

主 論 文 の 要 約

論文題目 Growth performance of the photoperiod-sensitive rice varieties released for the rainfed lowland in different soil types in Cambodia
(カンボジアの土壤タイプが異なる条件における天水田向け感光性イネ品種の生育および生産特性)

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In Cambodia, rice is predominantly produced in areas with rainfed lowland conditions where photoperiod-sensitive varieties are cultivated. A number of varieties have been released for rainfed lowland areas, and the rice grain yield has reportedly increased by approximately 12% over the past ten years. Moreover, great fluctuations in yield performance have been observed across different soil types of the rainfed ecosystems of Cambodia. Therefore, the present study aimed to analyze the grain yield and stability among ten popular varieties that were released for rainfed lowland ecosystems across the four different soil types in Cambodia at farmers' field in two years and as pot experiment in the following year.

For the study 1, two experimental fields in Battambang province produced the highest grain yield, followed by the fields in Pursat, Kampong Thom, and Siem Reap, respectively. The soil analysis showed that soil from Battambang is relatively high in clay content. Moreover, the relationship analysis showed that higher clay content is positively correlated with some soil fertility parameters. Taken together, the results suggested that higher grain yield achieved in Battambang was associated with good soil fertility. The grain yield varied 566 g m^{-2} as the highest in clay soil and about 220 g m^{-2} as the lowest in sandy soil. A combined ANOVA revealed significant differences for the main effect of genotype, environment, and genotype-by-environment interaction (GEI) for all yield-related traits and grain yield per square meter. Based on the analysis, Phka Rumduol was stable, and produced the highest grain yield across the eight tests, followed by Phka Rumdeng, Phka Mealdei and

CAR4, respectively. While, Riang Chey was lowest yielder. The Pearson's correlation analysis between some important yield-related traits with grain yield revealed that percentage of filled grain and number of panicles per hill are highly positive with grain yield. These results were from the field experiment for only one year and the important yield component determining the difference in grain yield was different depending on soil environment in a cultivation season of 2019. Thus, as the following experiment, we exam similar setting field experiment again to deepen our understanding of limiting factors of varietal difference in yield components employing specific varieties and more detail growth analytical procedures including nutrient analysis as the next study theme.

In study 2, an experimental field in Battambang province produced the highest grain yield, followed by the fields in Pursat, Kampong Thom, and Siem Reap, respectively. From the field experiments in two cultivation seasons, Phka Rumduol was stable, and produced the highest grain yield across the four tests, followed by Phka Mealdei and CAR4, respectively. While, Riang Chey was lowest yielder. The variety Phka Rumduol showed these preferable traits and produced higher yields in fertile to poor natural soil fertility conditions with moderate variation. This variety is considered to be more desirable and ideal due to its stability and higher grain yield. The other varieties, namely, Phka Mealdei, Phka Rumdeng, and CAR4, were identified as above-average yielders. Therefore, those varieties potentially may be recommended for cultivation in rainfed lowland rice ecosystems in Cambodia due to their high yields. CAR4 showed moderate variation at the same level as Phka Rumduol. From the point of stability, Phka Rumduol and CAR4 can be expected to excel.

In the pot experiment as the study 3, the significance of soil groups and varieties, and its interaction are the same as the field study 2. The tendency in panicle number per hill, percentage of filled grains and 1000-grain weight positively correlate with grain yield. T/R ratio showed negative relationship with leaf N concentration. In conclusion, larger roots proportion to top part (shoot) will lead to higher leaf N concentration especially poor soil condition such as SRP.

To sum up, from the three studies higher yielding varieties performed preferable

growth and production in any kind of soil condition. The varietal difference in grain yield might attribute to the difference in panicle number per hill or % of filled grains, and the main limiting factor will differently be depending on soil condition. In addition, higher yielding varieties' performance could be attributed by preferable morphological traits such as wider leaf blade and/or larger root proportion with their following positive influence for better panicle number per hill, % of productive culms and % of filled grains based on higher nutrient uptake ability.