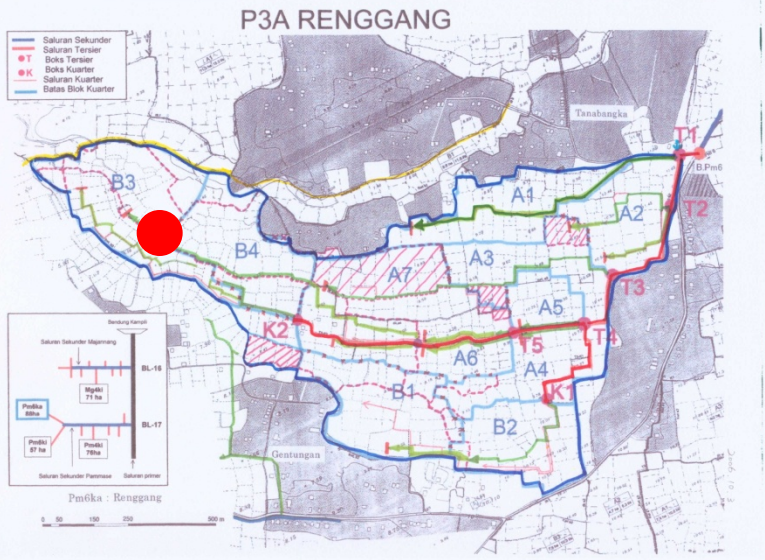
P3A RENGANG

- Saluran Sekunder
- Saluran Tersier
- T Boks Tersier
- K Boks Kuarter
- Saluran Kuarter
- Batas Blok Kuarter

