

Genotype-environment interactions and yield stability in rice grown under dryland conditions

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Yield analyses of rice varieties in dryland plantings were made to study plant response to different environments. The statistical measurements were genotype-environment interaction, genotype-year interaction and yield stability index. Yield stability index is defined here as a response of yield to environmental index which gives a slope of 1 and a deviation from the regression near zero (1). Using these measures, suitable rice varieties for varying environmental conditions existing in the tropics can be identified. In selecting rice varieties for dryland areas, growth duration, because of rainfall pattern, and plant-type are also important traits to be considered.

Methods

Field experiments were conducted using 18 promising rice varieties from previous trials; these included local traditional varieties, locally bred lines and introduced varieties. The plant type varied from low to high tillering, with dwarf, semi-dwarf and tall varieties. Varieties were evaluated in 1985, 1986 and 1987 at three research stations which represented three agro-climatic conditions: wet, intermediate and dry, with annual rainfall of 3,215 mm, 2,638 mm and 1804 mm respectively. Crops were grown under natural rainfall conditions, and a randomized complete block design was used for analyses.

The yield stability was investigated using a linear regression. The selection criteria used for desirable cultivars were yield stability index and high yield.

Results and discussion

The varieties responded differently under different growth conditions as indicated by significant genotype-environment, genotype-year and genotype-year-environment interactions. The variety Acc. 19815 was identified for a high yielding environment because it had the highest mean yield of 4.5 t/ha, a growth duration of 123 d, a low deviation from regression and a regression slope above 1. Variety Acc. 19801, with a mean 3.52 t/ha, a regression slope about 1 and growth duration of 110 days was considered a yield stable variety. The variety Acc 21191, with a mean yield of 2.86 t/ha, a regression slope less than 1 and growth duration of 100 days, was identified for low yielding environments because this had the highest yields under these conditions.

The yield stability index as well as the growth duration are important for selecting rice varieties for non irrigated conditions as implied in the present study.

1. Eberhart, S.A. and Russell, W.A. (1966). *Crop Sci.* 6: 36-40.