Does high evapotranspiration of plantation crops contribute significantly to the fluctuation of catchment discharge?

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Background





In our study area, former reports had correlated the water scarcity with high water use of the plantation crops.

Literatures indicated association between increased water use and water scarcity and

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Objective

Focus on water scarcity issue

The aim of this research is to investigate the relative contributions of increased ET and other factors like soil degradation to the change of the catchment hydrological cycle



Methodology

Research Location



 Field measurements in plantation crops (degraded soil) and forest/agroforests (non-degraded as reference)

• Soil characteristics/degradation

- Bulk density
- Infiltration
- Soil moisture/AWC
- Vegetation parameters
 - Evapotranspiration

SWAT model

- Parameterization
- Calibration
- Validation

Methodology

Catchment ETa Measurement : ETa = P-Q







Results and Discussion

Soil degradation indicators

Bulk density

Infiltration



Results and Discussion



Results and Discussion

Evapotranspiration (actual) - ETa



SWAT Parameterizations

Table 4. Change of model input value from non-degraded to degraded soil

SWAT parameter	Definition	Degraded	Non-
		soil	Degraded soil
HYDGRP	Hydrologic soil group	D	В
CN2	Curve number	83	65
$_$ SOL $_$ BD (g cm $^{-3}$)	Soil bulk density	1.2–1.3	1
OV_N	Manning's "n" value for overland flow	0.07	0.4
$SOL_K (mm h^{-1})$	Saturated hydraulic conductivity	30	400
AWC	Available water content	0.1	0.2

SWAT Calibration

FLOW_OUT_1





Conclusion

- The increased ET in oil palm plantation has a minor role on the catchment discharge fluctuations compared to that of soil degradation.
- Implication; It determines the plantation management, the management practices in oil palm plantation should be directed to reduce soil degradation and to promote higher infiltration rates.