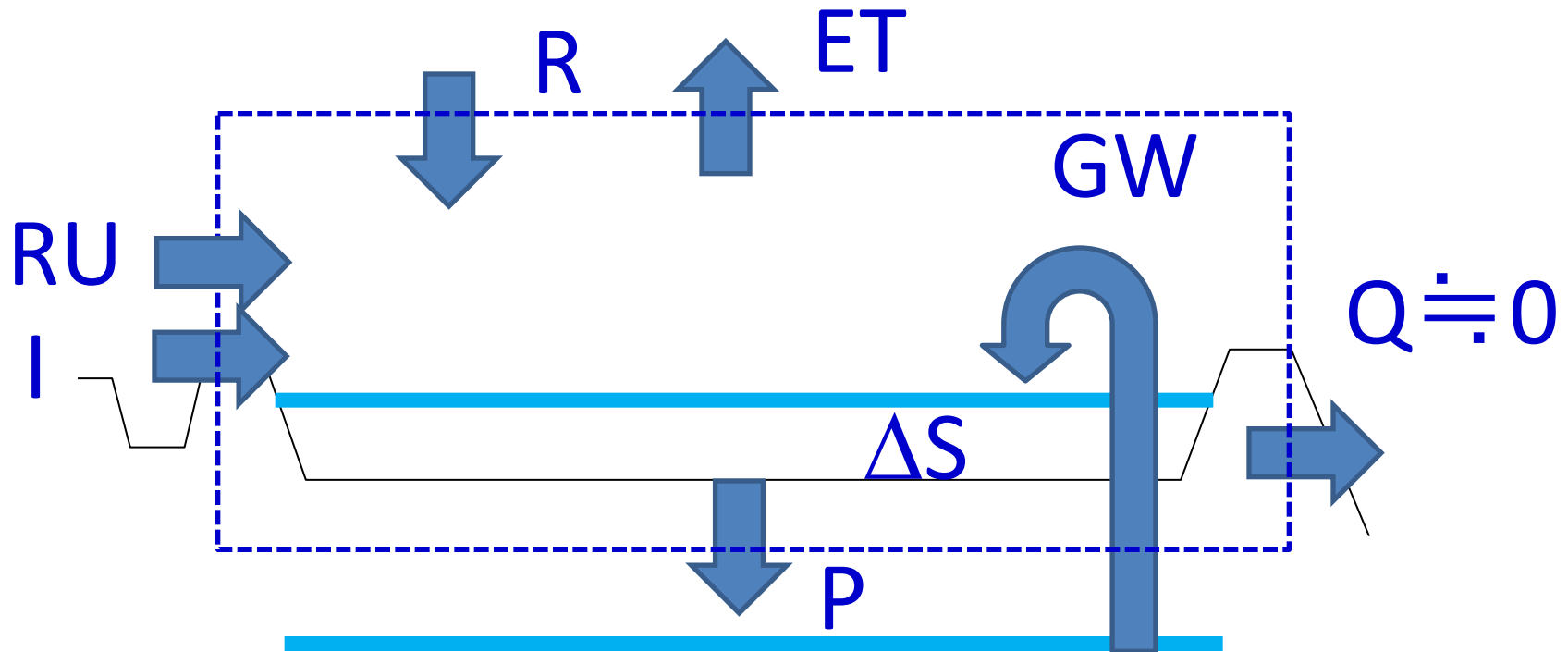
Re-use



Additional efforts; Ground water use



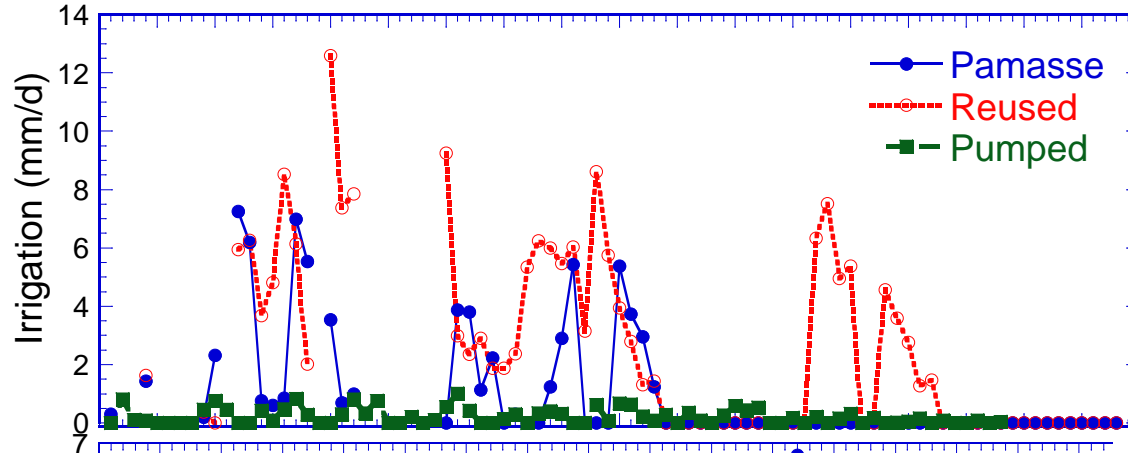
Water Balance Scheme in P3A Renggang



$$R + I + RU + GW = ET + P + Q + \Delta S$$

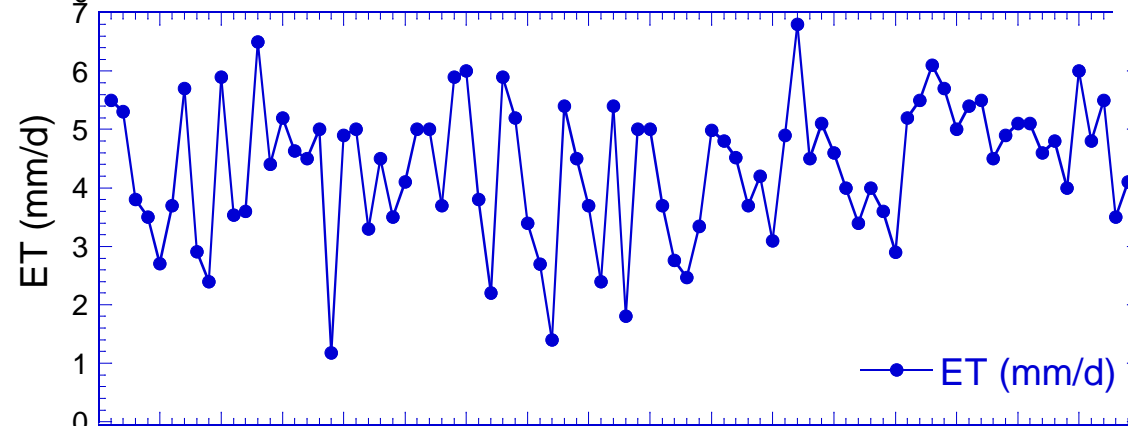
Taking long period WB makes $\Delta S = 0$

