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플럭스 관측 기반의 생태계 생산성과 효율성 평가 : 해남 농경지 연구 사례

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Assessment of Ecosystem Productivity and Efficiency based on Flux Measurement: A Case Study of Haenam Farmland in Korea

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Climate-smart agriculture is a global vision with three challenging objectives: (1) to achieve high productivity and income, (2) to adapt with resilience to climate change, and (3) to reduce greenhouse gases (GHG) emission. To build quantitative evidence for the achievement of CSA, time series analysis of tower flux measurement can be used. In this study, we have assessed the first objective of CSA (i.e., productivity and efficiency) for a typical farmland dominated with rice paddies. A set of quantitative indicators were evaluated by analysing the time series data of carbon, water and energy fluxes over the Haenam farmland site in Korea (HFK). The productivity and efficiency at HFK during the rice growing seasons from 2003 to 2015 were assessed by examining gross primary productivity (*GPP*), water use efficiency (*WUE*), carbon use efficiency (*CUE*), and light use efficiency (*LUE*). On average, *GPP* was 862 ± 45 g C m^{-2}, indicating that the productivity at HFK was slightly lower than the national standard but relatively higher than the Asian standard. In terms of efficiency, *WUE*, *CUE*, and *LUE* were 2.46 ± 0.25 g C kg H_2O^{-1}, 1.18 ± 0.08, and 1.35±0.14 g C MJ^{-1}, respectively, which are on average around the national standard and above the Asian standards. Other important findings from the concomitant variations of productivity and efficiency include the trade-offs between increased production and decreased efficiency. Such trade-offs and / or synergies are further expected in relation to the analyses of other two objectives, which are currently in progress.

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