Irrigation

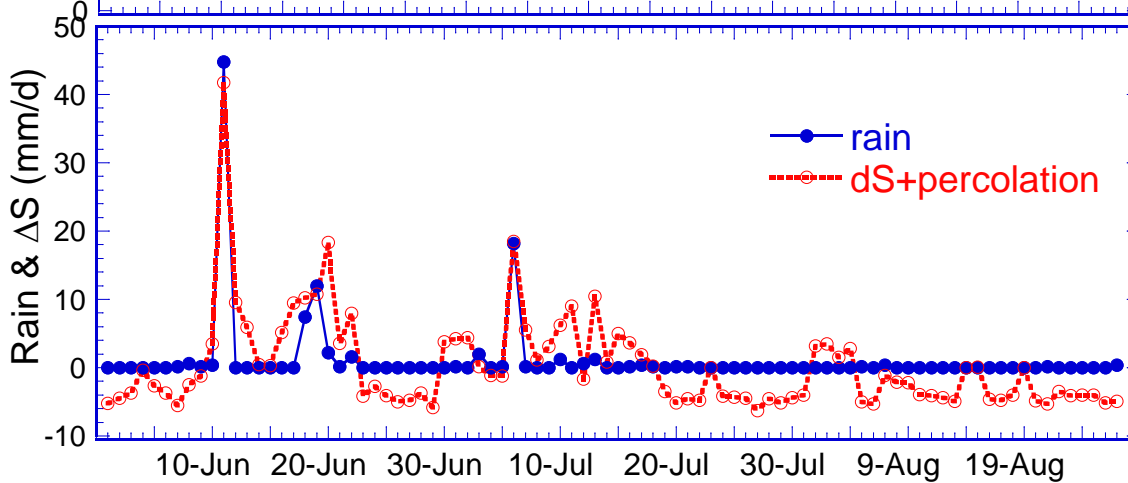


Canal
Re-use
Ground
water

ET



Rain
Storage



Daily variation of water balance terms in Renggang

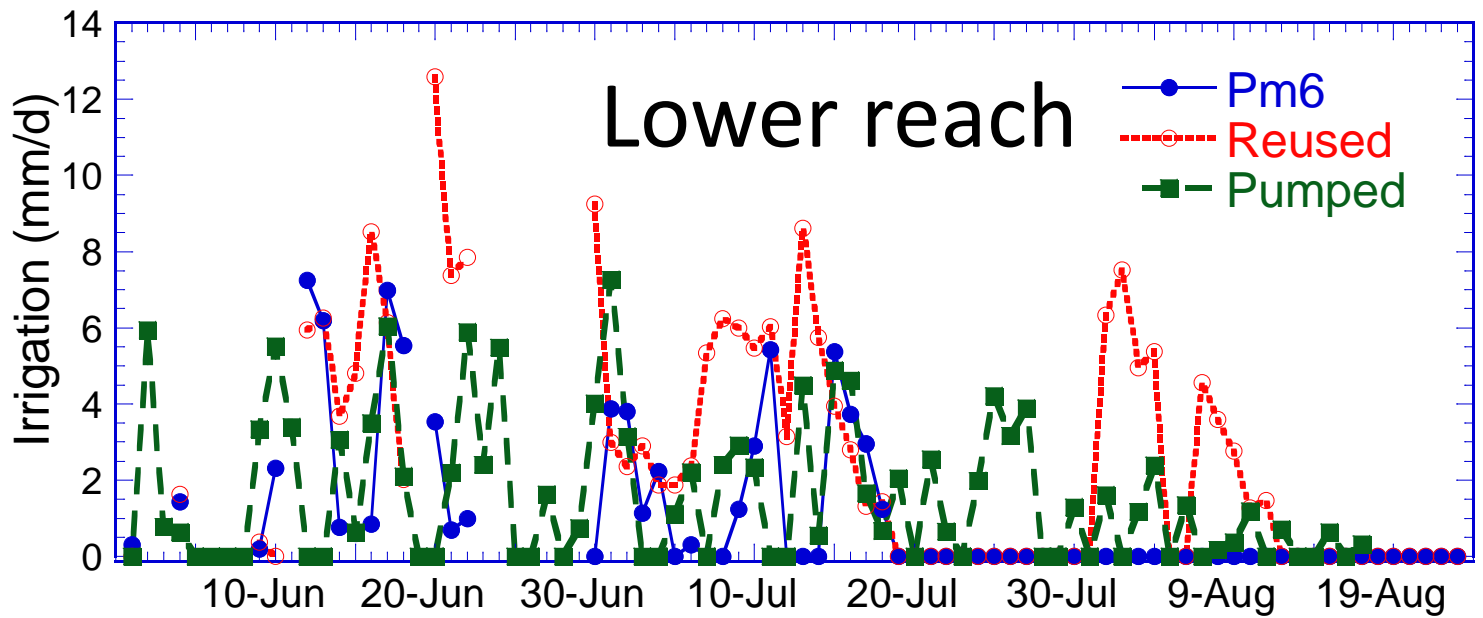
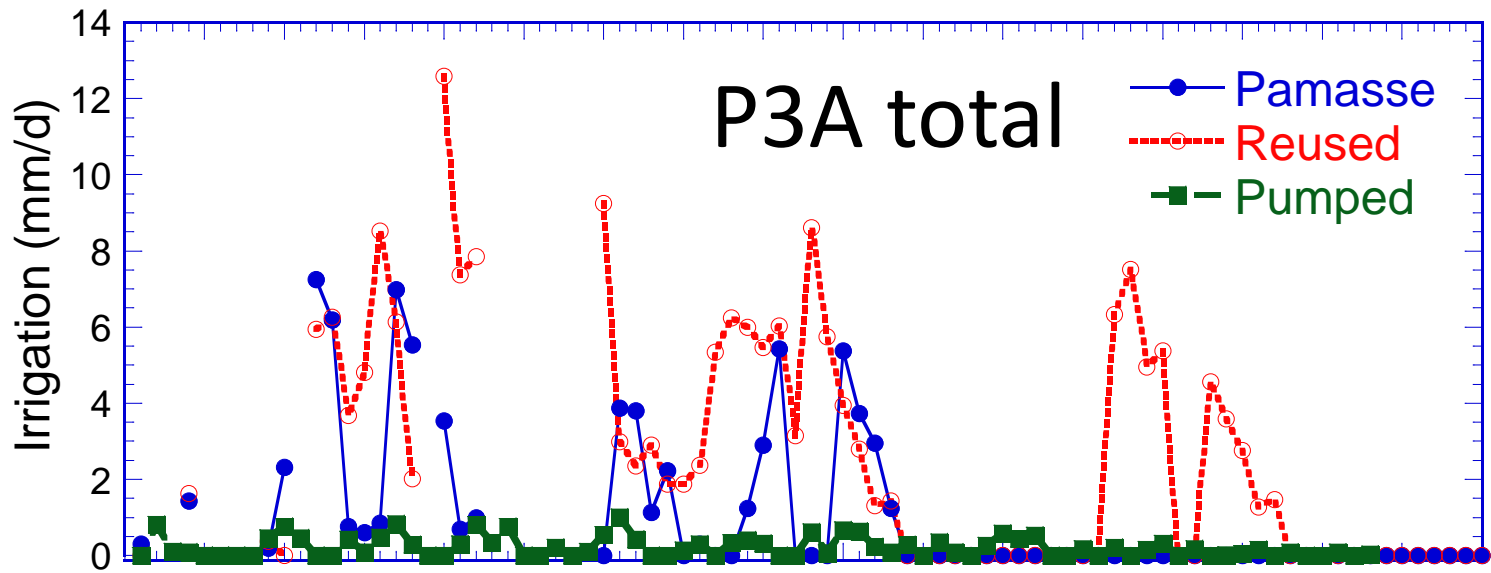


Table Measured and estimated water balance in Renggang P3A

	rain (mm)	Canal Irrig. (mm)		Pump (mm)	ET (mm)	ΔS (mm)
		Pammase	Reused			
June 1–30	69.60	37.67	76.41	7.97	120.25	71.40
July 1–31	25.00	34.25	70.46	8.07	122.29	15.48
Aug 1–27	1.20	0.00	37.83	1.38	111.40	-71.00
Sum	95.80	71.92	184.70	17.41	353.95	15.89
	rain (%)	Canal Irrig. (mm)		Pump (%)	ET (%)	ΔS (%)
		Pammase	Reused			
June 1–30	36.32	19.66	39.87	4.16	62.75	37.25
July 1–31	18.15	24.86	51.14	5.86	88.76	11.24
Aug 1–27	2.97	0.00	93.62	3.41	275.72	-175.72
Sum	25.90	19.45	49.94	4.71	95.70	4.30

Have farmers recognized the geological properties?



Hydraulic conductivity
 $k = 1.4 \text{ E-4 (m/s)}$

Conclusions of this research

1. Water balance features

1) Positive ΔS in June and July

→ Conserved in the ground (Reuse important).

2) Negative ΔS in August

→ Soil and ground water was consumed for ET

2. Rice Cultivation in the 1st dry season in this P3A

1) Water is utilized under limited conditions (Reuse and Ground water)

2) Knowing climatic conditions and ground water properties from experiences

What can we do in future by this co-research?

1. Recommendation for better water management
 - 1) Organize more systematic relationships between each Water User's Associations
 - 2) Start irrigation from the lower reach
 - 3) Constructing reservoirs
 - 4) Storing more water in reservoirs and under ground during rainy season
2. Empowerment for farmers
 - 1) Introducing new commercial crops
 - 2) Educating the function of agricultural water use